FH GR Fachhochschule Graubünden
University of Applied Sciences

[en] Caption: Fisherman in canoe on the Volta River, Ghana

SWITCH Innovation Lab "Image to Concept"

Final Project Report

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Executive Summary

By means of its "Research Data Connectome", SWITCH, the Swiss national infrastructure service provider for higher education and research, seeks to connect open research using linked open data technologies. The goal is to make the data accessible, interoperable and valuable for research, education and innovation. In order to kick-start the development of new services, SWITCH carries out so-called "InnoLab" projects which have an experimental character and are geared towards generating quick learnings.

The present InnoLab project brought together researchers and software developers from SWITCH, Wikimedia Sverige, the University of Applied Sciences of the Grisons as well as the Bern University of Applied Sciences. The goal was to develop a microservice that supports the semi-automatic tagging of images in order to interlink them with concepts on Wikidata. It thus facilitates the search and discovery of relevant images by researchers and other interested parties. The microservice builds upon an existing crowd-sourcing tool, the ISA Tool, that has been deployed on Wikimedia Commons in 2019 where it is used to apply "depicts" statements describing the content of images stored in the free media repository.

The semi-automatic tagging functionality added to the ISA Tool in the course of the present project relies on two distinct algorithms: One of them is used to extract entities from the image itself. For this purpose, the Google Cloud Vision service available on Wikimedia Commons is used. The other one extracts entities from the image metadata, thus leveraging earlier efforts made to describe the content of the images. At the time of writing, the enhanced version of the ISA Tool is available in the test environment and can be used to add "depicts" statements to images on Wikimedia Commons. Plans to deploy it to production have been postponed due to several remaining bugs.

The key learnings gained in the course of the project can be summarized as follows:

- There are several issues that need to be tackled to allow for wider use and promotion of the ISA Tool: performance issues, reliability issues, improvement of multilingual support.

- Once these issues have been resolved, measures should be taken to increase the visibility and take-up of the tool among potential contributors. As an accompanying measure, it would be advisable to assess and monitor the relevance of the ISA Tool in comparison to other tools and methods employed to add Structured Data on Commons. Moreover, activities to further promote the tool among the volunteer community should be accompanied by a dialogue with various stakeholders on what constitutes "good" tagging of images.

- The algorithms used for semi-automatic tagging should be further improved and/or complemented; a variety of avenues to be pursued to this effect have been suggested.

- Research use cases in the context of the SWITCH Research Data Connectome should be facilitated by developing alternatives to the current requirement of uploading all media files to Wikimedia Commons. Some initial use cases have been identified in the areas of digital humanities, medical libraries etc.

- Requirements arising from research use cases making use of "depicts" statements beyond their current use for search and discovery should be further investigated.

- If the ISA Tool is to be used on a large scale in the context of the SWITCH Research Data Connectome, the conclusion of contractual agreements with service providers may be indicated. Roles and responsibilities with regard to deployment, operations and maintenance need to be clarified.

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1 Introduction

The goal of the SWITCH Connectome project[1] is to connect open research data by means of linked open data technologies to make it accessible, interoperable and valuable for research, education and innovation. In order to improve the data enhancement and aggregation process, SWITCH supports the implementation of a series of so-called "InnoLab" projects the goal of which is to develop prototypical solutions of data enrichment services for the Research Data Connectome.

For the present InnoLab project, which was implemented between July 2022 and May 2023, the national infrastructure service provider for the academic sector in Switzerland teamed up with the Bern University of Applied Sciences, the University of Applied Sciences of the Grisons, and Wikimedia Sverige to develop an **Image-to-Concept Microservice** which supports the semi-automatic tagging of images on Wikimedia Commons by interlinking them to concepts on Wikidata, indicating what is "depicted" in the respective image. It thereby makes use of two distinct approaches to retrieve said concepts:

1. **Entity extraction from the image itself:** For this purpose, the Google Cloud Vision service available on Wikimedia Commons is used (Wikidata-based tag suggestions are provided through a publicly documented, open API).

2. **Entity extraction from the image metadata:** For this purpose, a "Metadata-to-Concept" module was developed as part of the InnoLab project.

The two approaches were combined in a single crowdsourcing tool – the **ISA Tool**[2] – a pre-existing tool which was enhanced in the context of the InnoLab project so that it can be combined with different entity extraction modules and is able to support machine learning approaches drawing on the information generated by the users of the tool. To facilitate the further development of the tool, the software architecture was designed in such a way as to allow for the replacement of the different entity extraction modules by other (open source) services. Data between the ISA Tool and the entity extraction modules are exchanged via publicly documented, open APIs.

The enhanced version of the ISA Tool has been made available in a test environment[3], where the semi-automatic tagging feature has been available by default since May 2023. Its deployment to production has been postponed due to some remaining bugs and after initial deployment plans were stalled due to prolonged maintenance issues of the production version between May and August 2023.

SWITCH aims to utilize this "Image-to-Concept Microservice" as a Data Enrichment module as part of the Linked Data Pipeline, enriching image metadata from given data providers as part of the integration process for the Connectome Knowledge Graph. These metadata will be reused through the SWITCH Open Data Navigator[4] and the Connectome API[5].

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[1] https://www.switch.ch/connectome/

[2] https://commons.wikimedia.org/wiki/Commons:ISA_Tool

[3] https://isa-dev.toolforge.org/

[4] https://opendatanavigator.switch.ch

[5] https://opendatanavigator-test.switch.ch/api/graphql (currently in development)

The present project report is structured as follows:

– Table 1 below gives an overview of the project team members, their affiliation and their role in the project.

– Section 2 contains a description of the technical solution of the Image-to-Concept Microservice and the enhancements that were made to the ISA Tool in the course of the InnoLab project.

– Section 3 describes the expected use of the Image-to-Concept Microservice in the form of short use case descriptions, complemented by current usage statistics of the ISA Tool in the context of Wikimedia Commons.

– Section 4 describes a possible test implementation of the Image-to-Concept Microservice in the Connectome Pipeline and highlights different options for the roll-out of the ISA Tool in various contexts.

– Section 5 lists the known issues and assesses possible avenues for the further development of the Image-to-Concept Microservice.

– Section 6 gives an overview of the project team's reflections with regard to the continuous monitoring and the evaluation of the Image-to-Concept Microservice.

– Section 7 comprises some concluding remarks and an outlook on the next steps.

Table 1: Project Team (in alphabetical order)

Name	Organization	Role
Andrea Bertino	SWITCH	Integration with the Research Data Connectome
Sebastian Berlin	Wikimedia Sverige	Software Development
André Costa	Wikimedia Sverige	Coordination on the side of Wikimedia Sverige
Florence Devouard	Wikimedia Sverige (contractor)	Community Outreach
Eugene Egbe	Wikimedia Sverige (contractor)	Software Development
Beat Estermann	University of Applied Sciences of the Grisons	Project Coordination
Navino Evans	Wikimedia Sverige (contractor)	Software Project Manager / Software Architect
Matthias Ruediger	Bern University of Applied Sciences	Software Development
Sebastian Sigloch	SWITCH	Coordination on the side of SWITCH

2 Description of the Technical Solution

This section contains a short description of the Image-to-Concept Microservice and the enhancements that were made to the ISA Tool in the course of the InnoLab project. It also describes the current maintenance situation of the ISA Tool and the other components of the Microservice. Iteration reports detailing the software development tasks and the user tests carried out in the course of the project can be found in Annex 1. Further documentation of the ISA Tool can be found on the tool's homepage on Wikimedia Commons[6]. A description of known issues and prospects for the further development of the tool can be found in section 5.

The **Image-to-Concept Microservice** currently consists of three components that interact with Wikimedia Commons and Wikidata (see figure 1):

- The **ISA Tool** is a web application for the tagging of images. The tagging of the images by means of the ISA Tool typically takes place in the context of crowdsourcing campaigns. For this purpose, a set of images from Wikimedia Commons is assigned to a campaign defined in the ISA Tool by a campaign organizer, upon which users are invited to browse through the images and to apply tags that describe what is "depicted" on a given image. The ISA Tool is currently set up for the use in combination with **Wikimedia Commons** (media repository) and **Wikidata** (knowledge graph). This means that all the images to be processed by the tool previously need to be uploaded to Wikimedia Commons. Furthermore, all the tags that are applied to a given image need to have their corresponding Wikidata item. Thus, if a specific named entity or a concept is missing on Wikidata, it needs to be added to Wikidata before it can be used in the context of the ISA Tool.

- **Google Cloud Vision**[7] is an image analysis service based on machine learning. In the context of **Wikimedia Commons**, Google Cloud Vision has been set up to power the machine vision extension[8]. It automatically provides a probabilistic interpretation of what is depicted in a given image, based on an analysis of the image itself. Suggested labels from Google Cloud Vision are mapped to **Wikidata** items. The service can be used via an open API.

- The **Metadata-to-Concept Module**[9] is an entity extraction service (currently using an algorithm that does not rely on machine learning) which provides an interpretation of what is depicted in a given image, based on an analysis of the descriptive metadata. Suggested labels come in the form of **Wikidata** items. The service can be used via an open API.

The ISA Tool and and the Metadata-to-Concept Module have been published under a free/libre open source software license, whereas the Google Cloud Vision service is a proprietary service owned by Google. The tag suggestions of the machine vision extension can be queried through a publicly documented, open API.

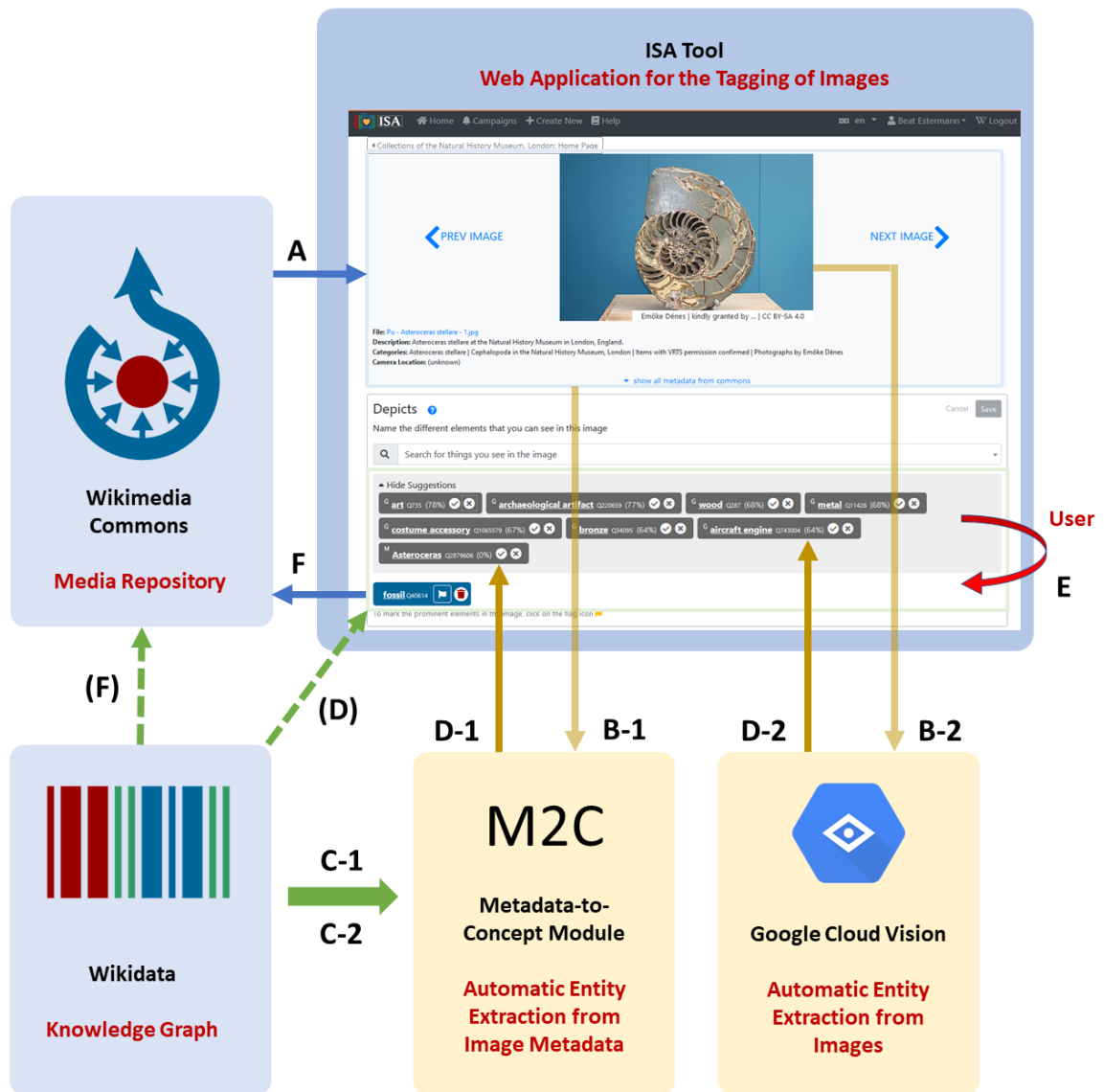[6] https://commons.wikimedia.org/wiki/Commons:ISA_Tool

[7] https://cloud.google.com/vision/

[8] https://www.mediawiki.org/wiki/Extension:MachineVision/Developers

[9] API: https://m2c.wmcloud.org/; code repository: https://github.com/Wikimedia-Sverige/m2c

Figure 1: Components of the Image-to-Metadata Microservice

Figure 1 illustrates the functioning of the Image-to-Metadata Microservice:

- Images from **Wikimedia Commons** that are part of a tagging campaign are displayed in the **ISA Tool**, along with their metadata (A).

- The **ISA Tool** sends out API calls to the **Metadata-to-Concept Module** (B-1) and to the **Machine Vision Extension** powered by **Google Cloud Vision** (B-2) in order to request tag suggestions. Both services express their suggestions in the form of **Wikidata** identifiers (C-1 / C-2) and send their response back to the **ISA Tool** (D-1 / D-2), which presents the suggested tags to the user in a dedicated section of the user interface.

- In the **ISA Tool**, users can use the free search field or the suggested tags to select the **Wikidata** items corresponding to the objects that are depicted in a given image. If a user decides that one of the suggestions is correct and clicks on the corresponding checkmark, the given tag disappears from the suggestions pane and is displayed instead in the section with the accepted tags (highlighted in blue) (E). If a user decides that a suggested tag is outright wrong, they have the
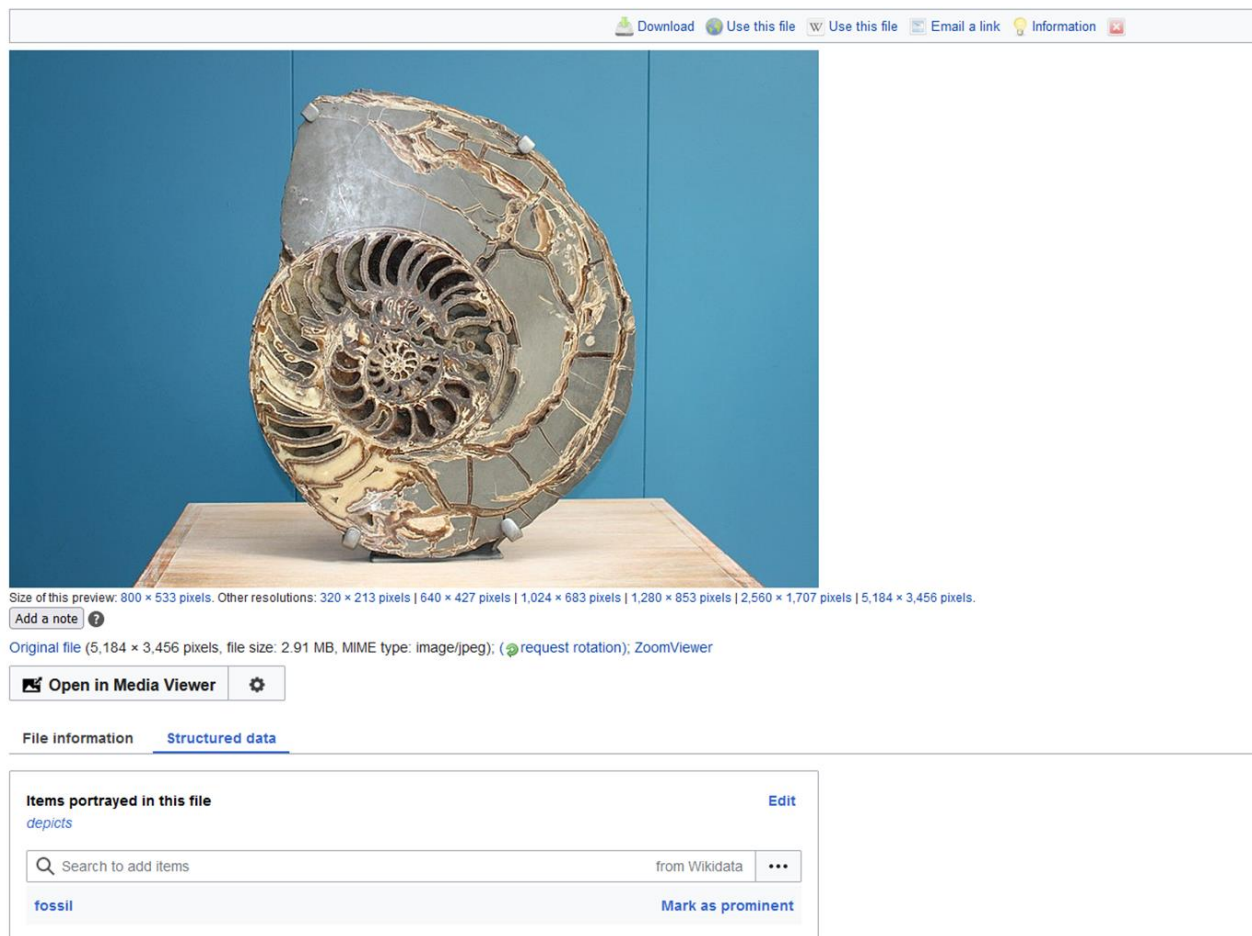
possibility to remove the tag from the suggestions pane. Both types of decision are stored by the **ISA Tool** for further processing.

