

Portable Platform for Image/Video Annotation

Students: Sujie Zhu, Max Pfeiffer, Yuanxin Wang

Volvo Mentor: Sohini Roy Chowdhury Faculty Mentor: Jenq-Neng Hwang

Requirements

- Develop a web application that allows Volvo to contract image annotation for training machine learning models
- The application must replicate annotation functionality from an existing MatLab prototype
- Software must have fluid and usable image editing and annotation graphical user interface (GUI)
- Users must be able to...
 - Create and label bounding boxes around objects of interest
 - Draw and label lanes and road edges
 - Segment drivable surfaces

Overview

Artificial intelligence and machine learning systems are at the forefront of modern technology. In order to successfully deploy an artificially intelligent computer system, the machine must learn. Much in the same way humans learn, machines require training by way of demonstration and constrained operation. Convolutional neural nets allow machines to process massive amounts of data and develop a basis for decision making when presented with novel data.

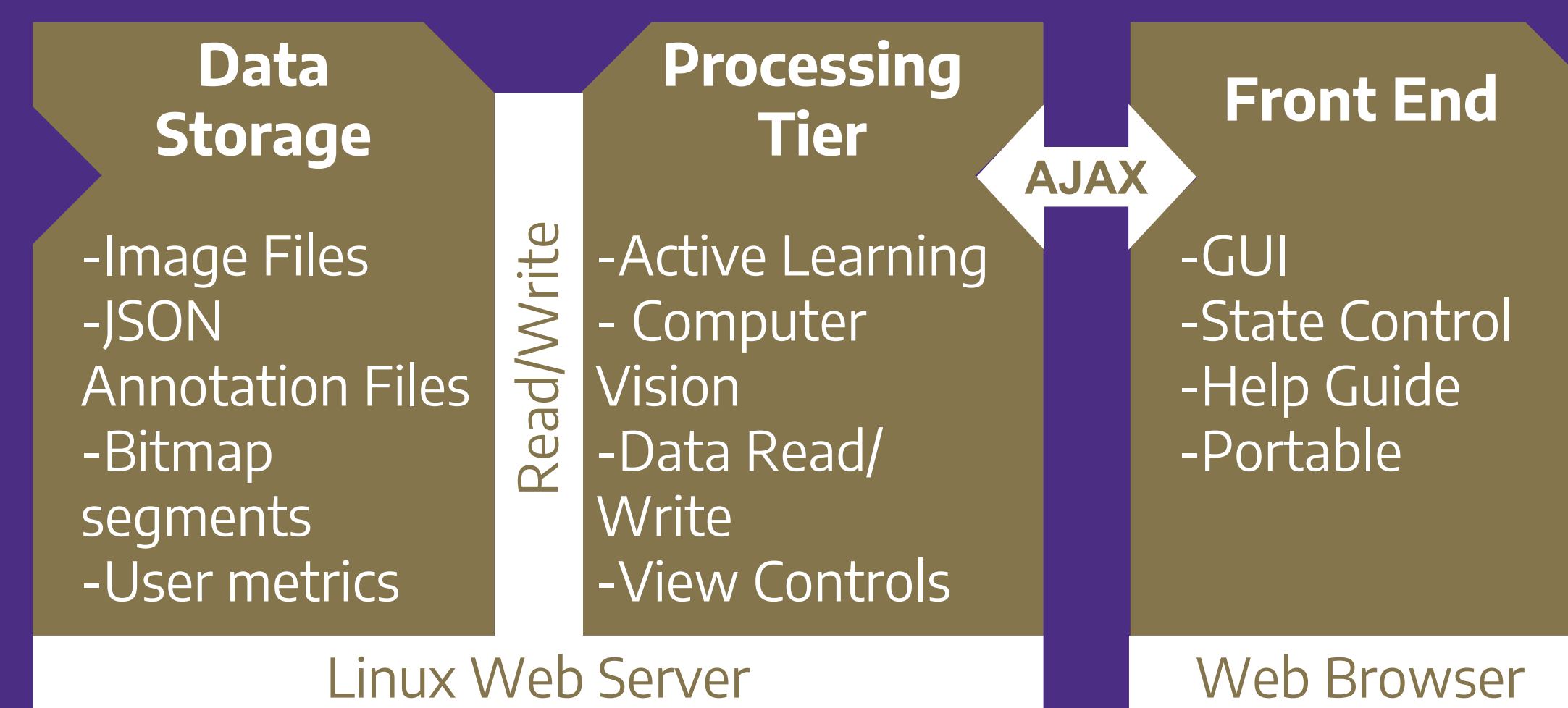
In order to teach these models, engineers need software tools to create training data. In our case, the data feeding the machine learning model is generated by annotating lanes, objects and drivable surfaces in pictures and video taken from autonomous vehicle camera systems.

