Car Damage Detective

Assessing Car Damage with Convolutional Neural Networks

Ting Neo

Metis NYCDS9
Dec 13, 2016

Car accidents are stressful and the auto claims process is ripe for disruption

Car accidents are stressful and the auto claims process is ripe for disruption

Objective: Use computer vision to accurately classify vehicle damage and facilitate claims triage

Can computer vision “see” car damage?

Convolutional Neural Networks (CNNs)

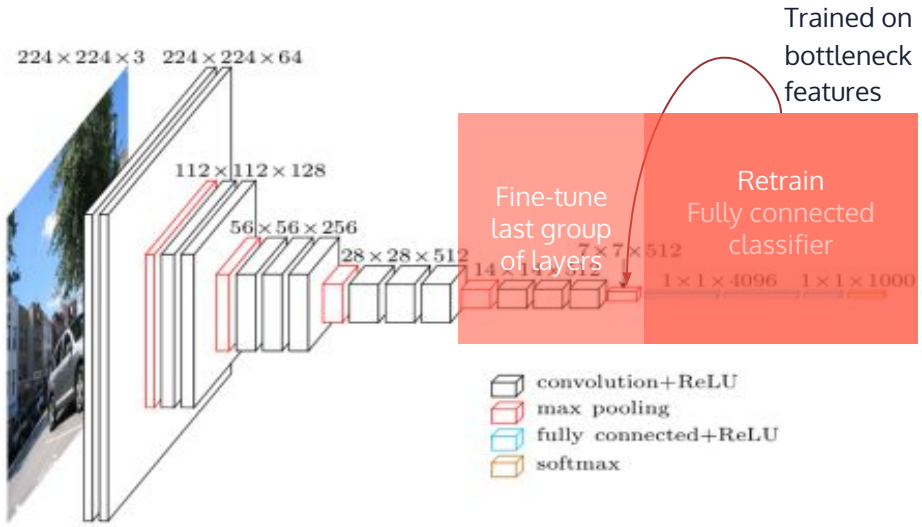
- VGG16 trained on Imagenet (14M images, 1000 classes)

Transfer learning

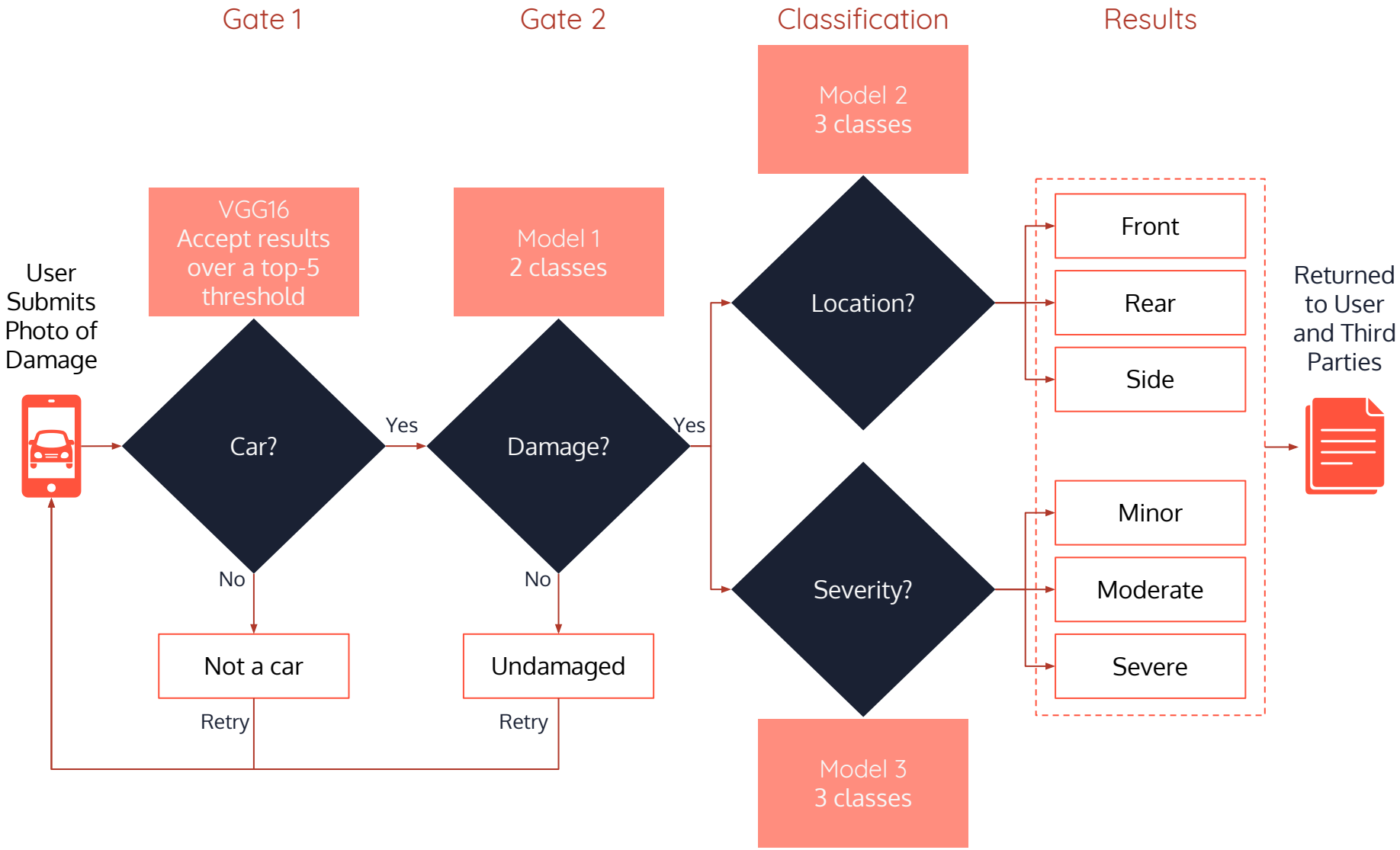
+ Train a fully-connected classifier on top of a pre-trained CNN
  - Allows training a CNN with as little as ~300 images per class