– When a user of the **ISA Tool** is done selecting tags, they hit the "Save" button to write the selected tags to **Wikimedia Commons** in the form of "depicts" statements (F). Figure 2 shows the corresponding Wikimedia Commons page with a new "depicts" statement in the "Structured data" section. By means of "Structured data", the image metadata is linked to the **Wikidata** knowledge graph, and the data can be queried through a SPARQL endpoint[10].


Figure 2: Wikimedia Commons page with a "depicts" statement

In the following, the three components of the Image-to-Concept Microservice are described in more detail, with a special focus on the results of the software development activities carried out in the course of the InnoLab project.

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[10] https://commons.wikimedia.org/wiki/Commons:SPARQL_query_service

2.1 ISA Tool

At the outset of the project, the ISA Tool was a crowdsourcing tool that had been successfully used for the tagging of images since 2019. The goal of the InnoLab project was to add a semi-automatic tagging functionality that supports users in selecting appropriate tags to describe the content of the images. In contrast to the earlier version, the enhanced version of the ISA Tool now contains a collapsible suggestions pane (see figure 3).
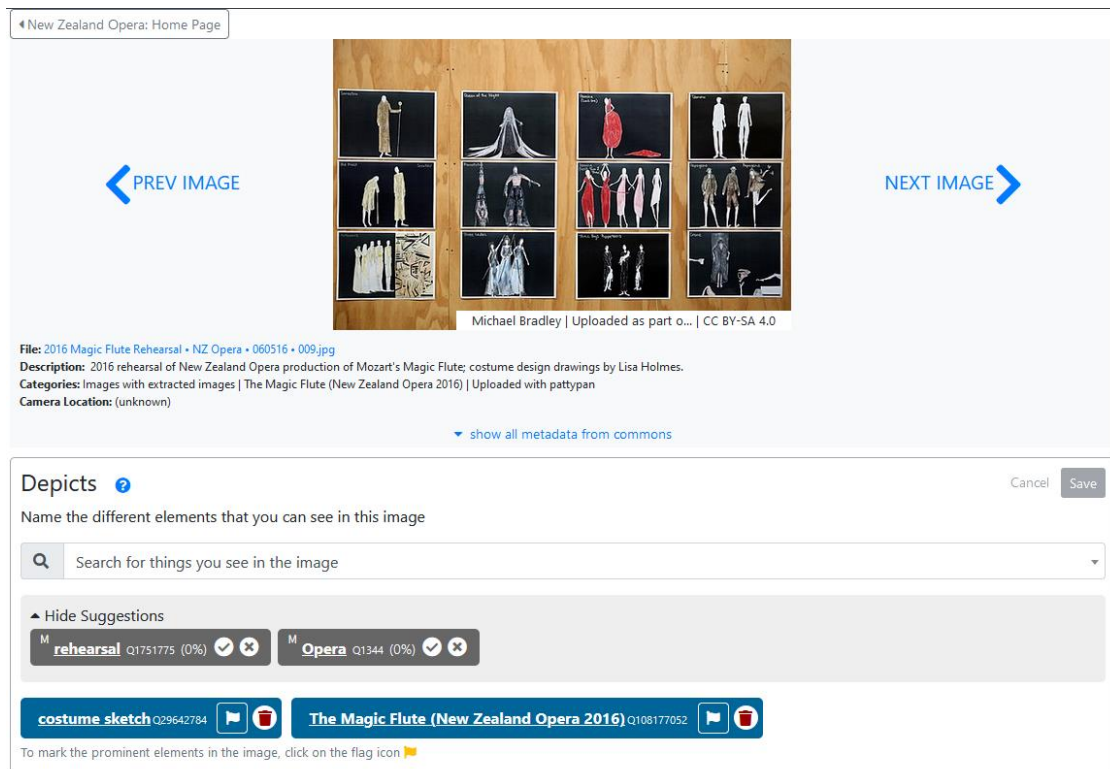
Figure 3: Enhanced version of the ISA Tool with the suggestions pane

Apart from this change in the user interface, the following improvements were made to the software in the course of the InnoLab project:

- Support for TIFF images was added to the ISA Tool, which makes the tool more valuable for image collections provided by heritage institutions.

- The tool's database was extended so that it is now able to store tag suggestions obtained from various online services as well as the user decisions pertaining to these suggestions (acceptance / rejection of a given tag).

- The tool's functionality was extended so that it is now able to send API calls to different online services to solicit tag suggestions and to present them in the user interface. Furthermore, it is able to send recorded user decisions back to said online services to help them improve their algorithms. This feedback can be given on the fly, in a continuous machine-learning approach, or the data can be downloaded for analysis in the form of a data dump.

- A mechanism was implemented that allows for the monitoring of automatic tag suggestions and tags entered by users based on community guidelines. Currently, tags that would clearly violate

community guidelines are suppressed from the automatic tag suggestions, and users of the ISA Tool are prevented from saving such tags. For the moment, this deny list simply replicates the blocklist already in use in connection with the Machine Vision Extension.[11] It can be expanded in the future, to the extent that consensus is reached among the community regarding such guidelines.

2.2 Machine Vision Service (Google Cloud Vision)

No direct improvements were made to the Machine Vision Service. The ISA Tool was however set up to feed back the results of user decisions made on the basis of tag suggestions obtained from this service. It will thus provide valuable information for the continuous improvement of the underlying algorithm, using a machine learning approach.

2.3 Metadata-to-Concept Module

The Metadata-to-Concept Module was developed from scratch. It complements the tag suggestions obtained from the Machine Vision Service. In contrast to the former, the tag suggestions generated by this module are not based on the analysis of the image itself, but on the analysis of image metadata already present on Wikimedia Commons (name and description of the image, Commons categories, etc.). The Metadata-to-Concept Module is particularly useful in the case of images that have been uploaded along with valuable metadata. It also allows to leverage the volunteer effort that has already been made to add descriptions or to assign the images to relevant categories. It thus leverages earlier efforts both by data providers and by the Commons community in order to facilitate the generation of adequate "depicts" statements.

The current version of the module is a functional prototype in the form of a JSON-REST service.[12] It has been developed on a budget of 100 working hours and should be improved in the future (see section 5).

The Metadata-to-Concept Module receives a Wikimedia Commons file name through an API call, gets the metadata about the file via the Wikimedia Commons API[13] and evaluates this metadata, using a linguistic model (Natural Language Processing). For this purpose, the open-source software library SpaCy[14] is used. The module then returns tag suggestions in the form of Wikidata items (Q numbers). Before returning the results, unwanted tag suggestions (e.g. names, disambiguation pages, days of the week, calendar months, taxonomic ranks, etc.) are filtered out based on a blocklist. The number of suggestions is greatly dependent on the language and amount of metadata provided. The module currently works reasonably well for metadata in English, but provides only very few suggestions if the metadata is in another language. The functionality is provided by a Python program using Fastapi and SpaCy. Gunicorn/Uvicorn in combination with nginx is used as the web server.

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[11] https://github.com/wikimedia/operations-mediawiki-config/blob/master/wmf-config/InitialiseSettings.php

[12] Available at: https://m2c.wmcloud.org/extract/

[13] In the current setup in connection with the ISA Tool, it is the ISA Tool which contacts the Wikimedia Commons API and then passes along the metadata to the Metadata-to-Concept Module as it needs this data for other purposes as well.

[14] https://spacy.io/

2.4 Maintenance of the Tools

The ISA Tool and the Metadata-to-Concept Module are maintained by Wikimedia Sverige, in collaboration with volunteer developers. Wikimedia Sverige intends to continue supporting the tool with necessary software updates and to act on critical bug reports. Further development of the tools (see section 5) would require additional resources.

The Machine Vision Extension (based on Google Cloud Vision) is maintained by the Wikimedia Foundation.

3 Expected Use

This section contains several use case descriptions illustrating how the Image-to-Concept Microservice is expected to provide added value in the context of the data ecosystems it has primarily been designed for, i.e. Wikimedia Commons/Wikidata and the SWITCH Research Data Connectome.

The ISA Tool has been designed to support the addition of "depicts" statements and captions to images on Wikimedia Commons. The use cases described in this section therefore focus on the added value arising from this information under the current constraints. See section 5 for reflections on how some of the current limitations of the tool could be overcome in the future in order to expand the scope of the use cases.

3.1 Usage of the ISA Tool

The ISA Tool has been successfully used for the addition of structured description metadata ("depicts" statements and captions) to images on Wikimedia Commons since 2019. Many of such edits have been made in the course of dedicated crowdsourcing campaigns[15]. Such campaigns typically last for a few weeks and feature between a few hundred to several thousands of images. They typically attract up to a few dozen contributors, making between a few hundred up to tens of thousands of contributions. Thus, between 2019 and 2022, 674 users made 440'000 edits by means of the ISA Tool[16].

The enhancements made to the tool in the course of the current project have been subject to repeated usability tests by real users of the tool, so that it is safe to assume that a) the overall usability of the tool has not been hampered by the changes made, and b) thanks to the tag suggestions, the effort for users required to add "depicts" statements has been reduced on average, with actual effort varying greatly depending on the image, the available metadata, prior knowledge of the user, as well as their assiduousness. Given that there is an ongoing debate within the community on Wikimedia Commons as to what constitutes "good" tagging[17], no attempts have been made to systematically assess the quality of the tags added.

In view of the future usage of the ISA Tool, the organization of dedicated crowdsourcing campaigns or similar efforts to tag specific collections of images will be key.

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[15] For an overview of some of these campaigns, see: https://commons.wikimedia.org/wiki/Commons:ISA_Tool/Challenges

[16] See the contribution statistics for the ISA Tool: https://commons.wikimedia.org/wiki/Commons:ISA_Tool/Stats

[17] See https://commons.wikimedia.org/wiki/Commons:Depiction_guidelines for the current interpretation of what constitutes rough consensus by the community.

Note that the use of the ISA Tool is not the only method used by contributors to Wikimedia Commons to add "depicts" statements.[18]

3.2 Current Applications Making Use of "depicts" Statements

There are currently at least three applications that make use of "depicts" statements:

– **MediaSearch**[19] is a new search function on Wikimedia Commons that was activated in May 2021[20]. In addition to using Commons categories and wikitext from templates, it uses structured data on Commons, including "depicts" statements, and information from Wikidata to find the most relevant and extensive results. Compared to the traditional search function on Wikimedia Commons, it offers a much better experience to users who use the search function in languages other than English.

– **ImageSuggestions** is a Wikipedia Extension/App used to provide image suggestions for Wikipedia editors, which was launched in February 2022. It comes in two flavors: as a MediaWiki extension for experienced editors, and in the form of suggested edits for beginning users. If available, the tool relies on P18 (image) and P373 (Commons category) statements on related Wikidata entries to suggest images. Where these are not present, it uses the MediaSearch, which in turn also relies on "depicts" statements, to generate suggestions.[21]

– **View it!** is a Wikipedia Extension/App used to display related images for Wikipedia articles, Wikidata entries and the like that was launched in January 2023.[22] It relies on Commons categories and on "depicts" statements to identify related images.[23]

3.3 Further Use Cases Making Use of "depicts" Statements

In the course of the InnoLab project, the following three use cases have been identified that are worthwhile pursuing. Like the Commons- and Wikipedia-related use cases, they are focused on facilitating discovery and promoting the re-use of images:

– **Integration of an image search on library discovery systems.** To achieve this, the structured data search[24] on national library discovery systems, such as Swisscovery[25], would need to be extended by an image search that functions in a way similar to "View it!". SWITCH will help establish the

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[18] The feature for adding "depicts" statements on Wikimedia Commons was enabled in April 2019. At the time of writing, almost four years later, approx. 11.5 million (12.5%) of the 91 million images on Wikimedia Commons have at least one "depicts" statement.

[19] https://commons.wikimedia.org/wiki/Special:MediaSearch

[20] https://diff.wikimedia.org/2021/05/19/media-search-is-available-for-all-users-on-wikimedia-commons/

[21] https://www.mediawiki.org/wiki/Extension:ImageSuggestions

[22] https://meta.wikimedia.org/wiki/View_it!_Tool

[23] Example for the use of "depicts": this image shows up in View it! on the article https://de.wikipedia.org/wiki/Sandgrube thanks to the "depicts" statement; the image is currently (as of 13.01.2023) not assigned to a Commons Category that would do the trick.

[24] For the description of a pilot implementation of structured data search on library discovery systems, see: https://outreach.wikimedia.org/wiki/GLAM/Newsletter/January_2020/Contents/Switzerland_report

[25] https://swisscovery.slsp.ch

contact to SLSP, the organization behind Swisscovery, with the goal to include an image search, including Wikimedia Commons, on their discovery portal.

– **Integration of an image search on discovery systems for researchers.** A first implementation will be considered in the context of the SWITCH Research Data Connectome Project. Such an integration would allow for metadata improvements when adding image resources to the Connectome Knowledge Graph.

– **Provisioning of the ISA Tool to researcher disciplines.** Next to the SWITCH Research Data Connectome Project, SWITCH may disseminate the ISA Tool to those research discipline multiplicators that would strongly benefit from the use of such tools. First discussions took place with organisations that provide services for the disciplines of Digital Humanities and Medicine. SWITCH will include the ISA Tool in future communications.

In addition, it remains to be explored how "depicts" statements could be used in the context of **specific research projects**. A further avenue to be explored is to investigate to what extent the approach could be used to **allow heritage institutions to reach further insights into their collections**.

4 Added Value for the Connectome Project

The ISA Tool indicates the following added values for the Connectome project that could be materialized during follow-up activities:

– image and context metadata for the Linked Data Pipeline;

– enrichment of image metadata from Swiss projects in relation to Wikimedia Commons;

– enrichment of image metadata from Swiss libraries, repositories, and archives.

They are elaborated in more detail below, followed by a list of open issues that have been identified during the project and that would need to be addressed depending on the future usage scenarios.

4.1 Image and Context Metadata for the Linked Data Pipeline

The Linked Data Pipeline of the Connectome Project allows for the harvesting, pre-processing, mapping, validation and importing of metadata from open data resources using the rescs.org schema. Aggregated data is available for the Communities through the Beta Version of the Connectome API and the Open Data Navigator. Currently, no image metadata is harvested using the Linked Data Pipeline. However, the Rescs.org structure of the Connectome Knowledge Graph could be adapted for this purpose and the data structure could be extended to include "depicts" statements.

4.2 Enrichment of Image Metadata from Swiss Projects in Relation to Wikimedia Commons

So far, one project could be identified that does not present any issues related to rights clearance, as the photos concerned have already been uploaded to Wikimedia Commons: The Annemarie Schwarzenbach Photo Edition project, which is jointly led by the University of Zurich and the University of Geneva. The project proposal will be submitted in fall 2023. If it gets accepted, the project is expected to start in summer 2024. Further projects of that kind could be identified by talking to the Swiss heritage institutions that have already made content available on Wikimedia Commons.

4.3 Enrichment of Image Metadata from Swiss Libraries, Repositories and Archives

Next to the enrichment of image metadata that are already stored on Wikimedia Commons, there are projects and collections that are not allowed to store image data on Wikimedia Commons due to intellectual property and/or privacy issues. Projects and collections where this applies include: the poster collection of the Swiss National Library; the medical objects collection of the Lausanne University Hospital (CHUV); projects hosted by the Swiss National Data and Service Center for the Humanities (DaSCH); or the photograph collections referenced on the online platform for Swiss audio-visual heritage (Memobase).

Such projects and initiatives would highly profit from the deployment of the ISA Tool in an environment with access control. First discussions with representatives of these projects have taken place. Further dissemination efforts are needed prior to taking decisions on a larger deployment.

In addition, deploying the ISA Tool in the context of Europeana might be an option to be further investigated.

4.4 Open Questions

Depending on the future usage scenarios, the following questions should be addressed in a follow-up project, before engaging in further development and deployment activities:

- What feedback do users provide to the enhanced version of the ISA Tool, especially also users from within the research community? – Larger tests need to be carried out once the remaining issues have been resolved and after the enhanced version of the tool has been deployed to production.

- How reliable is the current service maintained by Wikimedia Sverige in cooperation with volunteers? To what extent is Wikimedia Sverige in a position and willing to take responsibility for the maintenance of the ISA Tool in the future? To what extent is the organization ready to act as the primary interlocutor and partner on the side of the Wikimedia Movement when it comes to further improving the tool (e.g. as a partner in an international R&D consortium)? What are the alternatives if no satisfactory solution can be found with Wikimedia Sverige?

