January 06, 2016

METHOD OF IMPROVING ACCURACY FOR OBJECT DETECTION IN AN ANNOTATION SYSTEM

Rahul Garg

Navneet Dalal

Ankit Mohan

Thor Carpenter

METHOD OF IMPROVING ACCURACY FOR OBJECT DETECTION IN AN ANNOTATION SYSTEM

ABSTRACT

A method for improving accuracy of object detection or recognition in an annotation system while minimizing human effort is disclosed. This system runs an already trained detector on unannotated data for detecting objects from data such as image or video. Decisions are availed from human annotation only as the detected object is correct or incorrect. Images confirmed as not containing the object are then fed as 'negative' data. Images confirmed as containing the object can be further annotated for the exact bounding box, and then fed as 'positive' data to the machine learning algorithm. The process of presenting data to the algorithm can be iterated until the detector accuracy saturates. The advantages of using the method include improved object detection accuracy with minimal human effort.

BACKGROUND

It is a challenging task for an annotation system to find and identify an object in an image or video sequence. Machine learning algorithms are typically used for object recognition or detection. These algorithms learn from human annotated data, as humans are able to recognize a multitude of objects in images with little effort and high accuracy. This method requires a lot of manual effort for annotating large sets of data for training machine learning algorithms. There is therefore a need for an efficient approach for optimizing human interference in annotating image data, and to use those annotated images to improve object detection. This disclosure provides an annotation framework that allows humans to efficiently annotate such data and thus improve the detection accuracy with minimal human effort.

DESCRIPTION

Disclosed here is a method for improving accuracy of object detection or recognition in an annotation system. This system will run an already trained detector on unannotated data for detecting objects from data such as image or video data. Decisions will be availed from human annotation only as the detected object is correct or incorrect as shown in FIG. 1.

FIG. 1 Screenshot of object detection in the annotation system

The method for detecting an object in the annotation system involves:

- Uploading unannotated data in a system
- Executing an already trained detector on the unannotated data to avail object detection
- Uploading the detected unannotated data to a computing system for human annotation to obtain annotated data

- Feeding annotated detected data to a machine learning algorithm for improving detection accuracy
- Feeding undetected data to the system and iterating the above steps until the detector accuracy saturates

In one instance, the system will run the already trained detector on unannotated data to avail detections and crop the detected objects. In some cases, margins may be added before cropping the detections for including more contexts, which will be easier for human annotation.

In one example, a computing platform can be used for managing human worker accounts, and for serving questionnaires to the human workers. In operation, batches of detected data are uploaded to a system, which can be served one by one to the human workers as shown in FIG. 1. Then, the human workers efficiently do the annotation process as a binary task, for example, selecting only the correct or incorrect classification from the detected data. In some instances, to eliminate human errors, the system can be configured to allow the detected data to be annotated by multiple workers and the classification finalized on the basis of majority vote.

In one implementation, annotations may be done in large batches by displaying a grid of detected data and the human worker can manually annotate by selecting the correct or incorrect classification cases. When the classifications are fairly accurate, it is more efficient to have the human only select the incorrect classifications. In this manner, a human annotator can process large amounts of data with a glance.

Further, annotated detected data may be uploaded to a machine learning algorithm for improving detection accuracy. The method may further involve a step where undetected objects in the data are confirmed by the human workers and annotated as such. Then, the data is fed into

the machine learning algorithm for improving detection accuracy. Images confirmed as not containing the object are then fed as ‘negative’ data to the machine learning algorithm. Images confirmed as containing the object can be further annotated for the exact bounding box, and then fed as ‘positive’ data to the machine learning algorithm to improve detection accuracy. The process of presenting data to the algorithm can be iterated until the detector accuracy saturates. he data may be image or video data.

The application for improving accuracy of object detection or recognition and the system using the method illustrated can be implemented in any image processing, video processing, computer vision, image recognition, pattern recognition or other classification/annotation applications.

The advantages of using the method include improved object detection accuracy with minimal human effort. Further, this method can be easily integrated or leveraged into existing software applications, such as hand gesture detection in a mobile computing system.

Human face recognition is not contemplated by this invention. Nonetheless, in situations in which the systems and methods described herein may perform face recognition, such face recognition is conducted only with the explicit authorization and consent from all relevant users. In situations in which the systems and methods discussed herein may collect or use personal information about users (including biometric information, face recognition information, user profile information, information about the users’ social networks, demographic information, social network actions taken, preferences, content created or submitted, or location information), the users are provided with an opportunity to explicitly authorize and consent to such collection

or use. In addition, certain data are treated in one or more ways before storage and use so that personally identifiable information is removed.