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Business Domain
Parking services

Project Type
Machine Learning Services

Model Development for Automatic Parking Sign Recognition – 90% Accuracy Including Recognizing Unstandardized Signs

Client

The Client delivers innovative products for the automotive and transportation industries, such as real-time parking and traffic information and solutions that facilitate autonomous vehicles' safety testing and deployment. They also provide new insights to various other industries to make better business decisions by understanding how people move throughout the day.

Project

Building an ML pipeline for parking sign recognition to detect a sign's location and recognize the restrictions and time bounds for parking with no less than 90% accuracy, including recognizing unstandardized parking signs with texts.

The algorithms should recognize and classify the input images from mobile mapping platforms installed on the cars.

Wrapping ML model into a stand-alone web service and its integration with a customer analytics platform.

Objective

Developing of a web service to automate the collection and entry of parking data.

Team Reinforcement

The Client does not have Data Science experts but wanted to test how machine learning could improve and speed up data processing workflows to provide actual data updates for the biggest clients. Intetics software engineers offer the required expertise.

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Challenge

The project had several challenges: data analysis from several on-street images providers, development of an image download and pre-processing workflow, building a solution for parking sign detection and classification, extraction of text information about on-street parking from cropped images, integration of the end solution into Clients' cloud infrastructure.

The Client approached Intetics with a need for accurate detection of parking locations, restrictions and time limits. The detection was based on roadside imagery covering the area of a city. No less than 90% of the signs had to be identified correctly. Parking signs are not standardized. This makes the recognition more complicated because the process is based not on the sign in general but on the actual text on the sign. To solve this issue, object detection supported by image classification was used.

Due to the method of roadside data collection, some signs were present on several photos. That required the additional task of grouping data for one parking sign and determining the exact location. The algorithm also had to deal with poor image quality, different types of weather, light conditions, time of the day, seasons, fog, and other distortions.

Quick Facts

- Semi-automatic data labelling
- Recognition of unstandardized parking signs with texts
- 90%+ accuracy of recognition

Technologies

Python / Flask / Tensorflow / Keras / OpenCV / Scikit-learn / Tesseract / AWS

Solution

★ 01

To identify a specific parking sign, several steps were involved: identification of an image with a sign on it, detection of the parking sign on the image, and recognition of the text within the OCR component using basic NLP. Machine learning based on the TensorFlow framework and Keras library.

★ 02

The project started with the analysis of data and sources and resulted in an estimate for the data processing phase.

★ 03

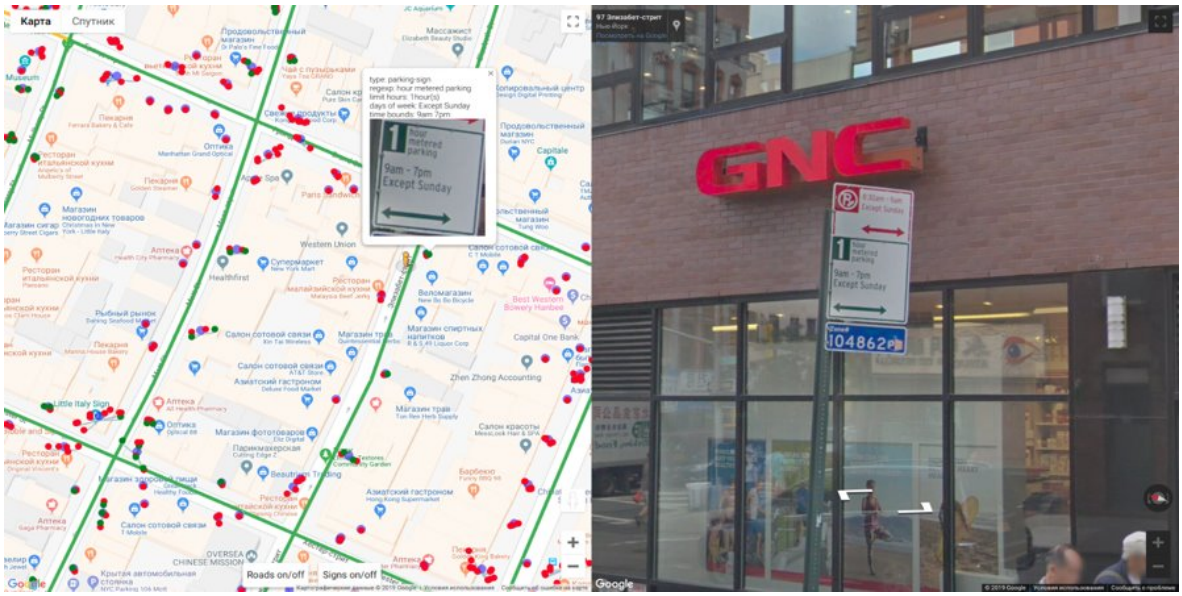
The next stage included data labeling and data transformation. Semi-supervised active learning techniques were used and saved up to 70% of the time spent on manual data labeling. To eliminate errors associated with various distortions, all types were identically distributed over labelled datasets: training, development, and testing. A script for automatic data transformation was also developed during this stage to reduce the data to a single format (color, rotation, tilt, etc.)

★ 04

The next stage covered iterative development and initial training of the Machine Learning model. Here it was possible to give a precise prediction of the accuracy that could be achieved with sign recognition and time for training the model.

★ 05

Within the postprocessing stage, sign location clarification and the same sign association problems were solved.



Client Reference

“Due to the predictable development approach, Intetics provided a detailed analysis and estimates for every step of the project and ensured all expectations would be met.

Client's representative

Benefits and Results

- The algorithm was successful in identifying 85%+ of signs on the streets in the city. 90%+ of the signs were identified correctly.
- All the ML and data processing algorithms were implemented in a single web application and supported with a detailed description of the model and project documentation.
- The Client received a solution that automated parking sign detection and reduced the workload significantly.

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Techstack:

Python / Tensorflow / Keras / OpenCV / Scikit-learn / Tesseract / AWS

Team: 6

Project Manager,
Data Analysts,
Data Scientists,
Python developer