- What are the requirements for operations when forking the ISA Tool for specific usage by the research community?

- What would the legal and contractual situation look like when using the ISA Tool in connection with Google Vision outside the context of Wikimedia Commons? What type of agreement could possibly be reached with Google?

- What are the competencies and efforts needed for deployment, operations and maintenance of a service targeted at Swiss research communities provided by SWITCH?

5 Current Limitations and Possible Next Steps

5.1 ISA Tool

Several issues have been identified that hamper the use and wider promotion of the ISA Tool:

1. **Performance Issues:** The enhanced version of the ISA Tool regularly encounters performance issues resulting in pages loading slowly or error screens being displayed, requiring the user to reload the page. Thus, at the time of writing (beginning of September 2023), the version of the tool that would support semi-automatic tagging has not yet been deployed to production. Intermittently, performance issues have also affected the production version of the tool.

2. **Maintenance Issues:** Between May and August 2023, the production version of the ISA Tool was broken for reasons that have not been entirely clarified. It took the software developers tasked with the maintenance of the tool about 3 months to recover a functioning version of the tool. During this period, all the running campaigns and any outreach efforts to promote the tool came to an unexpected halt. The deployment of the enhanced version of the tool has been delayed accordingly.

3. **Reliability Issues:** The campaign statistics functionality seems to malfunction in the case of big campaigns. This issue is currently being worked on.[26]

4. **Translation of the interface:** Currently, the user interface is available in 18 languages. Several major languages are still missing. The tool has been set up for translation; adding further languages therefore just requires a crowdsourcing effort.

Once the performance issues have been resolved, further efforts should be made to promote the tool among potential contributors – through visibility campaigns, live demos, conference presentations, etc.

5.2 Metadata-to-Concept Module

The Metadata-to-Concept Module currently uses the name and the description of the image, along with a language indication if available, as inputs for a syntactic analysis in a Natural Language Processing approach. The same goes for Commons categories present on the image description page, which are also analyzed as text strings. Based on this analysis, possible candidates of depicted concepts are extracted and matched against concepts already described on Wikidata. Whenever there is a good match, the corresponding Wikidata identifier is returned as a suggestion for a "depicts" statement. This procedure is applied to text strings in English as well as to text strings for which no language has been specified. In the latter case, the algorithm assumes that the text string presented is in English. Text strings in other languages are ignored. Automatic language recognition has been tested in the course of the development process; it was abandoned due to poor results given the fact that the text material fed to the algorithm consists of rather short strings that often do not contain grammatically well-formed sentences, while the number of languages to be distinguished is large. Furthermore, the language may vary across the different metadata fields for the same image.

There are several avenues that could be (further) explored for the improvement of the algorithm:

1. **Improvement of the existing algorithm based on training data**

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[26] See Phabricator ticket T328038.

Training data can be generated in two ways:

a) The quality of current suggestions can be evaluated on the basis of an **analysis of data dumps from the ISA Tool** where proposed suggestions, accepted suggestions and rejected suggestions are continuously logged, along with further "depicts" statements that are applied to a given image. Such log data could eventually also serve as a basis for a machine learning approach, whereby the users of the ISA Tool are continually generating new training data that is used to further improve the algorithm.

b) Training data can be **manually curated**. This would have the advantage of being able to take the same perspective as the algorithm, e.g. taking into account only the metadata and not the image itself in generating "depicts" statements. This task is however quite onerous, as this approach would require the manual description of at least 250 sample images per language. Thereby, it is not possible to just use an existing corpus of already curated images on Wikimedia Commons, as it is impossible to verify whether existing "depicts" statements have been added based on the image itself, based on its metadata, or based on both.

2. Adding Named Entity Recognition

Currently, the Metadata-to-Concept algorithm analyzes the text strings on a purely syntactic level, trying to determine a sentence structure and extracting all terms that are central to the sentence. In cases where this is not possible, all nouns are extracted, but this does not always work reliably, since a minimum amount of sentence structure must also be present to allow for the determination of the word type.

Given the fact that the metadata often contains named entities (names of people, organizations, or places, time indications, historical periods, titles of creative works, etc.), a Named Entity Recognition function could be added to the algorithm, which would be able to identify named entities through name pattern recognition and look-ups in existing registries, including Wikidata, independently from the analysis of sentence structures. This would most likely remedy a current shortcoming of the present algorithm consisting in the fact that it often extracts individual words from longer titles, individual words or names from composite names, single taxon names from composite taxons, and so on.

If external databases are used to identify named entities, this approach could also be used to suggest new Wikidata items to be created by the users of the ISA Tool before adding them in "depicts" statements.

3. Adding semantic analysis

While testing the current algorithm, it turned out that many "false positives" (which are currently filtered out by means of a blocklist) could be exploited to improve the recognition of compound names of people and places as well as composite biological taxa.

Semantic analysis could also be used to make more efficient use of the Wikimedia Commons categories already present on the image description pages, as their respective Wikidata item most often contains a pointer to a concept that should be suggested as a "depicts" tag.

Furthermore, a semantic approach could be used to remove "false positives" from tag suggestions generated by means of Natural Language Processing or Named Entity Recognition approaches. This would for example allow for the filtering out of erroneous suggestions for "depicts"

statements pointing to the painters, photographers, or institutions that have the depicted object in their holdings. In many cases, this information is present as structured data on the image description page, but may also be repeated in the file name or in the description, potentially leading to "false positives". In the same vein, hidden categories present on the image description pages (which are currently ignored by the algorithm) could be exploited to root out "false positives" obtained from the analysis of name and description fields.

If such information is not yet present as structured data on the image description page, the algorithm could be trained to semantically distinguish the various information in the descriptive metadata to assign it to different types of statements (e.g. creator, holding institution, owner, viewed from, etc.) that users can add by means of the ISA Tool in addition to the "depicts" statements. In this way, the algorithm could step by step become semantically more sophisticated, avoiding some of the false positives and allowing users to assign others to the correct type of statement.

4. **Adding support for other languages than English**

   As mentioned above, reliable language recognition is not possible due to the small amount of text. Nevertheless, for metadata fields where the language has been specified on the Wikimedia Commons page, the algorithm could be trained to process also other languages than English.

   Furthermore, the algorithm could be programmed to use further default languages, based on their frequency of use on Wikimedia Commons and their distinguishability with regard to other languages used as default languages[27].

5. **Combination of metadata analysis and machine vision approach in one algorithm**

   Currently, the Metadata-to-Concept algorithm has no knowledge of the actual objects or scenes depicted, while the Machine Vision algorithm does not take into account the already existing metadata. In the future, algorithms combining the two approaches may be trained to yield better results than the current algorithms taken individually.

5.3 Machine Vision Extension

The Machine Vision algorithm is not applied to all images on Wikimedia Commons by default. It therefore currently requires the manual inclusion of the respective Commons categories by Wikimedia Foundation staff upon request via a Phabricator ticket. This adds an extra manual step when setting up a new campaign in the ISA Tool and a waiting period of up to several weeks before Machine Vision suggestions are activated for the given campaign. Ideally, the Machine Vision Extension would be enhanced to allow for the inclusion of new categories by means of an API call from within the ISA Tool at the time of creation of a new campaign. In the case of "living" categories, there should also be a function to include newly added images in the analysis.

The Machine Vision Extension currently relies on a proprietary algorithm and is dependent on Google. As Google Cloud Vision does not natively support Wikidata, the extension relies on a (relatively old) mapping table to map tags between the Google Cloud Vision algorithm and Wikidata.

A possible way forward would consist in developing an open source algorithm to replace the current proprietary algorithm – either from scratch or based on an already existing solution. This algorithm could

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[27] For example, while it may be difficult to tell Italian and Spanish or Czeck and Slovak apart in an automatic fashion, it should not be a big deal to assign text strings to the hypothetical default languages English, Chinese, Arabic, and Hebrew.

be trained using Wikidata items directly, without the detour via a mapping table. Thereby, the existing "depicts" statements on Wikimedia Commons could be used as training data.

An alternative (or complementary) way forward would consist in developing open source algorithms for special types of images for which Google Cloud Vision does not perform well. Such algorithms could be added to the ISA Tool in addition to the two current ones.

5.4 Media Repository

Currently, the Image-to-Concept Microservice can be used only in connection with Wikimedia Commons. This means that the use of the service is restricted to images that can be published under a free copyright license on the Internet (no copyright issues, no data protection issues, etc.). From the point of view of research use cases that are of interest in the context of the SWITCH Research Data Connectome, this is a considerable limitation. In order to overcome it, the Image-to-Concept Microservice could be set up to be used in connection with other media repositories that may have more restrictive access and re-use policies than Wikimedia Commons. The tagging could still be done on the basis of Wikidata, or it could be extended to other knowledge graphs (see section 5.5. below). In any case, if separate instances of the service are to be run in the context of other media repositories, this would require fostering a separate user community that takes care of the tagging of the images.

While the ISA Tool and the Metadata-to-Concept Module could certainly be ported to be used in connection with another Media Repository[28], it must be noted that the Machine Vision Extension relies on an agreement with Google for the use of its Cloud Vision algorithm in the context of Wikimedia Commons. Thus, a similar agreement would need to be reached in view of its use in connection with another media repository. Alternatively, another machine vision algorithm could be developed (see section 5.3).

5.5 Knowledge Graph

Currently, the Image-to-Concept Microservice can be used only in connection with Wikidata. It would be possible to use it also in connection with other, possibly complementary, knowledge graphs. To do so, algorithms creating pointers to these other knowledge graphs would need to be specifically trained for this purpose. The Knowledge Graph of the SWITCH Research Data Connectome Project could be one way to reuse the Image-to-Concept Microservice.

6 Monitoring and Evaluation

In the course of the InnoLab project, reflections were made with regard to relevant statistics for the monitoring, evaluation, and improvement of the ISA Tool and the different algorithms. Annex 3 contains an overview of possible statistics and their assessment. Thereby, four categories of statistics have been distinguished:

1. Monitoring of the functioning and usage of the tool;

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[28] While connecting the ISA Tool to another MediaWiki-based image repository would likely be trivial, completely segregating the ISA Tool from the underlying repository might require a significant amount of work: First, the architecture would need to fully separate the frontend from the backend API calls, which currently may not entirely be the case. Second, the current implementation of the frontend makes a series of assumptions about the sort of data it gets from the image repository; thus an additional layer of abstraction would be required for the tool to be able to connect to various types of image repositories.

2. Campaign statistics as feedback to the users and campaign managers (basic statistics to be included in every campaign);

3. Improvement of the algorithms used in the context of the ISA Tool (manually or through machine learning);

4. Monitoring of the relevancy and effectiveness of the ISA Tool and the different algorithms used to suggest tags.

While the first three aspects have been addressed in the context of the InnoLab project, the fourth one reaches well beyond the scope of the project and should be addressed as part of a separate project that provides the basis for strategic decision making in view of the further development and promotion of tools facilitating the addition of structured data on Wikimedia Commons and eventually also directly in the context of projects related to the SWITCH Research Data Connectome. In the following are some reflections that should be taken into account in strategic decision making in this area:

1. **There is disagreement among the community on Wikimedia Commons as to what constitutes "good tagging" of images.**

   Apart from some early assessments by the Media Search team, there is little reflection and dialogue on possible use cases and their requirements regarding structured data on Wikimedia Commons.

   Rationale: As long as there is no agreement on what constitutes "good tagging", tools such as the ISA Tool and the algorithms employed to suggest tags, cannot be assessed against a shared quality standard, and possibilities to further develop them in a way to nudge contributors in accordance with shared community norms are limited. This aspect has a certain relevance, as criticism has been voiced in the past by community members pointing to potential biases in tagging behavior caused by the use of certain tools. It is thereby unclear whether alleged biases are induced by the tools themselves, by the fact that such tools are used by different types of users (e.g. new contributors), or by other factors. Also, there is no empirical evidence as to the type and extent of such alleged biases.

   Proposed approach: For pragmatic purposes, it should be assumed that each tool or method used to add structured data to Wikimedia Commons comes with its biases. To the extent possible, these biases should be oriented in a way to nudge contributors in accordance with shared community norms. This goes for the design of the tools themselves as well as for the settings in which their use is promoted. To come to grips with what constitutes "good tagging" of images, it would be useful to create an overview of (possible) use cases with regard to Structured Data on Commons and to systematically document their requirements with regard to the data.

2. **There are several tools that facilitate the addition of structured data on Wikimedia Commons. There is however neither an ongoing monitoring, nor a proper evaluation of these tools as to their relevance and effectiveness.**

   In addition to the standard user interface and the Image Upload Wizard[29], there are numerous tools that facilitate the addition of structured data on Wikimedia Commons. Examples include the

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[29] https://commons.wikimedia.org/wiki/Special:UploadWizard

ISA Tool, Depictor[30], OpenRefine[31], Computer Aided Tagging[32], ACDC[33], SDC[34], or ImageAnnotator[35]. Furthermore, contributors may use bots to generate "depicts" statements *en masse*, e.g. based on Commons categories or based on metadata from partner institutions[36].

Rationale: Without knowing the relative relevance and effectiveness of the different tools, it is impossible to make informed decisions with regard to their further development and their promotion.

Proposed approach: In order to allow for the evaluation of the various tools, it would be useful to create an overview of the tools facilitating the addition of structured data on Wikimedia Commons and their perspectives for future development. Furthermore, growth statistics of structured data on Wikimedia Commons over time should be made available, along with an evaluation of the compared relevance and effectiveness of the various tools.

3. **Structured Data on Commons can be seen as a replacement or a complement to the use of categories on Wikimedia Commons; there are currently no statistics as to their respective use and relative importance.**

   Rationale: Without knowing the extent and the relative importance of the use of structured data compared to the use of categories on Wikimedia Commons, it is difficult to make informed decisions with regard to the development and promotion of tools that support one or the other or that – as in the case of the Metadata-to-Concept Module – may assist users in the translation of one into the other.

   Proposed approach: Complement the statistics to be provided according to point 2 by longitudinal comparative statistics regarding the use of structured data vs. the use of categories on Wikimedia Commons. Explore and assess ways to facilitate the translation of categories into structured data and vice versa.

7 Conclusions and Outlook

In the course of the present project, a semi-automatic tagging functionality was added to the ISA Tool. The new functionality relies on two distinct algorithms: One of them is used to extract entities from the image itself. The other one extracts entities from the image metadata, thus leveraging earlier efforts made to describe the content of the images.

The project had an experimental character: The new functionalities have been implemented on a test version of the tool. Deployment to production has been postponed due to some remaining bugs. During the project, a variety of learnings could be gathered, which are summarized in the following subsections.

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[30] https://commons.wikimedia.org/wiki/Commons:Depictor

[31] https://commons.wikimedia.org/wiki/Commons:OpenRefine

[32] https://commons.wikimedia.org/wiki/Commons:Structured_data/Computer-aided_tagging

[33] https://commons.wikimedia.org/wiki/Help:Gadget-ACDC

[34] https://commons.wikimedia.org/wiki/User:Magnus_Manske/sdc_tool.js

[35] https://image-annotator.toolforge.org

[36] See for example METbot: https://commons.wikimedia.org/wiki/User:METbot

7.1 Further Improvement and Promotion of the ISA Tool

In the course of the project, the ISA Tool was found to be fit for the intended purpose of adding new functionalities and to test them with real users. As the usage statistics show, the tool is regularly being used for several campaigns every year and attracts a considerable number of users, even though the tool's significance compared to other tools and methods used to add "depicts" statements to images on Wikimedia Commons remains unclear as comparative statistics are lacking.

The project has nevertheless brought to the fore a series of challenges and shortcomings that should be addressed in order to encourage the wider use and facilitate proactive promotion of the ISA Tool in the future:

1. **Performance Issues:** The tool regularly encounters performance issues resulting in pages loading slowly or error screens being displayed, requiring the user to reload the page.

2. **Maintenance Issues:** Between May and August 2023, the production version of the ISA Tool was broken for reasons that have not been entirely clarified.

3. **Reliability Issues:** The campaign statistics functionality seems to malfunction in the case of big campaigns.

4. **Translation of the interface:** Several major languages are still missing and should be added.

Once these issues have been resolved, measures should be taken to increase the visibility and take-up of the tool among potential contributors. To this end, it would be useful to assess and monitor the relevance of the ISA Tool in comparison to other tools and methods used to add Structured Data on Commons.

Furthermore, from discussions with the community, it appears that it is unclear what constitutes "good" tagging of images. It therefore seems important to engage in a further dialogue around this question with the community on Wikimedia Commons, with developers of search and discovery tools, as well as with potential further users of Structured Data on Commons. To inform this discussion, it would be useful to have comparative statistics at hand as regards the relative use of categories and "depicts" statements on image description pages over time.

7.2 Further Development of the Algorithms for Semi-Automatic Tagging

Currently two algorithms are being used by the ISA Tool to support the semi-automatic tagging of images:

1. The Machine Vision Extension, based on the proprietary Google Cloud Vision algorithm.

2. The Metadata-to-Concept Module.

There are various possibilities to improve or complement these algorithms that may be considered in view of the further development of the tool:

1. The ISA Tool could be set up to provide feedback regarding accepted and rejected tag suggestions coming from the Machine Vision Extension. From the point of view of the community, the improvement of the algorithm would most likely take place in a black-box fashion without further communication between Google and the community.