+ Fine-tuning
  - Tweaking the last convolutional block and retraining fully connected classifier with a very slow learning rate

VGG16 architecture



Developing a pipeline



Tools and frameworks used

Python
Programming
Language

Data Collection

Selenium
Webscraper

Google Images
Data Source

Stanford Car
Image Dataset
Data Source

1,150
Undamaged cars

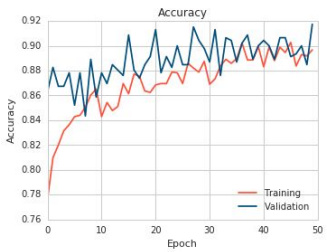
1,150
Damaged cars

Model Development

Amazon EC2
GPU Instance

Keras
Deep Learning
Library

Theano
Deep Learning
Library

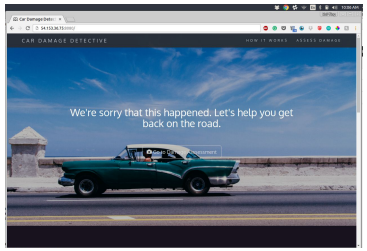


Web Development

Amazon EC2
GPU Instance

Flask
Python Web
Framework

Bootstrap
HTML, CSS,
Javascript
Framework



Evaluating pipeline components

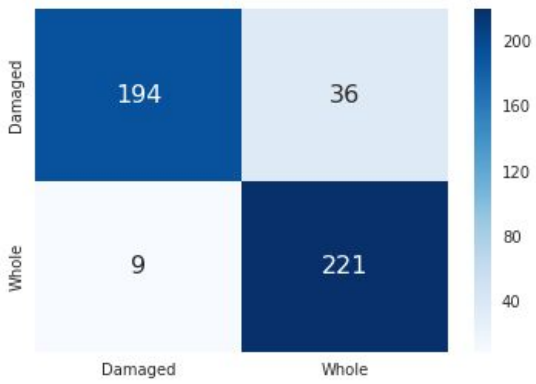
Model 1:

Damaged or whole?

