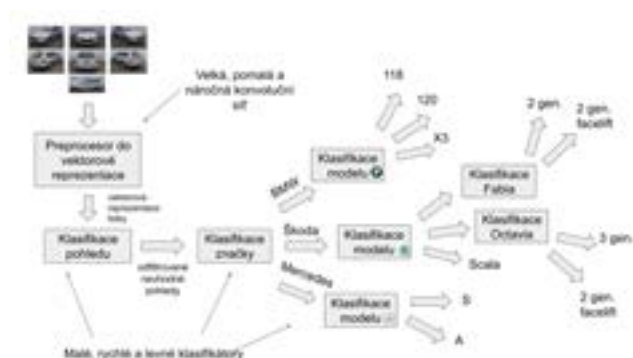# Carvago / Image Recognition

Overview

Carvago aims to simplify purchases and transfers of used cars. To do this, Carvago researches used car listings in a number of European countries.

The discovered advertisements are downloaded and collected on Carvago's website and presented to potential buyers.

Keywords

**image processing
effective classifier**

Situation

Carvago typically discovers tens of thousands of new listings every day. To present a full listing, Carvago also collects photographs associated with the advertisements and displayed to the customer. Unfortunately, the photos are presented in arbitrary order, are of inferior quality or are completely unrelated to the offered car. Apart from the presentation to customers, the photographs havenot been used and analysed.

Requirements

Explore computation-effective options to analyse obtained car photographs in order to: present photographs to the user in clear and predictable order, validate existing and extract additional information from the pictures.

Solution

In order to deliver computationally viable and maintainable solution, we have created a number of image classifiers - each focusing on specific area:

part of car shown (side-front exterior view, other exterior view, interiors, unrelated, etc.),

car showcase photo selection,

make/model/model generation hierarchy of classifiers,

manual/automatic gearbox and selected equipment detector.

All this information greatly improves car presentation with pretty showcase pictures, predictable photo sequencing, make/model verification and previously unavailable information about model generation. The extracted information about the car equipment is used to improve accuracy of the car's pricing. In order to make the computation viable, we have decided on a two-stage approach. The first stage converts the photograph into a vector of numbers (embedding) representing the picture. The second phase is to build a number of small classifiers processing the vector representation. The advantage of this approach is that the first phase, which is the expensive part, is performed only once and all subsequent tasks are performed on top of the vector representation. The vector representation task is built on top of ResNet architecture with multiple classification tasks driving the training stage.

Benefits and Results

The benefit for the end customer is better presentation of the advertisements, and better andmore accurate pricing.

In addition, Carvago can extract additional, in some cases previously unavailable, information about individual cars.

The two stage approach ensures that individual classifiers will be very fast and easy to update as long as the first stage, vector representation, remains unchanged. Also changes in one classifier have no impact on any other classifier.