2. Inclusion of images in the Machine Vision Extension could be automatized on a category basis (supporting subcategories); the dynamic inclusion of new images in already included categories could be supported.

3. The Metadata-to-Concept Module could be further improved along the lines sketched out in section 5.2 of this report.

4. A free, open source alternative could be developed that could eventually replace the Google Cloud vision algorithm.

5. Specialized algorithms could be developed that excel at generating tag suggestions in cases where the current algorithms are failing. The ISA Tool has been designed in a way that allows for the addition of further algorithms. The main limiting factor is the number of false suggestions presented to the user (which greatly hamper the usability and effectiveness of the semi-automatic tagging functionality).

In a more general manner, it might be useful to further investigate the question under which conditions the users of the ISA Tool make active use of the suggestions, and under which conditions they simply ignore them and favor other methods to select their tags instead[37].

7.3 Facilitation of Research Use Cases

As the first investigations for the identification of research use cases have shown, the main showstopper with regard to the use of the ISA Tool in the current setting is the requirement that all images be made available on the Internet under a free copyright license.

This challenge may be overcome by setting up an alternative media repository where copyright and/or access restrictions can be put in place. The porting of the software tools that are available under an open source license (ISA Tool and Metadata-to-Concept Module) would be possible. In this case it would make sense to clarify between SWITCH and Wikimedia Sverige to what extent it would be beneficial for both parties if the software code were further developed in common, with the perspective of supporting a variety of media repositories. Alternatively, the software code could be forked and adapted to the needs and requirements of the SWITCH Research Data Connectome Project.

Given the current setup, the porting of the Machine Vision algorithm would not be as straightforward: SWITCH could try to reach a separate agreement with Google in order to deploy Google Cloud Vision also on its own media repositories, or an alternative algorithm could be developed. In the meanwhile, the ISA Tool could be used on the alternative media repository without the tag suggestions from the Machine Vision Extension.

If the alternative media repository is expected to be used in a crowdsourcing setting, this would require fostering a contributor community, establishing and enforcing community norms, and fulfilling all the responsibilities that typically fall to the platform provider – this would require an extra effort for tasks that are currently covered by the Wikimedia Foundation and/or the Wikimedia Commons volunteer community. There are ways to avoid a part of this extra effort by implementing each image tagging project in a siloed approach, giving full control over the tagging process to the respective research project. This approach would have its pros and cons that should be pondered carefully before opting for one or the other approach.

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[37] In the current implementation of the ISA Tool, users can simply hide the tag suggestions if they think that they are of not much help. They may use the existing metadata on the image description pages instead to identify appropriate tags (this metadata is also displayed from within the ISA Tool), or they may simply have a close look at the image and use the search functionality of the ISA Tool to find appropriate tags.

In any case, given the experience with the ISA Tool, reaching a high level of completeness of "depicts" statements on a specific set of images would always require the targeted mobilization of contributors by means of a crowdsourcing / expert sourcing campaign or by putting dedicated staff to the task.

In the longer run, it would be useful to monitor to what extent the addition of "depicts" statements gains traction on Wikimedia Commons over time, regardless of the tools and methods being used for adding them. If the trend further gains momentum, it would be advisable for the research community to try to leverage the community dynamic by making a maximum of their images available on Wikimedia Commons.

A further avenue that could be explored in the context of the SWITCH Research Data Connectome Project is the use of "depicts" statements in research projects beyond the search and discovery use case. If the tagging of images is used for analytical purposes, specific requirements in terms of the quality, consistency and completeness of the tags may arise that would require particular attention.

7.4 Contractual Aspects

If the ISA Tool is to be used on a larger scale in the context of the SWITCH Research Data Connectome Project, it might be advisable to verify whether the current contractual arrangements (or absence thereof) are sufficient for the use cases in question. Aspects that might be of relevance in this context are:

- The contract between Google and the Wikimedia Foundation regarding the use of the Google Cloud Vision algorithm in connection with Wikimedia Commons.

- The formalization of commitments regarding the operation and maintenance of the ISA Tool itself and the different modules and extensions employed to generate tag suggestions (Machine Vision Extension, Metadata-to-Concept Module).

If the tools are ported to be used in connection with a different media repository, the same applies *mutatis mutandis.*

8 List of Annexes

The following annexes are provided in form of separate documents:

- Annex 1: Iteration Reports (Software Development and User Tests)
- Annex 2: Sample Requests and Responses for the Metadata-to-Concept Module
- Annex 3: Baseline Statistics for the ISA Tool

InnoLab "Image to Concept"

Annex 1 – Iteration Reports (WP 1 & WP 2)

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July 2022 to September 2023

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1. Preliminary Remarks

The present report documents the activities carried out in work packages 1 and 2, i.e. the activities pertaining to software development (WP 1) as well as the testing of the software with real users, including the discussions around community norms regarding the tagging of images (WP 2).

Below is the timeline of the software development tasks as they were carried out as the project unfolded.

1.1. Timeline of Software Development (Including User Tests)

Iteration	Time Span	Activities	Measure of 'done'
0	First half of July 2022	Set up the team and the development environment.	Team is ready to start. Work-around to process TIFF images has been implemented. Test environment for the ISA tool has been set up.
1.1	Second half of July 2022	Get the database of the ISA tool ready to record results of API requests and user decisions	On the ISA tool a first version of a database has been set up that records the API requests / the responses received / the user decisions made.
1.2	August 2022	Develop first iteration of core suggestions feature within ISA tool (based on the rough test version already developed) and with input from the Metadata-to-Concept Module	Enhancements to the frontend of the ISA tool have been made (in development version) so that it shows tags from Google Vision and Image-to-Concept tags - displayed in a different manner. Functionality for rejecting tags (not only accepting) has been implemented. Mechanism for storing user decisions in the database has been implemented. Initial rough test version has been developed, but not yet ready for production release.
2	First half of September 2022	After initial small scale testing and feedback, refine and improve the design and user experience.	The ISA tool is ready for the team to reach out to test users external to the project team (in coordination with WP2).
3	Second half of September 2022	Develop a first version of the Metadata-to-Concept Module.	A first version of the Metadata-to- Concept Module has been developed which is able to process requests from the ISA tool, returning tags along with confidence

		Add first iteration of user hints/corrections feature based on community guidelines (most specific item / people incorrectly depicting an occupation)	scores. The approach regarding community guidelines enforcement has been clarified.
4	First half of October 2022	Improve the Metadata-to-Concept Module. Launch a call for user tests.	The Metadata-to-Concept module has been deployed and is processing requests from the ISA Tool; the responses are used in the ISA Tool. Performance is good enough not to affect the usability of the tool.
5	Mid-October to Mid-November 2022	Further improvement of the Metadata-to-Concept Module Carry out user tests / Act on feedback from user tests	Collected user feedback. Acted on feedback from user tests.
6	Mid-November to Mid-December 2022	Carry out user tests / Act on feedback from user tests	Collected user feedback. Acted on feedback from user tests; reported improvements on the feedback page.
7	Mid-February to Mid-May 2023	Remove "hidden" categories and disambiguation pages from the Metadata-to-Concept suggestions Publish the code of the Metadata-to-Concept Module on Github and deploy it on a WMF server Fix the remaining issues in the ISA Tool related to the display of Metadata-to-Concept Module tags	The remaining issues related to the Metadata-to-Concept Module have been fixed and the module has been deployed on a WMF server.
8	*Originally planned for the second half of*	*Deploy the enhanced ISA Tool to Production.*	*Everything that makes the tool undeployable has been fixed.*

	May 2023; delayed indefinitely		*The enhanced tool has been deployed to production.*

2. Iteration Zero

- **Setup Test environment**
  The test environment has been deployed to https://isa-dev.toolforge.org/.

- **Support for TIFF images** (https://phabricator.wikimedia.org/T232038)
  See example test campaign: https://isa.toolforge.org/campaigns/223/participate
  Existing campaigns can be updated using the "update images" option on the campaign edit page (only the creator can access this page).

3. Iteration 1

3.1. Training Data for Metadata-to-Concept Module

In order to create initial sample data (input / output) for the Metadata-to-Concept Module, 30 sample images were randomly drawn from categories on Wikimedia Commons that have a certain relevance with regard to the project (existing ISA Tool campaigns; GLAM content donations). The images were analyzed with regard to the input data that would be sent to the Metadata-to-Concept Module and the responses that would be expected from the Module (see sample requests and responses). In order to facilitate the integration of the sample images into the ISA Tool, they were added to a specific hidden Commons Category for Iteration 1, which was in turn added to the Commons Category of the project.

The test campaign with these sample data of iteration 1 can be found under the following links:

- Development version: https://isa-dev.toolforge.org/campaigns/4
- Production version: https://isa.toolforge.org/campaigns/218/participate
  (add the ?mv=true attribute to show the machine vision tags where they have been activated).

During the analysis of the sample images, data modeling issues as well as questions regarding the correct tagging of images with "depicts" statements were identified that need to be clarified with the Wikimedia Community (see the comments in the sample requests and responses document in Annex 2). They could eventually be added to the page on Wikimedia Commons, which discusses the modeling issues related to "depicts" statements[1].

The initial analysis of the sample images also brought forward a set of challenges to be tackled in the context of the Metadata-to-Concept Module. See table 1 for an overview of the different types of challenges and suggested mitigation strategies. The creation of sample data is quite time intensive and has taken longer than expected/planned. At the same time, the analysis has not saturated yet (i.e. the analysis of each new batch of images has brought to the fore additional issues) and would ideally be extended to further sets of images.

Table 1: Overview of different types of challenges

Description of the challenge	Sample Images	Suggested Mitigation Strategy
One of the correct items does not exist (yet) on Wikidata.	Examples 2, 3, 8, 17	*Requires further investigation: Would it be possible for the algorithm to suggest the creation of a new item? On what basis?*
The correct item does not exist yet on Wikidata and the metadata does not contain sufficient information to create a meaningful item.	Example 14	The module would ideally return a NULL response; use suggestions from the less specific Machine Vision module instead.
The true positives include duplicate entries on Wikidata.	Example 27	The module would ideally return both responses: The issue of duplicate items should eventually be dealt with within the ISA Tool (enforcement of community norms).
The module has to process contradicting information due to errors in the metadata provided by the institution.	Examples 6, 25	*Requires further investigation: Will the selection of the correct answer be left to the user alone or are there ways to bring forward the correct information based on an evaluation of the source?*

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[1] https://commons.wikimedia.org/wiki/Commons:Structured_data/Modeling/Depiction

The module returns false positives due to information in the metadata pertaining to the point from where the picture was taken.	Examples 7, 10	This is a common type of false positive which the module should be trained to control for; ideally, there would be a standard way to store this information as structured data on Wikimedia Commons.
The module returns false positives due to information in the metadata (descriptions, categories, etc.) that refer to creators/photographers or collections/holding institutions and that are also present in specific structured data fields.	Examples 16, 17, 18, 24, 26, 27, 28, 29, 30	This is a common type of false positive the module should be trained to control for.
The module returns false positives due to information in the metadata (descriptions, etc.) that refer to concepts that have a relationship to what is depicted in the image, but are not actually depicted themselves.	Examples 20, 26, 27, 28, 29, 30 (and others)	This is a common type of false positive the module could be trained to avoid (but will probably never be able to fully avoid, hence the necessity of a human in the loop).
The module returns true positives that are less specific than other true positives (yet only the most specific concept should be used in the "depicts" statements).	Numerous examples (concerns almost all images)	This issue should be controlled for at the level of the ISA Tool (enforcement of community norms). The relationship to be taken into account include "subclass of" and "parent taxon" (the enumeration may not be complete)
The module returns false positives due to the polysemy of key terms in the metadata.	Examples 22, 23	If no Commons categories or pointers to Wikipedia or Wikidata have been applied yet, polysemy might be difficult to control for completely. Maybe the module could be trained to highlight potential issues with polysemy, and the ISA Tool could in these cases display the description along with the label of the item in order to nudge users to keep an eye on potential false positives due to polysemy.
The image does not contain a photograph (and is likely to show up in campaigns in the ISA Tool because it cannot easily be filtered out based on Commons categories); yet the image contains a visual representation of objects (e.g. a painting, drawing, etc.).	Examples 13, 20	Treat these cases as if they contained photographs.
The image does not contain a photograph (and is likely to show up in campaigns in the ISA Tool because it cannot easily be filtered out based on Commons categories); and the image contains a document (e.g. archival document).	Example 12 (archival document) Example 23 (backside of a photograph containing a description of the photograph and other metadata)	Add a module to filter out images that do not contain photographs or pictorial representations of objects. Of particular concern are the backsides of photographs for which the metadata of the photos themselves are given in the metadata fields on Commons (potentially leading to numerous false positives). - We should think of a way to exclude such backside images from ISA Tool campaigns.

Test Campaigns:

In view of the creation of test campaigns, requests were filed on Phabricator to add the following Commons categories to the Machine Vision service:

Task T277301 (done - 58'495 files)

- Category:Media_contributed_by_the_ETH-Bibliothek

Task [T312508](#) (done - approx. 50'000 files)[2]

- [Category:Archives_New_Zealand](#)
- [Category:Media contributed by the Swiss National Library](#)
- [Category:Collections of the Natural History Museum, London](#)
- [Category:New Zealand Opera](#)
- a small subset of [Category:Content_media_by_topic_supported_by_Wikimedia_CH](#)
- [Category:Photographs produced by UNESCO](#)
- [Category:Media files produced by UNESCO](#)
- [Category:Media contributed by Zentralbibliothek Solothurn](#)
- [Category:InnoLab_I2C_Iteration_1](#)

These categories contain ample material for the testing of the ISA Tool and for generating training sets for the Metadata-to-Concept module.

A first test campaign was set up in the ISA Tool for the [Leo Wehrli photographs in the ETH Library](#) collection: [https://isa.toolforge.org/campaigns/199/participate?mv=true](#)

Depending on the needs of the project, campaigns of various sizes and/or types of images can be set up as we go on.

Note that it is always possible to file new Phabricator tickets to ask for the inclusion of additional categories in the Machine Vision service, with an expected time lag of 1-4 weeks before they are available.

3.2. Interaction Between the ISA Tool and the Metadata-to-Concept Module

- An initial set of data fields to pass between the ISA Tool and the Metadata-to-Concept Module has been specified.

- The data fields include fields that are likely to serve as a basis for the extraction of entities to be included in "depicts" statements, as well as fields that are likely of use to filter out false positives (e.g. the fields "author" or "source").

- Mock-ups for the display of tags suggested by the Metadata-to-Concept Module in the ISA Tool have been developed.

3.3. Adaptations to the ISA Tool

The core functionality for all iteration 1 features is now complete and deployed to the Test ISA instance at [https://isa-dev.toolforge.org/](#).

The final pending tasks are on hold currently for the reasons shown below. There are also 2 tasks being reviewed before deployment but they do not affect the functionality of the current Test version.

---

[2] Note that further tasks have been added since, e.g. [https://phabricator.wikimedia.org/T320526](#).

Completed:

- [Only reject a suggestion after multiple user choices](#) (database entry only)

Deployed to Test:

- [Setup database for storing suggestions](#)
- [Create mock designs for depicts suggestions from Google Vision and Metadata-to-Concept](#)
- [Store accepted depict suggestions in the database](#)
- [Add "confidence" to saved suggestion data](#)
- [Setup user interface for "rejecting" suggestions](#)
- [Only include Google Vision suggestions with status "unreviewed"](#)
- [Add "user" to saved suggestion data](#)
- [Create API route to get rejected statements for logged in user](#)
- [Don't suggest statements current user has rejected](#)
- [Indicate which service depict suggestions come from](#)

Deployed to Live:

- [Support for .tiff images](#)

For a detailed overview of all tasks, see the task dependency tree on https://phabricator.wikimedia.org/T312872 or the [main ISA board](#).

4. Iteration 2

4.1. User Tests by Project Members

For the user tests, the development version of the tool was used: https://isa-dev.toolforge.org
Based on some initial small-scale tests at the beginning of September, feedback was provided to the developer team.

Testing was resumed on 13 September, after some of the major issues had been fixed. Two test campaigns were created (see screenshot). User feedback was collected in the document "ISA Tool: Internal User Tests"[3].

---

[3] https://docs.google.com/document/d/1Ug8r5TxcIO7onj3JqVEmlVItiwRv8s_9aPiA_5zD_PM/edit#heading=h.5at84q77y2zm

ISA - CAMPAIGNS

On this page are the curated campaigns that are currently running as part of the ISA tool. Click on the name of a campaign to get started and add structured data to an image. You can access information on the previous Campaigns in the Archive section.

Search: [   ]

Campaign ↑↓	Images ↑↓	Participants ↑↓	Contributions ↑↓	Start Date ↑↓	End Date ↑↓	Creation Date ↑↓	Status ↑↓	Get Started ↑↓
Photographs by Leo Wehrli (ETH Library collection)	13173	1	61	2022-09-12	Not Set	2022-09-13	Open	Go to Campaign
Turkey photographs taken on 2020-06-14	8	0	0	2022-09-12	Not Set	2022-09-12	Open	Go to Campaign

Showing 1 to 2 of 2 entries

Previous **1** Next

☐ Show closed campaigns

[Create a new campaign using this tool]

4.2. Improvements to the ISA Tool

Initial feedback bugs and usability issues from the Internal User Tests document are currently being investigated and will be uploaded to Phabricator as individual issues.

