

University of Groningen

## Visual Storytelling for Earth Sciences

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# Visual Storytelling for Earth Sciences

Maarten van Meersbergen, Lorenzo Amabili, Tom Klaver, Jiří Kosinka

Visual Analysis is often a very useful tool in data exploration, especially if the data exceeds the human capacity for understanding through manual inspection. This is often the case in the Earth Sciences, as the number of grid points, the total amount of vectors, or the multi-band nature of this data can be quite overwhelming. What is however often forgotten or neglected is that the process of analysis by visual inspection is a tool of scientific discovery in its own right, meaning that the actions of the human interfacing with the visualization are therefore not recorded.

With the system we are developing, we aim to allow any web-based visualization to store the successive human interactions in an accessible and browse-able format, so that these actions can be explored in and of themselves, reversed where deemed necessary, and to serve as input for a visual storytelling experience. This promotes collaboration, education, and also reproducibility of results.

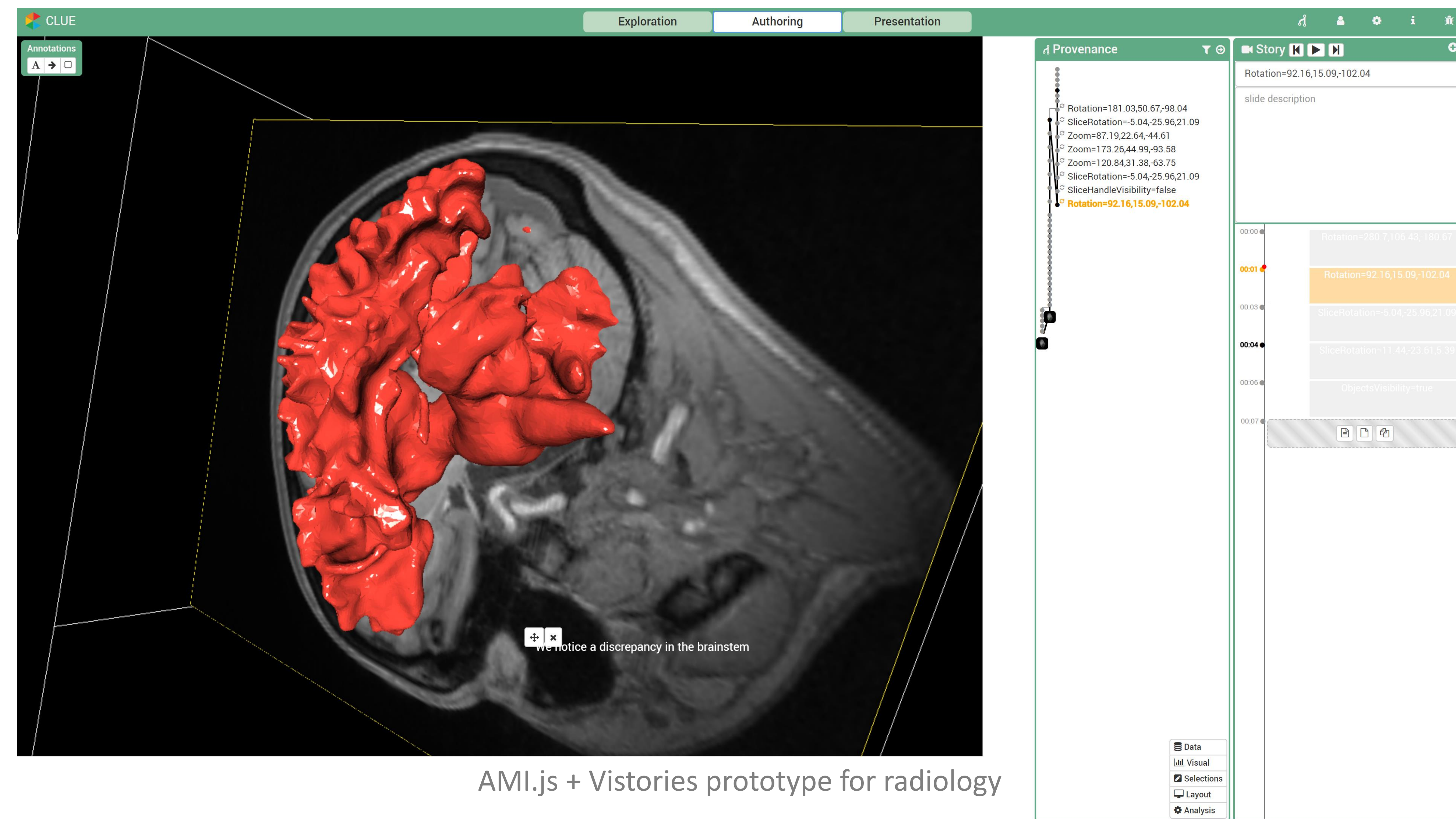
Furthermore, the recording of human actions in exploration of data can aid in the analysis of the interaction itself, identify repetitive actions and / or enhance the user experience.

## A medical prototype

In true eScience fashion, this tool crosses several scientific domains. An initial prototype of the system was developed in the sciencecenter project *Visual Storytelling for Big Imaging data*. Built with open source libraries AMI.js and Vistories, it is meant as a tool for radiologists to record their exploration actions and measurements of scans.

After the exploration phase, the automatically built provenance tree can be used to create a presentation based on key points selected by the user. Annotations can be added to further point out relevant features.

We envision that radiologists will use this tool to improve the communication between the radiology lab and the doctors reading their reports, building further trust between these parties that currently communicate only through written reports.



AMI.js + Vistories prototype for radiology



Cesium HydroSHEDS

eWaterCycle II + Vistories (future work)

## Use in eWaterCycle II

The eWaterCycle II project focuses on creating a collaborative environment for Hydrological modelling and experimentation. Visual exploration of model output is an important part of the envisioned workflow.

In addition, the experiment building itself will be done with JupyterLab, for which we are developing a widget to track provenance during the experimentation phase.

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- Selection Change = CatchmentID 51491
- Selection Change = CatchmentID 51438
- View Center = 52.31°N 13.23°E
- Selection Change = CatchmentID 56347



## Vistories

**From Visual Exploration to Storytelling and Back Again**  
Samuel Gratzl, Alexander Lex, Nils Gehlenborg, Nicola Cosgrove, Marc Streit  
Computer Graphics Forum (EuroVis '16), vol. 35, no. 3, pp. 491-500, 2016.



## AMI.js

**Medical imaging in the browser with the A\* Medical Imaging (AMI) toolkit.**  
Nicolas Rannou, Jorge Luis Bernal-Rusiel, Daniel Haehn, Patricia Ellen Grant, Rudolph Pienaar  
ESMRMB Annual Scientific Meeting 2017



## HydroSHEDS

**New global hydrography derived from spaceborne elevation data.**  
Lehner, B., Verdin, K., Jarvis, A.  
2008 Eos, Transactions, AGU, 89(10): 93-94.



## CESIUM

CesiumJS is a JavaScript library for creating 3D globes and 2D maps in a web browser without a plugin. It uses WebGL for hardware-accelerated graphics, and is cross-platform, cross-browser, and tuned for dynamic-data visualization.

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