System Specification

After identifying the system requirements, we researched web application frameworks. Our new understanding of web servers, computer vision and machine learning software, led us to define our **Full-Stack Implementation** architecture which deploys the following frameworks:

- **OpenCV:** Computer-vision for image processing
- **TensorFlow:** Machine learning for active-learning component
- **Flask:** Python web-server environment
- **AJAX:** Asynchronous XML front and back end communication
- **JavaScript:** Front-end processing for state control and user input handling
- **Canvas:** Front-end image and drawing display framework for annotations and image display
- **Bootstrap:** De-facto markup for styling and web page layout

Full-Stack Implementation



This structure allows for centralized management and ubiquitous use.

Annotator Screenshots

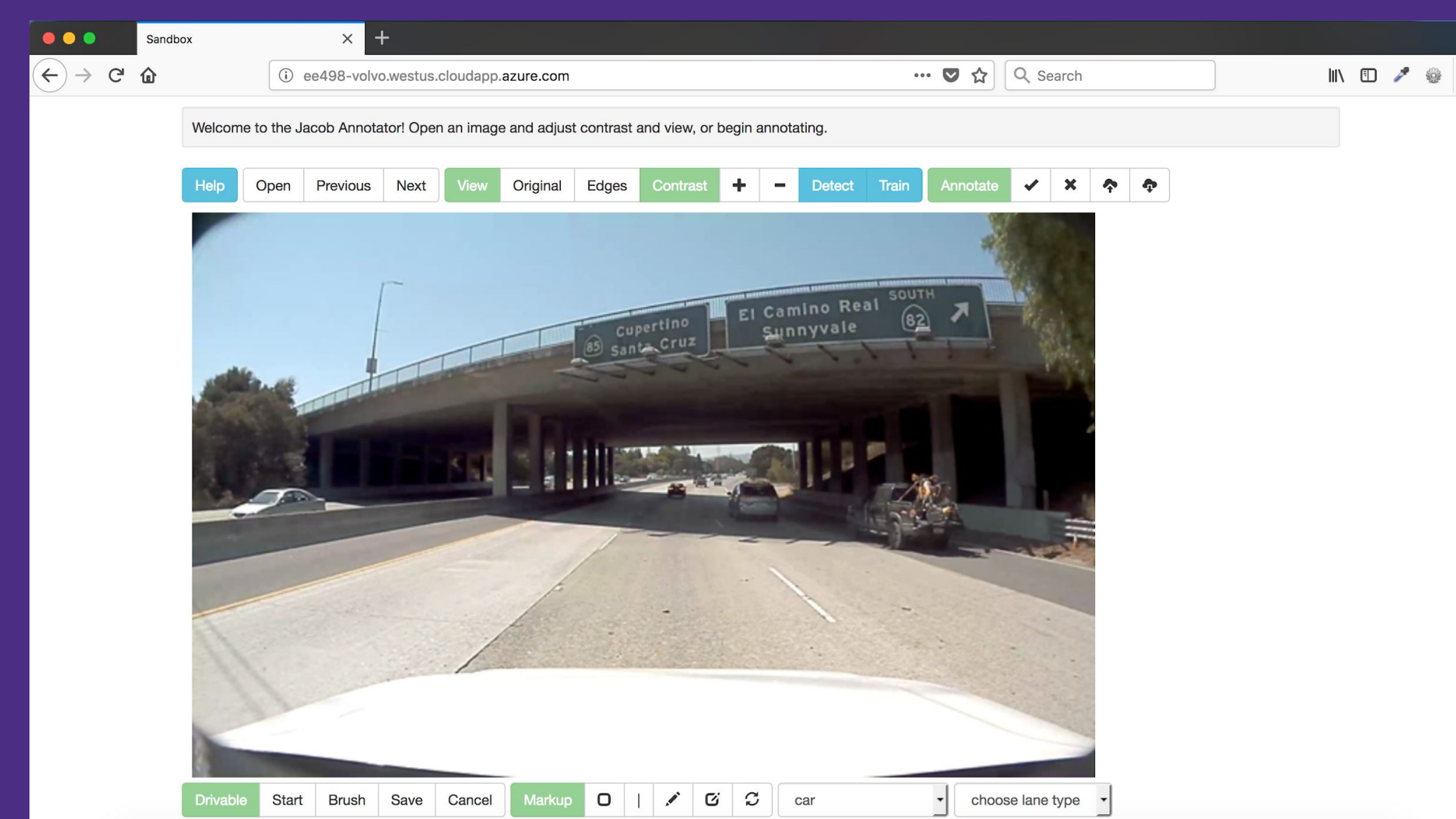
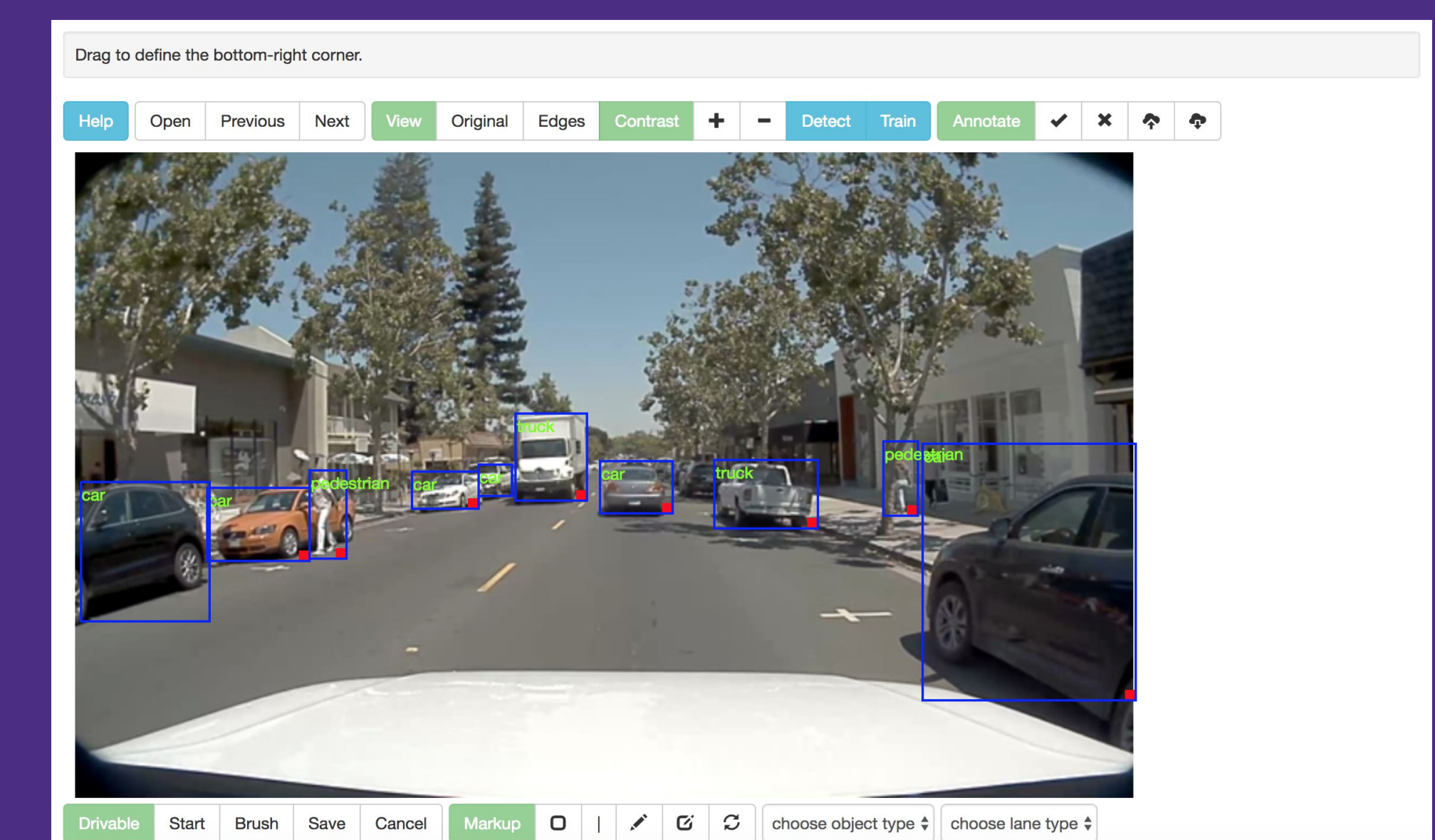
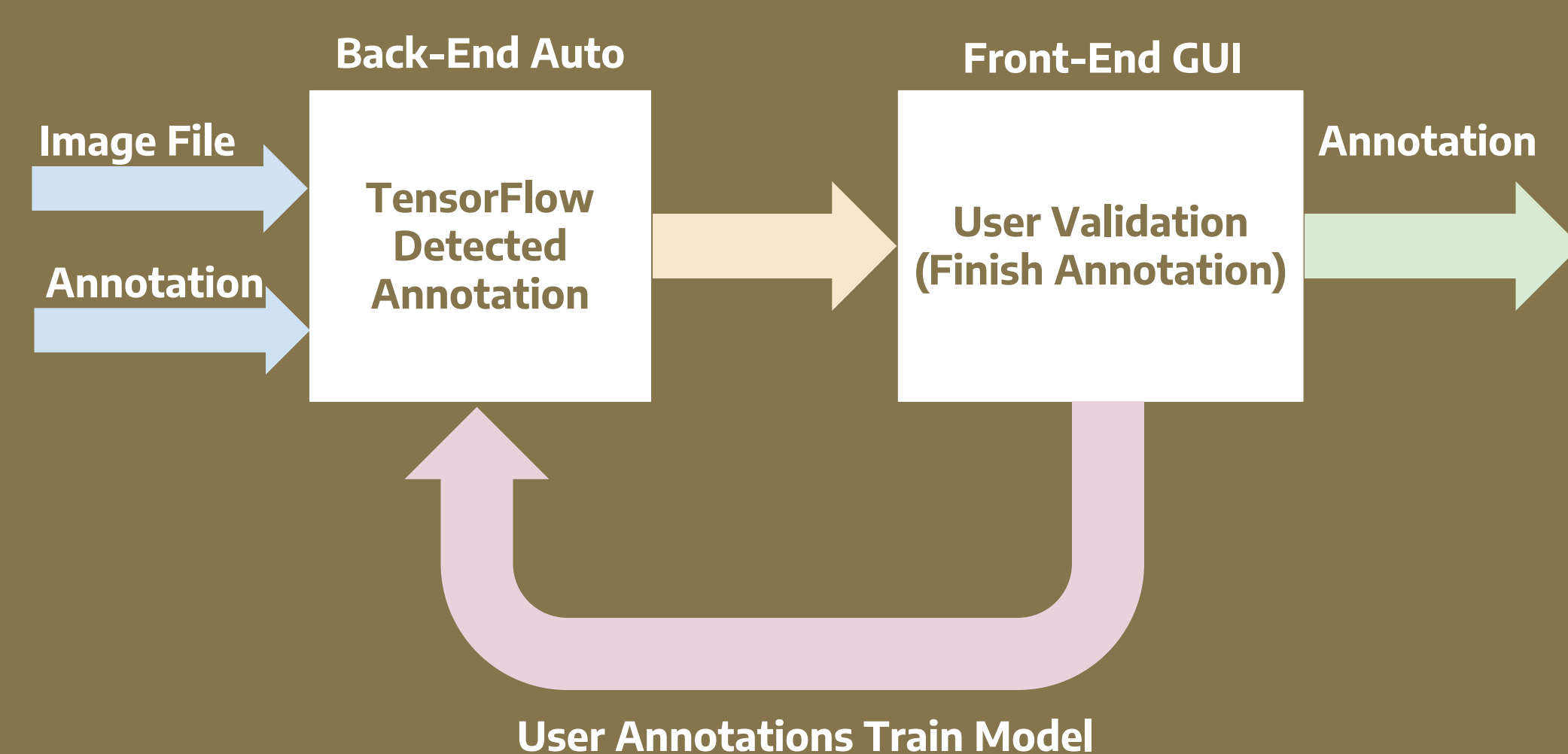