Pending:
- Show suggestions based on Metadata-to-Concept Module - Awaiting Metadata-to-Concept API.
- Submit reviews back to MachineVision service - To be activated once initial testing is complete, just to avoid submitting incorrect decisions in case of errors uncovered during testing.

In review:
- Add date time column to Suggestions stored in the database
- Fix: Suggestion service indicator not showing on some browsers

5. Iteration 3

5.1. Project Documentation in View of User Tests with External Users

A [project description](#) has been added to the description page of the ISA Tool on Wikimedia Commons. It includes a sign-up list for test users.

An analysis of the different places on Wikimedia Commons where structured data and more specifically the use of "depicts" statements are discussed has been carried out. It was decided that the following page will be used to keep track of and document data modeling issues related to "depicts" statements: https://commons.wikimedia.org/wiki/Commons:Structured_data/Modeling/Depiction

5.2. Development of the Metadata-to-Concept Module

The Innolab Metadata-to-Concept API provides a service for transforming image metadata into Wikidata concepts. It evaluates textual information from the metadata (i.e., from the filename, title, description, etc.), extracts key terms via linguistic analysis (part of speech tagging and dependency analysis) and searches for corresponding Wikidata elements. The service's response contains the found terms with their corresponding Wikidata Q identifier.

In the current iteration, the following elements have been implemented: service scaffolding, basic linguistic analysis, and Q identifier resolution via Wikipedia-API call (see [detailed report](#)).

Furthermore, it has been decided to implement the module on a virtual machine. After the deployment of the module to the virtual server, the system will be ready to process API calls from the ISA Tool.

5.3. Enforcement of Community Guidelines

The approach to be taken in the context of this project regarding the enforcement of community guidelines by the means of the ISA Tool has been clarified:

- In the context of the current project, a proof-of-concept will be provided showing how simple rules can be implemented in the ISA Tool. For the sake of the technical proof-of-concept, some non-controversial rules will be implemented.

- One of the outputs of the project will be a blocklist of Wikidata items that should not be used in "depicts" statements (e.g. colors or professions). This blocklist will be linked from the project page to allow for community review and discussion.

5.4. Improvements to the ISA Tool

Features and fixes discussed in a scheduled dev meeting ([see notes](#))

Pending:
- [Show suggestions based on Metadata-to-Concept Module](#) - Awaiting Metadata-to-Concept API.
- [Submit reviews back to MachineVision service](#) - To be activated once initial testing is complete.
- [Denylist for depict items that shouldn't be used](#)
- [Simplified suggestion interactions on small screen device](#)

Complete:
- [Add date time column to Suggestions stored in the database](#)
- [Fix: Suggestion service indicator not showing on some browsers](#)
- [Can't delete depict statement or change prominence](#)
- [Link to Wikidata items from depict suggestions](#)
- [Add Confirm dialogue box when rejecting suggestions](#)
- ["The results could not be loaded." when typing in depicts](#)

New deployment aiming for end of day Friday 30 September.

6. Iteration 4

6.1. Call for Test Users

A first round of user tests has been launched on 4th October 2022, which is focusing on the look, feel and the usability of the tool[4]. By 18th October, 12 test users had signed up, and 6 had provided feedback. Most feedback concerns already known bugs (server response times, server outages). One user raised a question regarding what constitutes "good" tagging and whether the ISA Tool reinforces it.

The Software Project Manager will translate the feedback into issues in the issue tracking system and respond directly on the talk page when a bug has been resolved or a new feature added.

A second round of user tests will focus on what constitutes good "depicts" statements and to what extent the ISA Tool encourages the meaningful tagging of images on Wikimedia Commons.

6.2. Development of the Metadata-to-Concept Module

A first prototype of the metadata-to-concept API is now up and running on a virtual server listening on http://92.205.161.71:8080/extract/

It now has a basic concurrency model and should (in theory) be able to handle multiple requests simultaneously.

The API specification was updated to make it more future-proof (see screenshot):

Added: Attributes to be handled must now be explicitly specified. They are specified in a list to be more extensible.

Added: the possibility to specify language information per attribute.

---

[4] https://commons.wikimedia.org/wiki/Commons_talk:ISA_Tool/Image_to_Concept ([permanent link](#))

The screenshot above should be largely self-explanatory, nevertheless here a few notes:

- The keys in the first level JSON dict are: name, url, attrs. All of them are mandatory. The name and url keys must be strings, the attrs key must be a list of dicts.
- At the moment name and url are ignored.
- All attributes used to derive concepts must be declared in the attrs list. Each attribute has a key, a value and lang. Lang is currently ignored and defaults to "en". One should always add the attribute name (= file name) as a fallback in the list.
- At this point the attribute types name, description, caption and categories are processed. Categories must be a semicolon-separated list of wiki categories.

At this stage, if the service fails, it must be restarted manually.

Next steps:

- Create a process to determine which language model to use, probably just a majority vote.
- Load different language models based on the determined language, default is English.
- Add logging
- Add a rate limiting mechanism
- Save requests for statistics
- Create a system service from it with start-on-boot and automatic restart in case of failure
- Cache Q-number determination

- Rate limiting for Wikipedia API requests to avoid being blacklisted

6.3. Enforcement of Community Guidelines

A first version of a "Deny List" has been created based on the deny list of the Machine Vision Tool. The "Deny List" will be made available on Commons for inspection and further development by the community.

6.4. Improvements to the ISA Tool

The deployment planned on 30th September did not happen, apologies for not notifying everyone. It's much easier for us if we finish all the database changes before the next deployment to avoid having to reset the application data or manually adjust. We've completed a new database migration feature that will make things easier going forward.

Navino will chip in with development this weekend to try and finish off all the delayed features.

Pending:
- [Submit reviews back to MachineVision service](#) - To be activated once initial testing is complete.

In progress:
- [Show suggestions based on Metadata-to-Concept Module](#) - The new API is working and work is ongoing to the results into the ISA suggestions.

Review:
- [Automated database migrations](#)
- [Denylist for depict items that shouldn't be used](#)
- [Simplified suggestion interactions on small screen device](#)
- [Add credits to footer](#)

Complete:
- [Submit categories for Machine Vision tagging](#)

6.5. Statistics on User Interaction with the ISA Tool

campaign	Which campaign the suggestion was accepted/rejected from
file_name	The image the suggestion was for
depict_item	The item suggested
user	User who accepted/rejected the suggestion
Status reported	The status the user submitted ("reject"/"accept")
google_vision	Is the suggestion from Google Vision
google_vision_confidence	Confidence from Google Vision

google_vision_submitted	Was submitted to Google Vision
metadata_to_concept	Is the suggestion from Metadata-to-Concept
metadata_to_concept_confidence	Confidence from Metadata-to-Concept
metadata_to_concept_submitted	Was submitted to Metadata-to-Concept
date-time	Date-time the suggestion was "accepted" / "rejected"
ID	
Session ID	(to be investigated)

The statistics need to be assessed in the context of the following usage scenarios:

1. Use of the statistics to improve the algorithms / machine learning
2. Campaign statistics as feedback to the users and campaign managers
   → integrate some basic statistics in every campaign
3. Monitoring of the relevancy and effectiveness of the ISA Tool and the different algorithms used to suggest tags

7. Iteration 5

7.1. User Tests

Continuous feedback is provided by test users on the Talk Page of the project. Apart from database access issues, a recurrent issue concerns the marking of prominent elements. Further comments concern the addition of help elements.

Longer comments address the question as to what constitutes "good tagging" and to what extent it is supported by the tool. As a first step to approach this issue, a succinct version of the community guidelines for adding depicts statements has been created and submitted to the community for review. So far, no consensus has been reached[5]. Inclusion of a link to the guidelines in the tool is therefore still pending.

On 4-5 November, user tests have been carried out on-site together with several test users during the Swiss GLAM hackathon (see documentation). Unfortunately, during these tests a variety of unexpected issues were encountered that seriously hampered the use of the tool:

1. Commons did not serve any images for a couple of hours;
2. The ISA Tool was not always accessible / usable for all users;
3. For the tag suggestions to appear, users had to append "?mv=true" to the URIs
4. Users encountered numerous database errors (screens would not show; tag suggestions would not load; tags would not get saved)

Nevertheless, useful feedback was obtained, concerning:

- The usability of the ISA Tool:
    - Don't suggest tags for no-longer existing Wikidata entities
    - Don't suggest tags that have already been added
    - Match the language of the displayed suggested tags to the preferred user language *(already resolved; probably confusion regarding different language settings)*
    - Layout: The search result suggestions should not cover the title and description of the image.
    - Layout: Separate zoom for upper and lower part of the ISA Tool screen (image vs. tags)

- A list of tags that are candidates to be included in the deny list

- The potential usefulness of tags extracted from the existing metadata

- Additional features:
    - The possibility to add structured data beyond "depicts", e.g. authorship, geographical information, file format, technique, etc.

- Specific tagging challenges

---

[5] See: Discussion at the Village Pump

- As previously tagged images keep coming up in the tool, the question was raised how to know whether an image is to be considered "fully tagged" or a campaign "completed".

- Useful statistics to track the usage of the tool, including pointers to relevant data sources

- Information regarding the Images Suggestion Tool for Wikipedia (targeted at editors)

7.2. Improvements to the ISA Tool

Pending:
- [Intermittent database errors](#)

In progress:
- [Do not display suggestions that are already in depict statements](#)

Review:
- [Submit reviews back to MachineVision service](#) - Complete, but needs activating for final test once initial user testing is finished.
- [Denylist for depict items that shouldn't be used](#)

Complete:
- [Show suggestions based on Metadata-to-Concept Module](#) - Complete but waiting for SSL certificate for deployed version
- [Simplified suggestion interactions on small screen device](#)
- [Add credits to footer](#)
- [Automated database migrations](#)
- Feedback for Matthias ([google doc](#))

8. Iteration 6

8.1. User Tests

User tests have been carried out and discussions were held in the course of several workshops (Lightning talk at Wikiconvention Francophone in November 2022; Presentation at LD4 Affinity Group on 5 December 2022; Workshop for the testing of the ISA Tool on 12 December 2022).

Feedback was received regarding the usability of the tool. Furthermore, the tagging principles and in some cases the guidelines themselves were discussed. It has to be noted, though, that participants had for the largest part so far not been deeply involved into the question as to what constitutes "good tagging" on Commons and therefore did not have very clear-cut views. Thus, the workshops were rather used to launch the reflection and the discussion around this topic than to reach any conclusions.

As to the inputs received regarding the usability of the tool, the following point is most noteworthy: Participants would like the image to be displayed in a bigger size; it was noted that on computers, the space left and right of the image is hardly being used - thus, it was suggested to display the metadata

and the tag suggestions on the right-hand side of the image. Other feedback pertained to already known issues (e.g. display of tag suggestions pointing to disambiguation pages).

8.2. Development of the Metadata-to-Concept Module

The issue related to the missing certificate could be resolved; the tag suggestions from the Metadata-to-Concept Module are now displayed in the ISA Tool.

8.4. Improvements to the ISA Tool

Pending:
- Return response for each contribution individually
- Get labels and description from Wikidata for M2C suggestions
- Activate suggestions by default

In progress:
- Intermittent database errors
- Denylist for depict items that shouldn't be used (previously in review)

Review:
- Do not display suggestions that are already in depict statements

Complete:
- Submit reviews back to MachineVision service - Complete, but needs activating for final test once initial user testing is finished.
- Switch to new Metadata-to-Concept API format

Added to Phabricator for future:
- Create "soft" reject list
- Track all viewed suggestions

8.5. Statistics on User Interaction with the ISA Tool

Requirements regarding the statistics in the following two areas were agreed upon:

1. Monitoring of the functioning and usage of the tool

2. Campaign statistics as feedback to the users and campaign managers
   (basic statistics to be included in every campaign)

See: Baseline Statistics for the ISA Tool

As regards the continuous improvement of the algorithms employed in the context of the ISA Tool, it was decided that no further statistics are required at this point. The improvement of the algorithms will take place on the basis of data dumps. The required data is continuously being logged already now.

As regards the evaluation of the relevance and effectiveness of the ISA Tool (also in comparison with other tools) it was decided that this would be indeed something valuable to do, but that it was out of scope for the present project.

9. Iteration 7

9.1. Development, Testing, and Deployment of the Metadata-to-Concept Module

Following earlier observations, "hidden" categories from Commons were excluded from the analysis in view of the generation of tag recommendations.

After that, two iterations of randomized tests of the Metadata-to-Concept Module were carried out from within the ISA Tool. The tests led to the following observations:

- The quality of suggestions could be substantially improved if certain types of items (e.g. names, days of the week, months of the year, taxonomic rank, etc.) were blocklisted and excluded from the recommendations. This improvement was subsequently implemented.

- The quality of suggestions could be substantially improved if the algorithm gave higher preference to composite names and titles over single-word terms or names. This improvement would require the further development of the algorithm that would extend beyond the scope of the present project. Possible avenues for improvement were documented in the final project report.

- The quantity of good suggestions could be substantially improved if support for languages other than English was added. This would again require the further development of the algorithm extending beyond the scope of the present project. Possible approaches were documented in the final project report.

- The tests ran into considerable reliability and performance issues on the side of the ISA Tool, possibly due to bottlenecks in the handling of API requests and responses. **These issues remain to be resolved.**

After the above-mentioned fixes had been made, the software code of the Metadata-to-Concept was transferred to a public repository[6], a free copyright license was applied, and the module was deployed on a WMF server[7].

10. Deployment

Deployment to production has been postponed due to some remaining bugs and after initial deployment plans were stalled due to prolonged maintenance issues of the production version between May and August 2023. Before taking further steps towards deployment, the resource situation and project roles need to be clarified.

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[6] https://github.com/Wikimedia-Sverige/m2c
[7] https://m2c.wmcloud.org.

InnoLab "Image to Concept"

Annex 2 – Sample Requests and Responses for the Metadata-to-Concept Module

Beat Estermann, June/July 2022

Purpose of this Document

This document contains a preliminary analysis of the metadata present on Wikimedia Commons that could be used as inputs for the Metadata-to-Concept Module (semi-automatic entity extraction from existing metadata).

Table of Contents

Template

Information provided through the API request	
file_name	
title	
date	
Commons_categories	
Matching Wikidata Items (depicts)	

Categories on Wikimedia Commons

In order to add the sample pictures to campaigns in the ISA Tool, they have been added to specific categories on Wikimedia Commons:

- The Category "InnoLab I2C Iteration 1" contains the sample images 1 to 20

Wiki Loves Earth in Turkey

From the test campaign: Wiki Loves Earth in Turkey:
https://isa.toolforge.org/campaigns/97/participate?mv=true

Example 1

https://commons.wikimedia.org/wiki/File:Tree_from_Teos_ancient_city.jpg	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/4/4d/Tree_from_Teos_ancient_city.jpg
file_name	Tree from Teos ancient city
description_en	A tree from Teos ancient city
caption_en	In İzmir, Turkey
date	18 October 2018
Commons_categories	Teos Menengici monumental tree
Matching Wikidata Items (depicts)	
Q10884	tree
Q63045	Pistacia terebinthus[1]
Q17586	Teos

---

[1] This is an interesting case for the community discussion in WP2 (reference to organisms / parts of organisms in combination with a corresponding taxon).

Example 2

Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/c/cc/Great_Temple%2C_Hattusa%2C_Bo%C4%9Fazkale%2C_%C3%87orum%2C_Turkey_06.jpg
file_name	Great Temple, Hattusa, Boğazkale, Çorum, Turkey 06
description_en	GREAT TEMPLE was located in the Lower City of Hattusa which was the capital of the Hittite Empire. The temple was built in the 14th century BCE.
caption_en	Great Temple was dedicated to the supreme deities of the Hittites, TESHUB, the god of sky and storm, and the Sun goddess of ARINNA.
date	12 November 2019
camera_location	40° 01′ 11.49″ N, 34° 36′ 55.31″ E
Commons_categories	Great Temple, Hattusa
Camera manufacturer[2]	HUAWEI
Camera model	VOG-AL00
Author	Picasa
Exposure time	1/1,250 sec (0.0008)
F-number	f/2.2
ISO speed rating	50
Date and time of data generation	12.11.2019 13:33
Lens focal length	2.35 mm
Width	5,120 px
Height	2,368 px
Bits per component	8
	8
	8
Horizontal resolution	72 dpi

---

[2] Information with purple background is image metadata extracted from the image file. We could systematically pass it on in full or agree on the fields that are likely to be of use for the entity extraction (e.g. camera location, time of capture). – Note: After discussion with the developer, we agreed that this information was not of much use for the development of the Metadata-to-Concept Module.

