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1 DESCRIPTION

This Work consists of furnishing a road condition analysis system to be used to collect data from crowdsourced imagery and analyze that data automatically using machine vision and artificial intelligence to understand the status and condition of the thoroughfare.

1.1 Submittals

The Contractor shall submit a plan for the road condition analysis system to the Project Manager at least two (2) weeks prior to its implementation. The plan shall include all associated information regarding the number of images collected, frequency of collection, and the data sets that will be implemented. In addition, the plan shall include the personnel that will be monitoring the information and how this information will be processed and delivered to the Project Manager.

2 MATERIALS

2.1 Description

The road condition analysis system (system) shall be a cloud hosted data aggregation and monitoring system. The system shall be commercially available and streamline the collection, processing, management and dissemination of roadway images used to generate roadway insights. The system shall collect imagery of roadways from dashboard cameras and/or a mobile application or similar sources and store this data in an online database.

2.2 Data Collection and Storage

The system shall be capable of collecting video and imagery from dashboard cameras and/or a mobile application in real-time intervals. The collection shall be done by tracking all recorded intervals and retrieving those intervals whenever communication through cellular data or WiFi is available. The system shall provide sufficient coverage of data collection throughout specified deployment. The system shall provide an alternative to crowd sourced dashboard cameras either in the form of a mobile application or by equipping agency vehicles with dashboard cameras to supplement coverage, which shall be owned by the cloud vendor. The system shall store all image data, classification data, and resulting

map layers within cloud services, none should be stored on premises. The imagery shall be deidentified.

2.2.1 Image Validation

The system shall validate that image data is not corrupted and thus meets criteria to remove glare, low visibility, or other abnormalities. Poor quality images will be filtered out of the deployed system, or have the option to flag for review during review. The system shall support dashboard camera video or single image uploads for specific frame analysis. The system shall sample video into its composite frames.

2.2.2 Semantic Image Segmentation

The system shall utilize a semantic image segmentation model to label specific regions of an image according to what is being shown. More specifically, the image segmentation model shall label each pixel of an image with a corresponding class of what is being represented. These classifications represent differing road assets.

2.2.3 Image Segmentation Mask Generation

The system shall take frames from the segmentation model and generate image segmentation masks according to the data metric/road asset desired. The system shall only use these generated masked images for prediction.

2.2.4 Classification and Object Detection Model

The system shall be capable of uploading, preprocessing, and classifying images through supervised learning models to identify sets of categories within an observation. The system shall categorize segmented roadway images to predict the class of the desired output. The system shall identify roadway segment pavement quality as well as pavement marking visibility. The system shall also be capable of image object detection and localization.

2.3 User Interface Management

The system shall provide an online interface accessible for any user with an internet browser. The interface shall have a user-management system that allows for multiple users. Each user shall have personalized login information and specialized permissions.

2.4 Data Integration and API

The system shall be compatible to generate map layers to be ingested by open Geographic Information Systems (GIS). The system shall have an endpoint

server that is an open-geospatial (OGC) compliant Web Map Service (WMS) and Web Feature Service (WFS) server, secured by OAuth2.

3 CONSTRUCTION REQUIREMENTS

The system shall verify dashboard camera data coverage within specified deployment areas or provide alternative options to supplement data coverage including mobile application or options to equip agency fleet vehicles with dashboard cameras/mobile application.

All Materials and devices shall be maintained and replaced if necessary for the duration of the Project in conformance with these Specifications.