Image Loaded into Annotator, Ready for Annotation

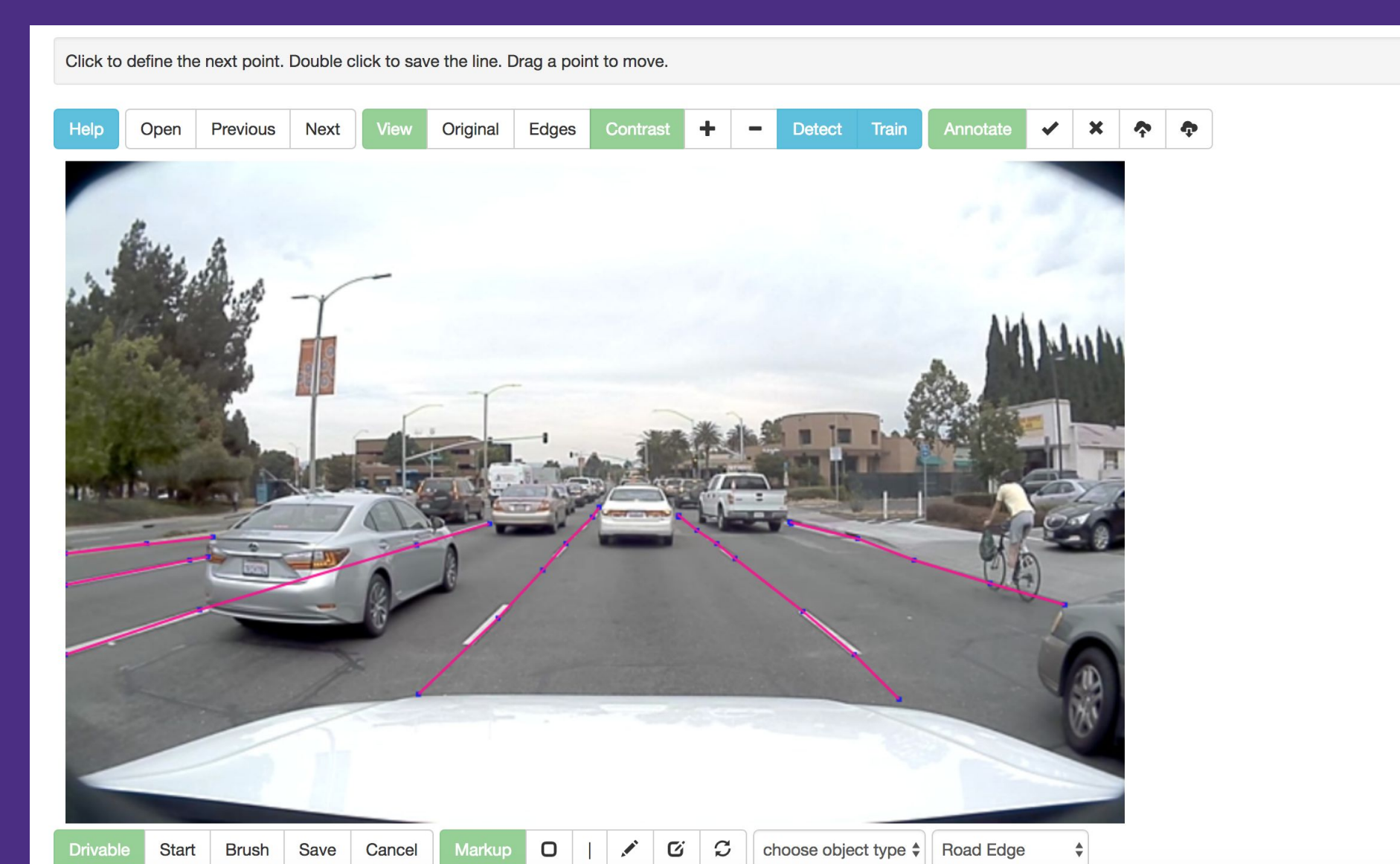


Completed Object Annotation

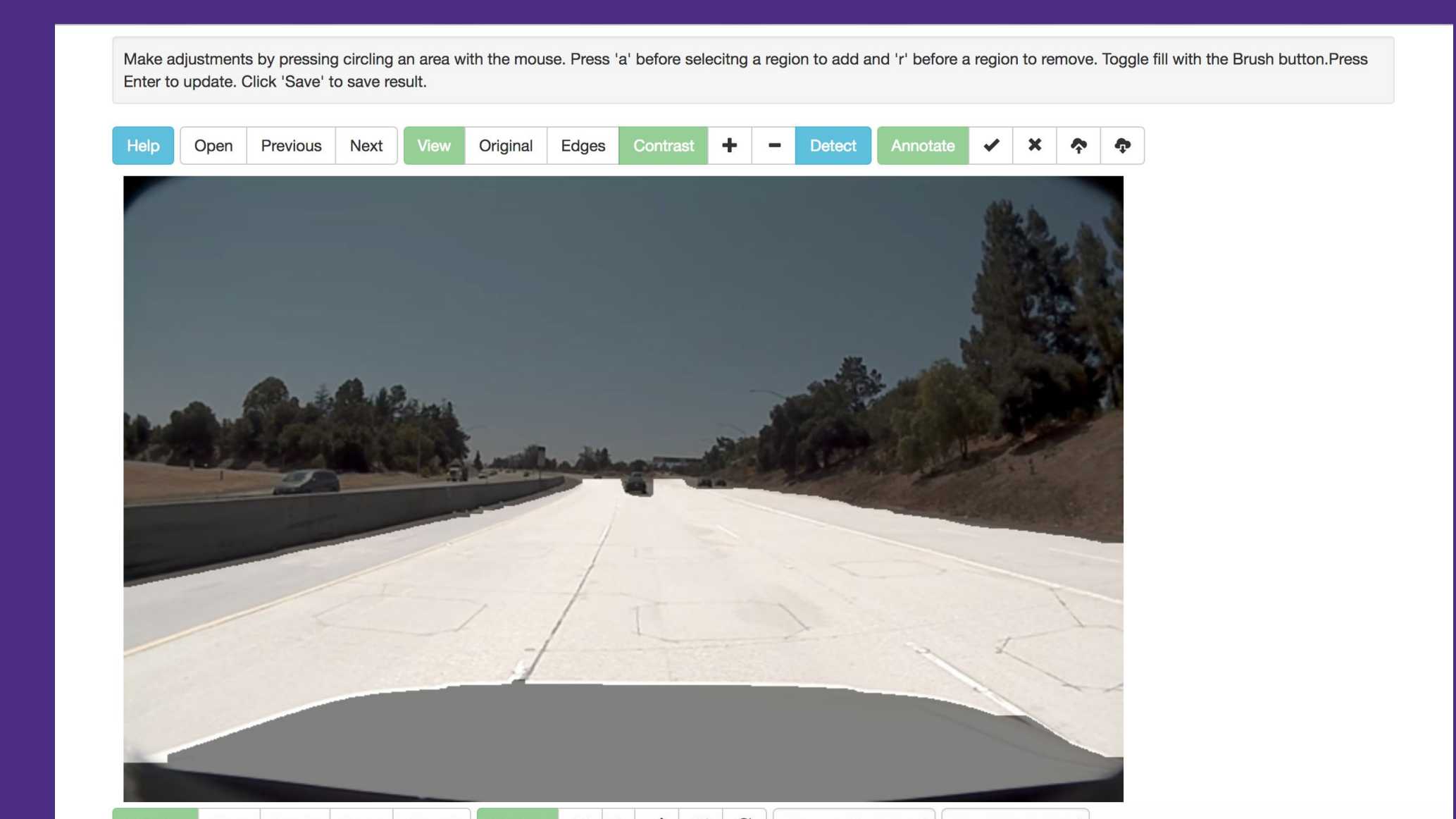
Active Learning



Active learning re-trains auto-detection for improved functionality over time.



Completed Lane Line Annotation



Completed Drivable Surface Segmentation