Vertical resolution	72 dpi
Software used	VOG-AL00 9.1.0.226(C00E210R1P12)
File change date and time	22:45, 6 June 2020
Y and C positioning	Centered
Exposure Program	Normal program
Exif version	2.1
Date and time of digitizing	12.11.2019 13:33
Meaning of each component	1. Y
	2. Cb
	3. Cr
	4. does not exist
Image compression mode	0.95
APEX shutter speed	29.8973
APEX aperture	2.27
APEX brightness	0
APEX exposure bias	0
Maximum land aperture	2.27 APEX (f/2.2)
Metering mode	Pattern
Light source	Daylight
Flash	Flash did not fire
DateTime subseconds	843848
DateTimeOriginal subseconds	843848
DateTimeDigitized subseconds	843848
Supported Flashpix version	1
Color space	sRGB
Sensing method	One-chip color area sensor
File source	Digital still camera
Scene type	A directly photographed image

Custom image processing	Custom process
Exposure mode	Auto exposure
White balance	Auto white balance
Digital zoom ratio	1
Focal length in 35 mm film	16 mm
Scene capture type	Standard
Scene control	None
Contrast	Normal
Saturation	Normal
Sharpness	Normal
Subject distance range	Unknown
Unique image ID	5e3f8ab90547b8d9780a685e3c9cfa64
Latitude	40° 1′ 11.49″ N
Longitude	34° 36′ 55.31″ E
Altitude	1,092.69 meters above sea level
GPS time (atomic clock)	10:33
GPS date	12. Nov 19
GPS tag version	2.2.0.0
IIM version	4
Matching Wikidata Items (depicts)	
[item to be created]	Great Temple (Hattusa)
Q181007	Hattusa

Example 3

https://commons.wikimedia.org/wiki/File:Sorgun-G%C3%B6leti_Tabiat_Park%C4%B1.jpg	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/e/ee/Sorgun-G%C3%B6leti_Tabiat_Park%C4%B1.jpg
file_name	Sorgun-Göleti Tabiat Parkı
description_tr	Sorgun Göleti
caption_en	Sorgun pond
date	11 August 2019, 20:53:49
Commons_categories	Sorgun Göleti Nature Park
Camera manufacturer	Canon
Camera model	Canon EOS 500D
Exposure time	1/125 sec (0.008)
F-number	f/5.6
ISO speed rating	100
Date and time of data generation	11.08.2019 20:53
Lens focal length	47 mm
Width	4,752 px
Height	3,168 px
Bits per component	8
	8
	8
Pixel composition	RGB
Orientation	Normal
Number of components	3
Horizontal resolution	72 dpi
Vertical resolution	72 dpi
Software used	Adobe Photoshop CC 2017 (Windows)

File change date and time	10:57, 29 June 2020		
Exposure Program	Portrait mode (for closeup photos with the background out of focus)		
Exif version	2.21		
Date and time of digitizing	11.08.2019 20:53		
Meaning of each component	1. Y		
	2. Cb		
	3. Cr		
	4. does not exist		
APEX shutter speed	7		
APEX aperture	5		
APEX exposure bias	0		
Metering mode	Pattern		
Flash	Flash did not fire		
DateTime subseconds	50		
DateTimeOriginal subseconds	50		
DateTimeDigitized subseconds	50		
Supported Flashpix version	1		
Color space	sRGB		
Focal plane X resolution	5,315.4362416107		
Focal plane Y resolution	5,342.3271500843		
Focal plane resolution unit	inches		
Custom image processing	Normal process		
Exposure mode	Auto exposure		
White balance	Auto white balance		
Scene capture type	Standard		
GPS tag version	0.0.2.2		

Date metadata was last modified	13:57, 29 June 2020
Unique ID of original document	F2C0D43FA7D857D4600169C57D8802B1
Matching Wikidata Items (depicts)	
Q108228355	Sorgun Göleti (protected area in Turkey)
[item to be created]	Sorgun Pond (body of water)

Example 4

https://commons.wikimedia.org/wiki/File:G%C3%B6ksu%27da_G%C3%BCnbat%C4%B1m%C4%B1_2.jpg	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/c/cc/G%C3%B6ksu%27da_G%C3%BCnbat%C4%B1m%C4%B1_2.jpg
file_name	Göksu'da Günbatımı 2
description_tr	Bu çalışma Göksu, diğer adıyla Kuş Cennetinin günbatımı eşliğinde çekilmiş, görüntülerinden biridir.
caption_tr	Göksu'da çekilmiş bir manzara fotoğrafı
date	22 February 2020, 18:02:57
Commons_categories	Göksu Delta
Camera manufacturer	HUAWEI
Camera model	POT-LX1
Exposure time	747/500,000 sec (0.001494)
F-number	f/1.8
ISO speed rating	50
Date and time of data generation	18:02, 22 February 2020
Lens focal length	3.62 mm
Width	4,160 px
Height	3,120 px
Bits per component	8
	8
	8
Orientation	0
Horizontal resolution	72 dpi
Vertical resolution	72 dpi
Software used	POT-LX1 9.1.0.293(C432E8R1P12)
File change date and	18:02, 22 February 2020

time	
Y and C positioning	Centered
Exposure Program	Normal program
Exif version	2.1
Date and time of digitizing	18:02, 22 February 2020
Meaning of each component	1. Y
	2. Cb
	3. Cr
	4. does not exist
Image compression mode	0.95
APEX shutter speed	29.8973
APEX aperture	1.69
APEX brightness	0
APEX exposure bias	0
Maximum land aperture	1.69 APEX (f/1.8)
Metering mode	Pattern
Light source	Daylight
Flash	Flash did not fire
DateTime subseconds	316967
DateTimeOriginal subseconds	316967
DateTimeDigitized subseconds	316967
Supported Flashpix version	1
Color space	sRGB
Sensing method	One-chip color area sensor
File source	Digital still camera
Scene type	A directly photographed image

Custom image processing	Custom process
Exposure mode	Auto exposure
White balance	Auto white balance
Digital zoom ratio	1
Focal length in 35 mm film	26 mm
Scene capture type	Standard
Scene control	None
Contrast	Normal
Saturation	Normal
Sharpness	Normal
Subject distance range	Unknown
Matching Wikidata Items (depicts)	
Q6034096	Göksu Delta

Example 5

https://commons.wikimedia.org/wiki/File:Bor%C3%A7ka-Karag%C3%B6l_Nature_Park_13.jpg	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/c/c6/Bor%C3%A7ka-Karag%C3%B6l_Nature_Park_13.jpg
file_name	Borçka-Karagöl Nature Park 13
description_en	Borçka-Karagöl Nature Park
caption_en	Borçka-Karagöl Nature Park
date	3 August 2019, 10:16:45
Commons_categories	Borçka Karagöl Nature Park
Camera manufacturer	Canon
Camera model	Canon EOS 100D
Exposure time	1/160 sec (0.00625)
F-number	f/4.5
ISO speed rating	100
Date and time of data generation	03.08.2019 10:16
Lens focal length	50 mm
Width	3,456 px
Height	5,184 px
Bits per component	8
	8
	8
Pixel composition	RGB
Orientation	Normal
Number of components	3
Horizontal resolution	72 dpi
Vertical resolution	72 dpi
Software used	Adobe Photoshop CS5 Windows

File change date and time	11:07, 6 June 2020
Y and C positioning	Co-sited
Exposure Program	Normal program
Exif version	2.3
Date and time of digitizing	03.08.2019 10:16
Meaning of each component	1. Y
	2. Cb
	3. Cr
	4. does not exist
APEX shutter speed	7.375
APEX aperture	4.375
APEX exposure bias	0
Metering mode	Pattern
Flash	Flash did not fire, compulsory flash suppression
DateTime subseconds	0
DateTimeOriginal subseconds	0
DateTimeDigitized subseconds	0
Supported Flashpix version	1
Color space	sRGB
Focal plane X resolution	5,798.6577181208
Focal plane Y resolution	5,788.9447236181
Focal plane resolution unit	inches
Custom image processing	Normal process
Exposure mode	Auto exposure
White balance	Auto white balance

Scene capture type	Standard
GPS tag version	2.3.0.0
Serial number of camera	18070055874
Lens used	EF50mm f/1.8 II
Rating (out of 5)	0
Date metadata was last modified	15:07, 6 June 2020
Unique ID of original document	xmp.did:29557AEBC3A7EA11B48295702BEB0460
IIM version	44,033
Matching Wikidata Items (depicts)	
Q108228031	Borçka Karagöl Nature Park (protected area in Turkey)

ETH-Bibliothek - Photographs by Leo Wehrli

https://commons.wikimedia.org/wiki/Category:ETH-BIB_Leo_Wehrli

Example 6

https://commons.wikimedia.org/wiki/File:ETH-BIB-Martinswald_bei_Innsbruck-Dia_247-05068.tif	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/a/a1/ETH-BIB-Martinswald _bei_Innsbruck-Dia_247-05068.tif
file_name	ETH-BIB-Martinswald bei Innsbruck-Dia 247-05068
title	Martinswald bei Innsbruck[3]
date[4]	1929
Commons_categories	Martinswand; ETH-BIB Leo Wehrli - Austria
Width	3,365 px
Height	2,811 px
Compression scheme	Uncompressed
Pixel composition	Black and white (Black is 0)
Image data location	14,636
Number of components	1
Number of rows per strip	2,811
Bytes per compressed strip	9,459,015
Horizontal resolution	300 dpi
Vertical resolution	300 dpi
Software used	Adobe Photoshop CS Windows

---

[3] Note that the handwritten inscription on the glass diapositive is correct, but there is a mistake in the official metadata of the library (Martinswald vs. Martinswand).
[4] This is the date field from the template (different from the ones in the Wiki Loves Earth series).

File change date and time	31.08.2005 15:50
Color space	Uncalibrated

Matching Wikidata Items (depicts)	
Q1814711	Martinswand (mountain in Austria)

Example 7

https://commons.wikimedia.org/wiki/File:ETH-BIB-Athen,_Stadt-Panorama_(Ausschnitt),_vom_Parthenon_nach_Nordost_Lykabettos-Dia_247-08759.tif	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/4/43/ETH-BIB-Athen%2C_Stadt-Panorama_%28Ausschnitt%29%2C_vom_Parthenon_nach_Nordost_Lykabettos-Dia_247-08759.tif
file_name	ETH-BIB-Athen, Stadt-Panorama (Ausschnitt), vom Parthenon nach Nordost Lykabettos-Dia 247-08759
title	Athen, Stadt-Panorama (Ausschnitt), vom Parthenon nach Nordost Lykabettos
depicted_place	Athen; https://commons.wikimedia.org/wiki/Category:Athen
date	1935
Commons_categories	ETH-BIB Leo Wehrli - Greece; Views from the Acropolis in Athens; 1935 in Athens
Image title	Box_118 046
Width	3,630 px
Height	2,822 px
Compression scheme	Uncompressed
Pixel composition	Black and white (Black is 0)
Image data location	17,058
Number of components	1
Number of rows per strip	2,822
Bytes per compressed strip	10,243,860
Horizontal resolution	300 dpi
Vertical resolution	300 dpi
Software used	Adobe Photoshop CS Windows
File change date and	06.09.2005 09:33

time	
Color space	Uncalibrated

Matching Wikidata Items (depicts)	
Q1524	Athens
Q1357713	Mount Lycabettus
Potential False Positives (does not depict)	
Q131013	Acropolis of Athens
Q131668	acropolis

Example 8

Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/0/02/ETH-BIB-Kattowitz%2 C_st%C3%A4dtisches_Krankenhaus-Dia_247-02211-1.tif
file_name	ETH-BIB-Kattowitz, städtisches Krankenhaus-Dia 247-02211-1
title	Kattowitz, städtisches Krankenhaus
description	Reproduktion einer Postkarte
date	1915
Commons_categories	ETH-BIB Leo Wehrli - Poland; Historical photographs of Katowice; 1915 in Poland; Postcards of Katowice
Image title	Box_28 020
Width	3,579 px
Height	2,549 px
Compression scheme	Uncompressed
Pixel composition	Black and white (Black is 0)
Image data location	14,448
Number of components	1
Number of rows per strip	2,549
Bytes per compressed strip	9,122,871
Horizontal resolution	300 dpi
Vertical resolution	300 dpi
Software used	Adobe Photoshop CS Windows
File change date and time	29.08.2005 15:45

Color space	Uncalibrated
Matching Wikidata Items	
Q192425	postcard[5]
[item to be created]	de: Städtisches Krankenhaus (Kattowitz)[6]

---

[5] To be clarified with the Wikimedia Commons community: Should "postcard" be added as a "depicts" statement?

[6] To be clarified: How to enter a former building that probably has since been destroyed?

Example 9

https://commons.wikimedia.org/wiki/File:ETH-BIB-Valcov,_Zwischen_Weiden-Dia_247-10008.tif	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/7/70/ETH-BIB-Valcov%2C_Zwischen_Weiden-Dia_247-10008.tif
file_name	ETH-BIB-Valcov, Zwischen Weiden-Dia 247-10008
title	Valcov, Zwischen Weiden
depicted_place	Vylkove; https://en.wikipedia.org/wiki/Vylkove
date	1936
Commons_categories	ETH-BIB Leo Wehrli - Ukraine; Historical images of Vylkove; Boats in Vylkove
Image title	Box_139 031
Width	3,690 px
Height	2,874 px
Bits per component	8
	8
	8
Compression scheme	Uncompressed
Pixel composition	RGB
Image data location	14,682
Number of components	3
Number of rows per strip	2,874
Bytes per compressed strip	31,815,180
Horizontal resolution	300 dpi

Vertical resolution	300 dpi
Data arrangement	chunky format
Software used	[Adobe Photoshop CS Windows](#)
File change date and time	06.09.2005 13:36
Color space	Uncalibrated
Matching Wikidata Items	
[Q889536](#)	Vylkove (city in Odessa Oblast of Ukraine)
[Q35872](#)	boat
[Q10884](#)	tree
[Q36050](#)	Salix (taxon)

Example 10

Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/9/98/ETH-BIB-Basel%2C_M%C3%BCnster_von_der_Wettsteinbr%C3%BCcke-Dia_247-11518.tif
file_name	ETH-BIB-Basel, Münster von der Wettsteinbrücke-Dia 247-11518
title	Basel, Münster von der Wettsteinbrücke
depicted_place	Basel; https://en.wikipedia.org/wiki/Basel
date	1938
Commons_categories	ETH-BIB Leo Wehrli - BS; Exterior of Basel Minster
Width	3,634 px
Height	2,739 px
Compression scheme	Uncompressed
Pixel composition	Black and white (Black is 0)
Image data location	13,802
Number of components	1
Number of rows per strip	2,739
Bytes per compressed strip	9,953,526
Horizontal resolution	300 dpi
Vertical resolution	300 dpi
Software used	Adobe Photoshop CS Windows
File change date and time	15:39, 6 September 2005
Color space	Uncalibrated
Matching Wikidata Items	

Q78	Basel
Q666479	Basel Minster
Potential False Positives (does not depict)	
Q1597642	Wettsteinbrücke[7]

---

[7] Question to be resolved in the context of Wikimedia Commons: How to enter information about the point/perspective from where a photograph is taken / an object is shown?

Images from Archives New Zealand

https://commons.wikimedia.org/wiki/Category:Images_from_Archives_New_Zealand

Example 11

https://commons.wikimedia.org/wiki/File:Edgecumbe_quake007.jpg	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/8/82/Edgecumbe_quake007.jpg
file_name	Edgecumbe quake007
title	
caption_en	Edgecumbe Earthquake 1987
description_en	At 1.35 p.m. on 2 March 1987, a magnitude 5.2 earthquake struck the Bay of Plenty region, cutting power and sending many people outdoors. Minutes later a much stronger quake rocked the region. This main shock, at 1.42 p.m., had a magnitude of 6.3 and was centred north of Edgecumbe. Four aftershocks with magnitudes greater than 5 occurred in the next six hours, and smaller aftershocks were felt for weeks.
date	3 July 2019, 08:23
Commons_categories	1987 Edgecumbe earthquake; Edgecumbe earthquake (1987) at Archives New Zealand
Matching Wikidata Items (depicts)	
Q1284366	1987 Edgecumbe earthquake
Q2192924	Bay of Plenty Region

Example 12 (not a photograph!)

https://commons.wikimedia.org/wiki/File:Coroners_Inquests_-_Case_Files_-_Auckland_-_Roberts,_Peter_(1855_-_1855).jpg	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/2/26/Coroners_Inquests_-_Case_Files_-_Auckland_-_Roberts%2C_Peter_%281855_-_1855%29.jpg
file_name	Coroners Inquests - Case Files - Auckland - Roberts, Peter (1855 - 1855)
title	
description_en	Coroners Inquests - Case Files - Auckland - Roberts, Peter (1855 - 1855) Archives New Zealand Reference: AAAR 27339 W6101 9 / [30]
date	between 1855 and 1855[8]
Commons_categories	Coroners Inquest Files at Archives New Zealand
Matching Wikidata Items (depicts)	
[item to be created]	coroner's inquest
Potential False Positives (does not depict)[9]	
Q37100	Auckland (city on the North Island of New Zealand)
[item to be created]	Peter Roberts (died in Auckland in 1855 / 1856?)

---

[8] In the document, I am reading "1856".
[9] Question for the community: How to add this information as qualifiers of the coroner's inquest?

Example 13 (not a photograph)

https://commons.wikimedia.org/wiki/File:1908_New_Zealand_Coat_of_Arms_Competition_Entries_-_%22New_Zeal_and_Old_Fealty%22_(Page_1).jpg	

Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/a/a7/1908_New_Zealand_Coat_of_Arms_Competition_Entries_-_%22New_Zeal_and_Old_Fealty%22_%28Page_1%29.jpg
file_name	1908 New Zealand Coat of Arms Competition Entries - "New Zeal and Old Fealty" (Page 1)
description_en	In 1908, a competition was held to design the first New Zealand Coat of Arms. Previously New Zealand used the coat of arms of the United Kingdom, but after Dominion status was given in 1907 a new coat of arms was considered to be appropriate. This entry, "New Zeal and Old Fealty" is designed by "La Cote Male Tale" and was one of 75 design submissions entered in the competition, most of which are held at Archives New Zealand. Page 1 of 2. Archives New Zealand Reference: ACGO 8341 IA9 29 / 30 47
caption_en	Page 1 of 2. Submission for the 1908 New Zealand Coat of Arms Competition, "New Zeal and Old Fealty" designed by "La Cote Male Tale"
date	1908
Commons_categories	Proposed coats of arms of New Zealand; Symbols of New Zealand

Matching Wikidata Items (depicts)	
Q5078274	sketch
Q14659	coat of arms

Potential False Positives (does not depict)	

[Q200972](Q200972)	Coat of Arms of New Zealand[10]

---

[10] Question for the community: How to express with qualifiers that the image depicts a design sketch of a Coat of Arms of NZ?

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Example 14

https://commons.wikimedia.org/wiki/File:Captain_F._G._Richards_portrait_(1920).jpg	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/b/b2/Captain_F._G._Richards_portrait_%281920%29.jpg
file_name	Captain F. G. Richards portrait (1920)
description_en	Captain F. G. Richards - D.S.O. [Distinguished Service Order]. Born in Wellington. At the outbreak of war was in London, volunteered and spent the whole time since in France, where he received his D.S.O. [Distinguished Service Order]. At his own request he transferred from The British Army to the New Zealand Expeditionary Forces. Archives New Zealand Reference: AALZ 25044 2 / F1026 41
date	1 April 2020[11]
Commons_categories	Great War medal recipients photographs at Archives New Zealand
Matching Wikidata Items (depicts)	
[item to be created]	*Insufficient data for the creation of a person item (e.g. full name, year of birth, year of death)*

---

[11] The date entered is wrong. It should probably read "1920".

Example 15

https://commons.wikimedia.org/wiki/File:Loading_Taranaki_produce_from_railway_wagons_into_overseas_ship,_Cumberland_at_New_Plymouth._View_from_platform_of_crane.jpg	
Information provided through the API request	
image_uri	https://upload.wikimedia.org/wikipedia/commons/7/78/Loading_Taranaki_produce_from_railway_wagons_into_overseas_ship%2C_Cumberland_at_New_Plymouth._View_from_platform_of_crane.jpg
file_name	Loading Taranaki produce from railway wagons into overseas ship, Cumberland at New Plymouth. View from platform of crane
description_en	CAPTION: Loading Taranaki produce from railway wagons into overseas ship, Cumberland at New Plymouth. View from platform of crane. PHOTOGRAPHER: J.F. Le Cren DATE: November 1951 Archives New Zealand Reference: R25619558 AAVK 6390 W3493 178 / B2495
caption_en	CAPTION: Loading Taranaki produce from railway wagons into overseas ship, Cumberland at New Plymouth. View from platform of crane. PHOTOGRAPHER: J.F. Le Cren DATE: November 1951
date	1951
Commons_categories	New Zealand Railways Department photographs at Archives New Zealand; Port Taranaki; Loading (freight); People at work in New Zealand; 1951 in New Zealand
Matching Wikidata Items (depicts)	
Q7230977	Port Taranaki (port in New Zealand)
Q2516616	loading (transfer of goods from one transport mode to another)
Q5	human
Q208502	railroad car[12] (vehicle used for carrying cargo or passengers on rail transport system)
Q105999	cargo ship (ship or vessel that carries cargo, goods, and materials onboard from one port to another)
Q11446	ship (large buoyant watercraft)
Q1913301	produce (group of farm-produced crops and goods)

---

[12] Note that the term "railway wagon" is not listed among the aliases in Wikidata.

Media in Category Bibliotheca de Catalunya

https://commons.wikimedia.org/wiki/Category:Biblioteca_de_Catalunya

Example 16

https://commons.wikimedia.org/wiki/File:Manuel_Jov%C3%A9s.jpg	
Information provided through the API request	
file_name	Manuel Jovés
description_ca	El compositor i pianista Manuel Jovés
date	14 September 2013, 18:16:23
Commons_categories	Biblioteca de Catalunya; Manuel Jovés
Matching Wikidata Items (depicts)	
Q16941993	Manuel Jovés (Argentinian pianist)
Potential False Positives (does not depict)	
Q1200925	National Library of Catalonia[13]

---

[13] In this case, this could be controlled for by adding also the "author" field to the API request.

Example 17

https://commons.wikimedia.org/wiki/File:Retrat_de_dona.jpg	
Information provided through the API request	
file_name	Retrat de dona
description_en	Albumin-painted watercolor, 22 x 20 cm to 1860[14]
description_ca	albúmina pintada a l'aquarel·la ; 22 x 20 cm cap 1860
date	31 March 2011, 19:46:43[15]
Commons_categories	Photographs by Manuel Moliné i Muns; Portraits of women at full length; Biblioteca de Catalunya; People of Spain in 1860; Moliné y Albareda[16]
Matching Wikidata Items (depicts)	
Q467	Woman (female adult human)
Potential False Positives (does not depict)	
Q1200925	National Library of Catalonia[17]
Q11934972	Manuel Moliné i Muns (Spanish painter)
[item to be created]	Moliné y Albareda (group of artists)

---

[14] The description in English is wrong. It is an Albumen print, painted with watercolors.

[15] The date is wrong; this is the date of digitization.

[16] The last one is a "red" category that has not yet been created on Wikimedia Commons.

[17] In this case, this could be controlled for by feeding also the "source" field (Fons Fotogràfic de la Biblioteca de Catalunya).

Example 18

https://commons.wikimedia.org/wiki/File:Biblioth%C3%A8que_Catalogne_Barcelone_4.jpg	
Information provided through the API request	
file_name	Bibliothèque Catalogne Barcelone 4
description_fr	Bibliothèque de Catalogne, Barcelone.
date	7 March 2019, 09:01:03
Commons_categories	Biblioteca de Catalunya; March 2019 in Barcelona; Buildings in Barcelona photographed in 2019; Statues in Spain photographed in 2019; Stairs in Barcelona
Matching Wikidata Items (depicts)	
Q179700	statue (sculpture primarily conceived as a representational figure)
Q12511	stairs (construction designed to bridge a large vertical distance by dividing it into steps)
Q683875	Old Hospital de la Santa Creu, Barcelona (building in which the National Library of Catalunya is located)
Less specific items depicted	
	building
	Barcelona
	Spain
Potential False Positives (does not depict)	
Q1200925	Biblioteca de Catalunya (organization)

Example 19

https://commons.wikimedia.org/wiki/File:Joana_Escobedo_Abraham_a_la_Biblioteca_de_Catalunya,_2005.jpg	
Information provided through the API request	
file_name	Joana Escobedo Abraham a la Biblioteca de Catalunya, 2005
description_ca	Joana Escobedo Abraham a una taula rodona amb motiu de l'exposicó El Quixot: un heroi de paper, els papers d'un heroi, desembre de 2005
date	23 December 2005, 04:10:40
Commons_categories	Essayists from Catalonia; Writers from Barcelona; Librarians from Catalonia; Philologists from Catalonia; 1942 births; Biblioteca de Catalunya; Female writers from Catalonia
Matching Wikidata Items (depicts)	
Q16941932	Joana Escobedo i Abraham (Spanish philologist and librarian)
Less specific items depicted	
	essayist
	writer
	librarian
	human
	female

Example 20 (not a photograph)

https://commons.wikimedia.org/wiki/File:PalacioVirreinaldeLima.jpg	
Information provided through the API request	
file_name	PalacioVirreinaldeLima
description_en	Interior aspect of the Viceregal Palace in Lima. Can be seen in it the Halberdiers of the Royal Infantry Guard, and the throne of the Viceroy of Peru. Drawing made in the epoch of the Viceroy Manuel de Amat y Junient (1772-1776)
description_es	Aspecto interior del Palacio Virreinal de Lima, en el cual puede observarse a los Alabarderos de la Guardia Real de Infantería, y el trono del Virrey del Perú. Este documento es el único conocido hasta hoy que muestra como era interiormente el antiguo Palacio de los Virreyes. Dibujo inédito conservado en la Biblioteca de Catalunya, sig. Ms. 400. Barcelona.
date	Siglo XVIII, Época del Virrey Manuel de Amat y Junient (1772-1776)
Commons_categories	History of Peru; Spanish Empire; Biblioteca de Catalunya; Viceregal Palace, Lima; 1770s
Matching Wikidata Items (depicts)	
Q385938	Government Palace (seat of the executive branch of the Peruvian Government, and the official residence of the President of Peru), also known as Viceregal palace
Q189233	throne (seat of state of a potentate or dignitary)
Q3126109	halberdier (soldier using halberd)
Less specific items depicted	
Q2868	Lima
Q419	Peru
Potential False Positives (does not depict)	
Q1891800	Manuel de Amat y Junie (governor, viceroy (1707-1782))
Q1200925	Biblioteca de Catalunya (organization)

Media from the UNESCO Archives

Category:Images_from_the_archive_of_UNESCO

Example 21

https://commons.wikimedia.org/wiki/File:African_cultures,_Kano_-_UNESCO_-_PHOTO0000005007_0001.tiff	
Information provided through the API request	
file_name	African cultures, Kano - UNESCO - PHOTO0000005007 0001
title	The photo includes a view over the city of Kano, but also includes the view of a tree just outside the wall where there is what appears to be a small gathering of people with some goods. There is even one person in the photo riding a bicycle.
depicted_place	Kano (https://www.wikidata.org/wiki/Q182984); Nigeria (https://www.wikidata.org/wiki/Q1033)
inscription_en	A view of Kano.
inscription_fr	Vue de Kano.
date	1975
keywords	African cultures, Urban areas, Desertification
Commons_categories	Kano
Matching Wikidata Items (depicts)	
[Q182984](Q182984)	Kano (city in Nigeria)
[Q10884](Q10884)	tree (perennial woody plant)
[Q42948](Q42948)	wall (vertical structure, usually solid, that defines and sometimes protects an area)
[Q5](Q5)	human
[Q2424752](Q2424752)	product (anything that can be offered to a market)
[Q11442](Q11442)	bicycle (pedal-driven two-wheel vehicle)
Less specific items depicted	

Q1033	Nigeria[18]

Example 22

https://commons.wikimedia.org/wiki/File:Botany,_Domasi_-_UNESCO_-_PHOTO0000004351_0001.tiff	
Information provided through the API request	
file_name	Botany, Domasi - UNESCO - PHOTO0000004351 0001
description_fr	Dans une salle de classe une énorme table trône au milieu. Sur celle-ci différents types de plantes en pot sont posées. Certaines sont étiquettées. Trois élèves, deux garçons et une fille, les manipulent. Un professeur et deux élèves plus âgés sont en arrière plan
inscription_en	The Domasi Scientific Training Centre is a joint UNESCO/UNICEF Project to train primary school teachers in modern methods of natural science teaching. This project will train 1500 teachers for 250 Malawi primary schools in two years. Botany class
inscription_fr	Le Centre de formation scientifique de Domasi est une réalisation du programme conjoint de l'UNESCO et de l'UNICEF destiné à former les instituteurs d'écoles primaires aux méthodes modernes d'enseignement des sciences naturelles. Ce programme prévoit la formation de 1.500 instituteurs en deux ans pour les 250 écoles primaire du Malawi. Classe de botanique
depicted_place	Domasi (Q5289937), Malawi (Q1020)
date	1967
keywords	Botany, Plants, Children, Primary schools, Learning methods, Practical work (learning method),
Commons_categories	1967 in Malawi; Children of Malawi; Domasi; Science education in Malawi
Matching Wikidata Items (depicts)	
Q5289937	Domasi (human settlement in Malawi)
Q621114	classroom (room inside school building where lessons are given)
Q14748	table (piece of furniture with a flat top)
Q756	plant (multicellular eukaryote of the kingdom Plantae)

---

[18] The removal of less specific Wikidata items if a more specific item is added as a "depicts" statement could be part of a feature to be added on the ISA Tool if this helps enforcing community norms (needs further discussion).

Q869381	flowerpot ((usually) conical container in pottery or plastic in which flowers and plants are grown)
Q48282	student (learner, or someone who attends an educational institution)
Q37226	teacher (person who helps others to acquire knowledge, competences or values)
Q41694961	training facility (place where people are trained)
Q379833	lesson (section of learning or teaching into which a wider learning content is divided)[19]
Less specific items depicted	
Q1020	Malawi[20]
Potential False Positives (does not depict)	
Q974144	educator (occupation which teaches others knowledge, skills, and habits)[21]
Q37517	class (taxonomic rank)
Q18204	class (in education, a group of students taking the same course, or at the same level in an institution)
Q600134	course (program of study, or unit of teaching that typically lasts one academic term)
Q217594	class (collection of sets in mathematics that can be defined based on a property of its members)
Q4479242	class (in object-oriented programming, a definition that specifies how an object works)
Q16889133	class (collection of items in an ontology sharing common characteristics)

---

[19] Check with the Commons Community: How to add the information that it is a botany class?
[20] To be controlled for at the level of the ISA Tool.
[21] There is a specific way, occupations of people depicted in images should be added to "depicts" statements.
- To be clarified with the Commons community. - This might be controlled for at the level of the ISA Tool.

Example 23 (not a photograph / backside of a photograph)

https://commons.wikimedia.org/wiki/File:Conferences,_Paris_-_UNESCO_-_PHOTO0000002934_0000.tiff	
Information provided through the API request[22]	
file_name	Conferences, Paris - UNESCO - PHOTO0000002934 0000
description_fr	Dans une salle recouverte deois, avec un plafonnier très moderne, des hommes à la tribune. L'un d'eux est debout et lit un papier. La salle est pleine et écoute.
inscription_en	Inauguration of the 4th building at UNESCO Headquarters. Mr René Maheu director-general of UNESCO delivering his speech in conference room X.
inscription_fr	Inauguration du 4eme bâtiment du siège. M. René Maheu, Directeur Général de l'UNESCO, prononce son discours dans la salle X.
depicted_people	René Maheu (Q1388759)
depicted_place	Paris (Q90), France (Q142)
date	10 April 1965
keywords	Conferences, Building design, International relations,
Commons_categories	1965 photographs; UNESCO buildings in Paris; René Maheu; Dominique Roger
Potential False Positives (does not depict)	
Q1207465	conference hall (room provided for singular events such as business conferences and meetings)
Q3279650	World Heritage Centre (building complex at number 7 Place de Fontenoy in Paris, France; seat of the headquarters of UNESCO)
Q1388759	René Maheu
Q1417098	Inauguration (formal ceremony to mark the beginning of a major public leader's term of office, or official opening or beginning of an institution or structure)
Q861911	speech (address delivered to an audience)
Q90	Paris
Q142	France

---

[22] The description is wrong, as it applies to the recto of the photograph. We need a way to filter out backsides of photographs. This is an issue that cannot be resolved at the level of the Metadata-to-Concept Module.

Example 24

https://commons.wikimedia.org/wiki/File:Conferences,_Paris_-_UNESCO_-_PHOTO0000002934_0001.tiff	
Information provided through the API request	
file_name	Conferences, Paris - UNESCO - PHOTO0000002934 0001
description_fr	Dans une salle recouverte deois, avec un plafonnier très moderne, des hommes à la tribune. L'un d'eux est debout et lit un papier. La salle est pleine et écoute.
inscription_en	Inauguration of the 4th building at UNESCO Headquarters. Mr René Maheu director-general of UNESCO delivering his speech in conference room X.
inscription_fr	Inauguration du 4eme bâtiment du siège. M. René Maheu, Directeur Général de l'UNESCO, prononce son discours dans la salle X.
depicted_people	René Maheu (Q1388759)
depicted_place	Paris (Q90), France (Q142)
date	10 April 1965
keywords	Conferences, Building design, International relations,
Commons_categories	1965 photographs; UNESCO buildings in Paris; René Maheu; Dominique Roger
Matching Wikidata Items (depicts)	
Q1207465	conference hall (room provided for singular events such as business conferences and meetings)
Q3279650	World Heritage Centre (building complex at number 7 Place de Fontenoy in Paris, France; seat of the headquarters of UNESCO)
Q1388759	René Maheu
Q1417098	Inauguration (formal ceremony to mark the beginning of a major public leader's term of office, or official opening or beginning of an institution or structure)
Q861911	speech (address delivered to an audience)
Less specific items depicted[23]	
Q90	Paris
Q142	France
Potential False Positives (does not depict)	

---

[23] Description practice to be verified with the Wikimedia Commons community; the filtering out of less specific items should be done at the level of the ISA Tool.

Q3469909	conference room
Q67013607	Dominique Roger (French photographer)[24]

Example 25

https://commons.wikimedia.org/wiki/File:Historic_monuments,_Athens_-_UNESCO_-_PHOTO0000000 2426_0001.tiff	
Information provided through the API request	
file_name	Historic monuments, Athens - UNESCO - PHOTO0000002426 0001
description_en	Photograph of the interior of the Erechtheion (north and east sides). #Acropolis monuments #Greek culture[25]
inscription_en	The interior of the Erechtheion (north and east sides).
inscription_fr	L'erechthéion vu de l'intérieur (façade nord et façade est).
depicted_place	Athens (Q1524), Greece (Q41)
date	1964
Commons_categories	Inside the Parthenon; 1964 in Athens; 1964 photographs
Matching Wikidata Items (depicts)	
Q10288	Parthenon (former temple on the Athenian Acropolis, Greece)
Less specific items depicted	
Q131013	Acropolis of Athens
Q1524	Athens
Q41	Greece
Q131668	acropolis
Potential False Positives (does not depict)	
Q242741	Erechtheion (ancient Greek temple on the north side of the Acropolis of Athens)

---

[24] Use the "photographer" field to control for this.
[25] This information is wrong. The photograph shows the Parthenon, and not the Erechtheion (see the different shape of the columns).

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Images donated by the Natural History Museum, London

Category:Images_donated_by_the_Natural_History_Museum,_London

Example 26

https://commons.wikimedia.org/wiki/File:010430161_Delias_apatela_taliabu_Tennent_Rawlins_%26_Yagishita_2009_HT_1.jpg	
Information provided through the API request	
file_name	010430161 Delias apatela taliabu Tennent Rawlins & Yagishita 2009 HT 1
description	A ventral photograph of Delias apatela taliabu, Tennent, Rawlins & Yagishita, 2009, a Holotype
date	25 March 2019, 16:26:20
Commons_categories	Pieridae of the Natural History Museum, London; Taliabu Island Regency; Lepidoptera of the Moluccas; Pieridae of Indonesia; Type specimens of the Natural History Museum, London; Pierinae specimens; Pieridae holotypes; Delias apatela
Matching Wikidata Items (depicts)	
Q13561202	Delias apatela (taxon)
Q1061403	holotype[26]
Less specific items depicted	
Q41559	Pieridae (family of insects)
Q28319	Lepidoptera (order of insects that includes butterflies and moths)
Q51255340	type specimen
Q2075980	biological specimen
Potential False Positives (does not depict)	
	Tennent
	Yagishita
	Rawlins

---

[26] Clarify with the Community: How to express that the holotype of a specific taxon is depicted?

	Taliabu Island Regency
	Indonesia
	Moluccas
	Natural History Museum

Example 27

Information provided through the API request	
file_name	013376559 Lepidochrysops pittawayli Larsen 1983 PT 1
description	A ventral photograph of Lepidochrysops pittawayli, Larsen, 1983, a Paratype[27]
date	15/03/2019 14:09
Commons_categories	Lycaenidae of the Natural History Museum, London; Lepidoptera of Saudi Arabia; Lycaenidae paratypes; Type specimens of the Natural History Museum, London; Polyommatinae specimens; Lepidochrysops pittawayi
Matching Wikidata Items (depicts)	
Q6527562	Lepidochrysops pittawayi
Q926578	paratype (taxonomic term)[28]
Less specific items depicted	
Q158717	Lycaenidae (family of insects)
Q28319	Lepidoptera (order of insects that includes butterflies and moths)
Q460892	Polyommatinae (subfamily of insects)
Q104899714	Polyommatinae (subfamily of Lycaenidae)[29]
Q51255340	type specimen
Q2075980	biological specimen
Potential False Positives (does not depict)	
	Natural History Museum
	London
	Saudi Arabia
	Larsen

---

[27] Note that there is a spelling error in the Museum metadata; it seems that the term has been wrongly copied from the label.

[28] There is a more meaningful definition in German and other languages: "Material, das neben einem vom Autor bestimmten Typus und dessen Dubletten bei der Originalbeschreibung genannt wird".

[29] This and the previous one are duplicate entries on Wikidata.

Example 28

https://commons.wikimedia.org/wiki/File:013376706_Hypolycaena_phorbas_purpura_Tennent_2016_PT.jpg	
Information provided through the API request	
file_name	013376706 Hypolycaena phorbas purpura Tennent 2016 PT
description	A dorsal photograph of Hypolycaena phorbas purpura, Tennent, 2016, a Paratype
date	19/03/2019 16:03
Commons_categories	Lycaenidae of the Natural History Museum, London; Lycaenidae paratypes; Type specimens of the Natural History Museum, London; Hypolycaena phorbas specimens; Lycaenidae of Milne Bay Province
Matching Wikidata Items (depicts)	
Q28744840	Hypolycaena phorbas purpura
Q926578	paratype (taxonomic term)
Less specific items depicted	
Q158717	Lycaenidae (family of insects)
Q5959823	Hypolycaena phorbas (species of insects)
Q51255340	type specimen
Q2075980	biological specimen
Potential False Positives (does not depict)	
	Tennent
	Natural History Museum
	London
	Milne Bay Province

Example 29

https://commons.wikimedia.org/wiki/File:013376824_Hypolycaena_phorbas_purpura_Tennent_2016_PT_1.jpg	
Information provided through the API request	
file_name	013376824 Hypolycaena phorbas purpura Tennent 2016 PT 1
description	A ventral photograph of Hypolycaena phorbas purpura, Tennent, 2016, a Paratype
date	19/03/2019 10:32
Commons_categories	Lycaenidae of the Natural History Museum, London; Lycaenidae paratypes; Type specimens of the Natural History Museum, London; Hypolycaena phorbas specimens; Lycaenidae of Milne Bay Province
Matching Wikidata Items (depicts)	
Q28744840	Hypolycaena phorbas purpura
Q926578	paratype (taxonomic term)
Less specific items depicted	
Q158717	Lycaenidae (family of insects)
Q5959823	Hypolycaena phorbas (species of insects)
Q51255340	type specimen
Q2075980	biological specimen
Potential False Positives (does not depict)	
	Tennent
	Natural History Museum
	London
	Milne Bay Province

Example 30

https://commons.wikimedia.org/wiki/File:013377368_Mycalesis_terminus_mitchelli_Tennent_2014_PT.jpg	
Information provided through the API request	
file_name	013377368 Mycalesis terminus mitchelli Tennent 2014 PT
description	A dorsal photograph of Mycalesis terminus mitchelli, Tennent, 2014, a Paratype
date	15/05/2019 12:24
Commons_categories	Nymphalidae of the Natural History Museum, London; Nymphalidae paratypes; Type specimens of the Natural History Museum, London; Mycalesis terminus specimens; Nymphalidae of Milne Bay Province
Matching Wikidata Items (depicts)	
Q23069263	Mycalesis terminus mitchelli
Q926578	paratype (taxonomic term)
Less specific items depicted	
Q6946847	Mycalesis terminus
Q156449	Nymphalidae (family of insects)
Q51255340	type specimen
Q2075980	biological specimen
Potential False Positives (does not depict)	
	Tennent
	Natural History Museum
	London
	Milne Bay Province

InnoLab "Image to Concept"

Annex 3 – Baseline Statistics for the ISA Tool

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December 2022

Contents

1. Preliminary Remarks

The present document contains a set of indicators that could/should be tracked and reported on a permanent basis in the form of baseline statistics for the ISA Tool.

The indicators serve the following purposes:

1. Monitoring of the functioning and usage of the tool

2. Campaign statistics as feedback to the users and campaign managers
    (basic statistics to be included in every campaign)

3. Improvement of the algorithms used in the context of the ISA Tool (manually or through machine learning)

4. Monitoring of the relevancy and effectiveness of the ISA Tool and the different algorithms used to suggest tags

The remainder of the document is structured in four sections reflecting the four purposes.

2. Functioning and Usage of the Tool

The indicators listed in the table below are used to monitor the well-functioning and the usage of the tool.

Indicator	Purpose	Priority	Needs dev work
Percentage of downtime (day / month / year)	Monitor the availability of the tool[1]	SHOULD	
Percentage of error pages / error messages among the pages served (day / month / year)	Monitor the well-functioning of the tool	SHOULD	
Channels (origin of website traffic)	Monitor the channels through which users access the tool	COULD	Y
Number of sessions (visits) (day / month / year)	Monitor the usage of the tool	SHOULD	Y
Average length of a session (mean & median) (day / month / year)	Monitor the usage of the tool	SHOULD	Y
Number of unique visitors (day / month / year)	Monitor the usage of the tool	SHOULD	Y
~~Bounce rate (= percentage of single page visits)~~ *Misleading as usage of the tool happens on the same page.*	~~Monitor the usage of the tool~~	n/a	
Number of active users (i.e. users with at least one edit) (day / month / year)	Monitor the usage of the tool	MUST	Y
Number of edits (day / month / year)	Monitor the usage of the tool	MUST	
Average number of edits per active user (mean & median) (day / month / year)	Monitor the usage of the tool	MUST	
Number of active campaigns (month / year) *What definition to use for "active" campaign? - Proposal: 5 users with at least one edit in a given month.*	Monitor the usage of the tool	SHOULD	
Number of images in active campaigns (month / year)	Monitor the usage of the tool	SHOULD	
Average number of images per active campaign (mean & median) (month / year)	Monitor the usage of the tool	SHOULD	
Average length of a campaign (mean & median)	Monitor the usage of the tool	COULD	

---

[1] Statistics for Toolforge projects are tracked, e.g.
https://grafana-cloud.wikimedia.org/d/toolforge-k8s-namespace-resources/kubernetes-namespace-resources?var-namespace=tool-isa&orgId=1&refresh=5m

(month / year) *Based on the definition used above.*			
Percentage of sessions of a specific device category (desktop, mobile or tablet)	Monitor the usage of the tool	MUST	

3. Campaign Statistics

The following indicators are used to monitor individual campaigns and to give feedback to the campaign managers and contributors (statistics to be displayed in the context of the campaign).

It is important to provide figures from within the tool that can be used by campaign managers for their reporting vis-à-vis funding organizations.

Indicator	Purpose	Priority	Needs dev work
Number of images in a campaign (day / month / year)	Baseline information about the campaign	MUST	
Percentage of images with at least one depicts statement in a campaign (day / month / year)	Monitor progress of the campaign	COULD	Y (Hard)
Average number of depicts statements for the images in the campaign (mean & median) (day / month / year)	Monitor progress of the campaign	COULD	
Number of contributors (logged-in users with at least one edit) of a campaign (day / month / year)	Monitor participation in the campaign	MUST	
Number of contributions to a campaign (day / month / year)	Monitor participation in the campaign	MUST	
Number of contributions to a campaign by contributor	Monitor participation in the campaign; leaderboard	MUST	

4. Improvement of Algorithms

The following data is used for the continuous improvement of the algorithms employed in the context of the ISA Tool. The data should be provided at a granularity level of individual user interactions (the user pressing). The improvement may take place both manually and as part of a machine learning approach. The data should be made available through an API so that algorithms can directly consume the data.

Note: The provision of more extensive data is presently not needed as the newly developed Metadata-to-Concept (M2C) algorithm is currently not making use of a machine learning approach. Similarly, no further data needs to be collected in order to feed back information to Google Vision as to which tag suggestions have been rejected.

It is therefore suggested that improvements be made on the basis of database dumps after a campaign has been completed. In order to improve the M2C service at regular intervals, it is sufficient to retrieve all images together with existing depicts tags from the database and compare this with a run of the M2C service. From this, both the hit rate for meaningful suggestions of the M2C service and the rate for useless suggestions can be calculated. In particular, nonsensical suggestions can then be clustered to improve the process, as patterns will most likely emerge here. These patterns can be used to extend a blacklist or to weed out systematic errors in the algorithm.

Data point	Description	Priority	Dev work needed
campaign_ID	Unique identifier of the campaign	MUST	
user	User name	MUST	
session_ID	Session ID	SHOULD NOT	We don't have this.
file_name	Name of the file processed	MUST	
date-time	Date and time of the user interaction (i.e. the user hitting the "save" button ~~or pressing the "next" button without making any changes~~)[2]	MUST	Y
depicts_before	Depicts statement present on the file description page when loading the page (Wikidata Q-number; multiple values are possible) *Are counts enough?*	SHOULD NOT	Approach this on the basis of database dumps (snapshots).
depicts_suggested @source @confidence	Depicts statement suggested by one of the algorithms and displayed when loading the page (Wikidata Q-number;	SHOULD NOT	Y - Very difficult if you want to get accurate values for "viewed" suggestions (we know it was

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[2] This needs clarifying - Currently, the date-time for every major user action (save , accept suggestion, reject suggestion, create campaign, edit campaign) is stored. However, we do not store when a user clicks Next/Previous anywhere as it would quickly become a large list of interactions that just say "User A" -> "clicked next" on "Campaign 1", etc. Without context, this information may mean very little. The main issues are:
1. Users often click forward/back through a bunch of images very quickly looking for a particular one.
2. We have to account for if the user has already seen the image previously and made changes. It would appear like a skip Next even though they already edited the image.
3. A skip on a very complete image means very little. Because ISA currently shows a random order, you end up with more and more skips towards the end of a campaign as users land on already edited images.
Implementation should be postponed until there is a better system running for selecting the order of images in the campaign. Then, a "skip percentage" or similar metric could be clearly defined.

	multiple values are possible). Attributes indicate the source algorithm which suggested the depicts statement as well as the confidence score if available.		loaded, but not seen)
depicts_rejected	Depicts statement explicitly rejected by the user (Wikidata Q-number; multiple values are possible).	SHOULD NOT	
depicts_after	Depicts statements present on the file description page after hitting the "save" button or pressing the "next" button (Wikidata Q-number; multiple values are possible). *Are counts enough?*	SHOULD NOT	

5. Relevance and Effectiveness of the ISA Tool

The following indicators are used to evaluate the relevancy and the effectiveness of the ISA Tool and the different algorithms used in the context of the tool.

It was decided that these statistics are out of scope for the InnoLab Project. This aspect has been included in a WMF Research Grant Request submitted in December 2022 (Grant Application 9542). The Grant Request has been rejected upon an initial review, the reason given was insufficient alignment with the selection criteria.

Indicator	Purpose	Priority	
Overall number of (non-hidden) category assignments on Wikimedia Commons image description pages (month / year)	Evaluate the development of the relative preponderance of depicts statements and category assignments on Wikimedia Commons image description pages		
Number and percentage of Commons image description pages with at least one (non-hidden) category assigned	Evaluate the development of the relative preponderance of depicts statements and category assignments on Wikimedia Commons image description pages		
Overall number of depicts statements on Wikimedia Commons image description pages (month / year)	Evaluate the development of the relative preponderance of depicts statements and category assignments on Wikimedia Commons image description pages		
Number and percentage of Commons image description pages with at least one depicts statement	Evaluate the development of the relative preponderance of depicts statements and category assignments on Wikimedia Commons image description pages		
Number of (non-hidden) category assignments added to Wikimedia Commons image description pages (month / year)	Evaluate the development of the addition of category assignments on Wikimedia Commons		
Number of depicts statements added to Wikimedia Commons image description pages (month / year)	Evaluate the development of the addition of depicts statements on Wikimedia Commons		
Number and percentage of depicts statements added and reverted within 48 hours (month / year)	Evaluate the relevance and correctness of depicts statements added		
Number and percentage of depicts statements added and reverted within 60 days (month / year)	Evaluate the relevance and correctness of depicts statements added		
Number and percentage of depicts statements added through the ordinary user interface, without assistance of a tool; possibly differentiating between	Evaluate the development of the addition of depicts statements on Wikimedia Commons by means of various tools		

tools used to access the service (e.g. mobile phone vs. personal computer) (month / year)			
Number and percentage of depicts statements added through the ordinary user interface and reverted within 48 hours (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added through the ordinary user interface and reverted within 60 days (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by means of the ISA Tool (month / year)	Evaluate the development of the addition of depicts statements on Wikimedia Commons by means of various tools	See: Commons:ISA_Tool	
Number and percentage of depicts statements added by means of the ISA Tool and reverted within 48 hours (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by means of the ISA Tool and reverted within 60 days (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by means of the Depictor Tool (month / year)	Evaluate the development of the addition of depicts statements on Wikimedia Commons by means of various tools	See: Commons:Depictor	
Number and percentage of depicts statements added by means of the Depictor Tool and reverted within 48 hours (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by means of the Depictor Tool and reverted within 60 days (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by means of OpenRefine (month / year)	Evaluate the development of the addition of depicts statements on Wikimedia Commons by means of various tools	See: Commons:OpenRefine	
Number and percentage of depicts statements added by OpenRefine and reverted within 48 hours (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by OpenRefine and reverted within 60 days (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by means of the Computer-aided Tagging Tool (month / year)	Evaluate the development of the addition of depicts statements on Wikimedia Commons by means of various tools	See: Commons:Structured data/Computer-ai	

		ded tagging	
Number and percentage of depicts statements added by means of the Computer-aided Tagging Tool and reverted within 48 hours (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by means of the Computer-aided Tagging Tool and reverted within 60 days (month / year)	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by means of any other known tool	Evaluate the development of the addition of depicts statements on Wikimedia Commons by means of various tools	e.g. MetBot, AC/DC, SDC, Image Annotator	
Number and percentage of depicts statements added by means of any other known tool and reverted within 48 hours	Evaluate the relevance and correctness of depicts statements added by means of various tools		
Number and percentage of depicts statements added by means of any other known tool and reverted within 60 days	Evaluate the relevance and correctness of depicts statements added by means of various tools		