92% accuracy

91% precision

90% recall



Diagnosis:

More damaged cars identified as whole

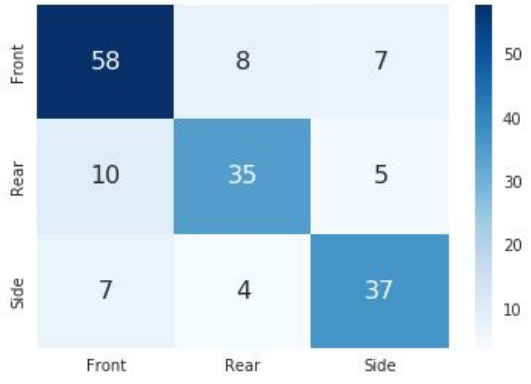
Model 2:

Damage location

79% accuracy

76% precision

76% recall



Diagnosis:

Ambiguous closeups of front/rear damage

Model 3:

Damage severity

71% accuracy

71% precision

69% recall

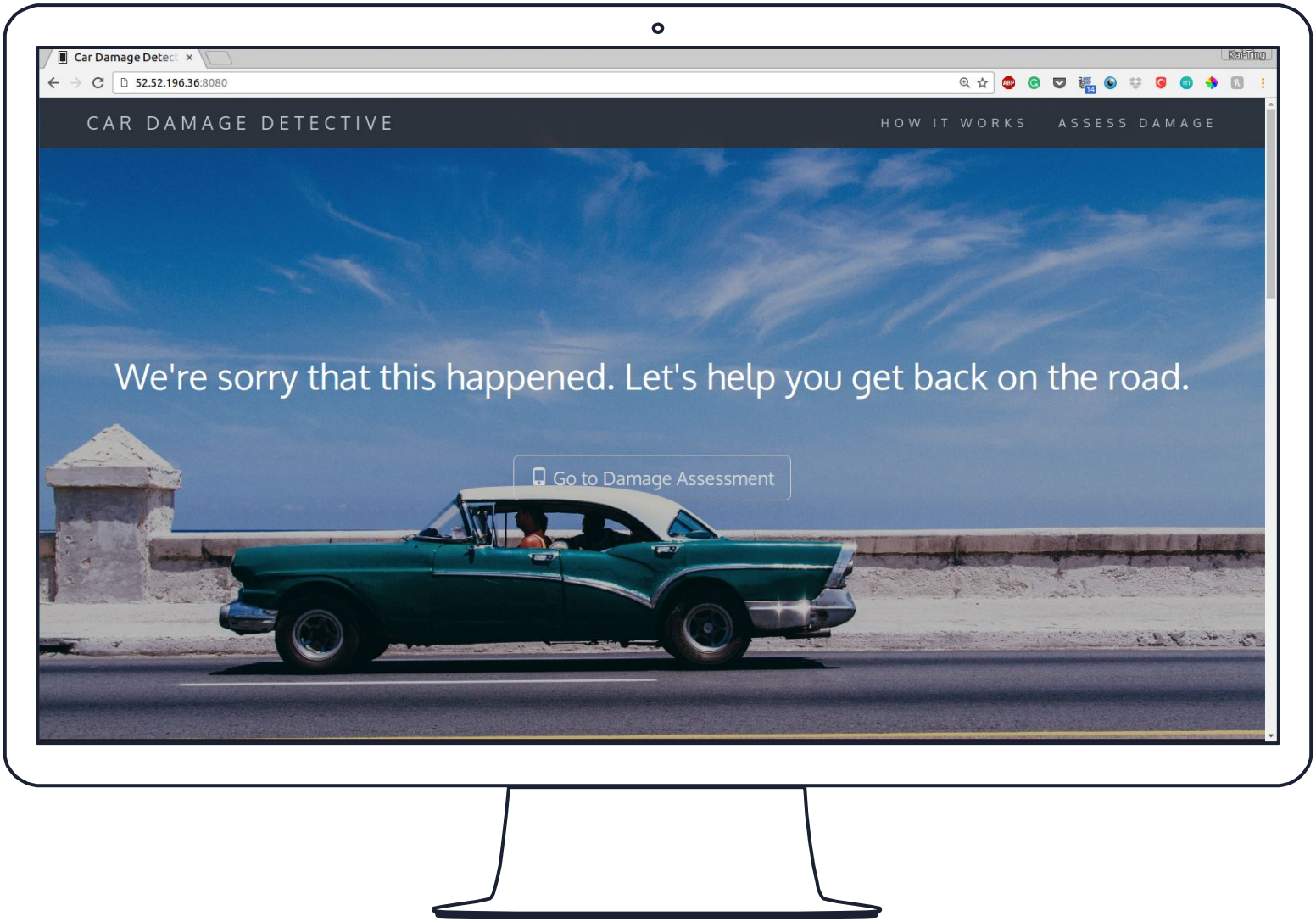
Diagnosis:

Subjective labeling criteria

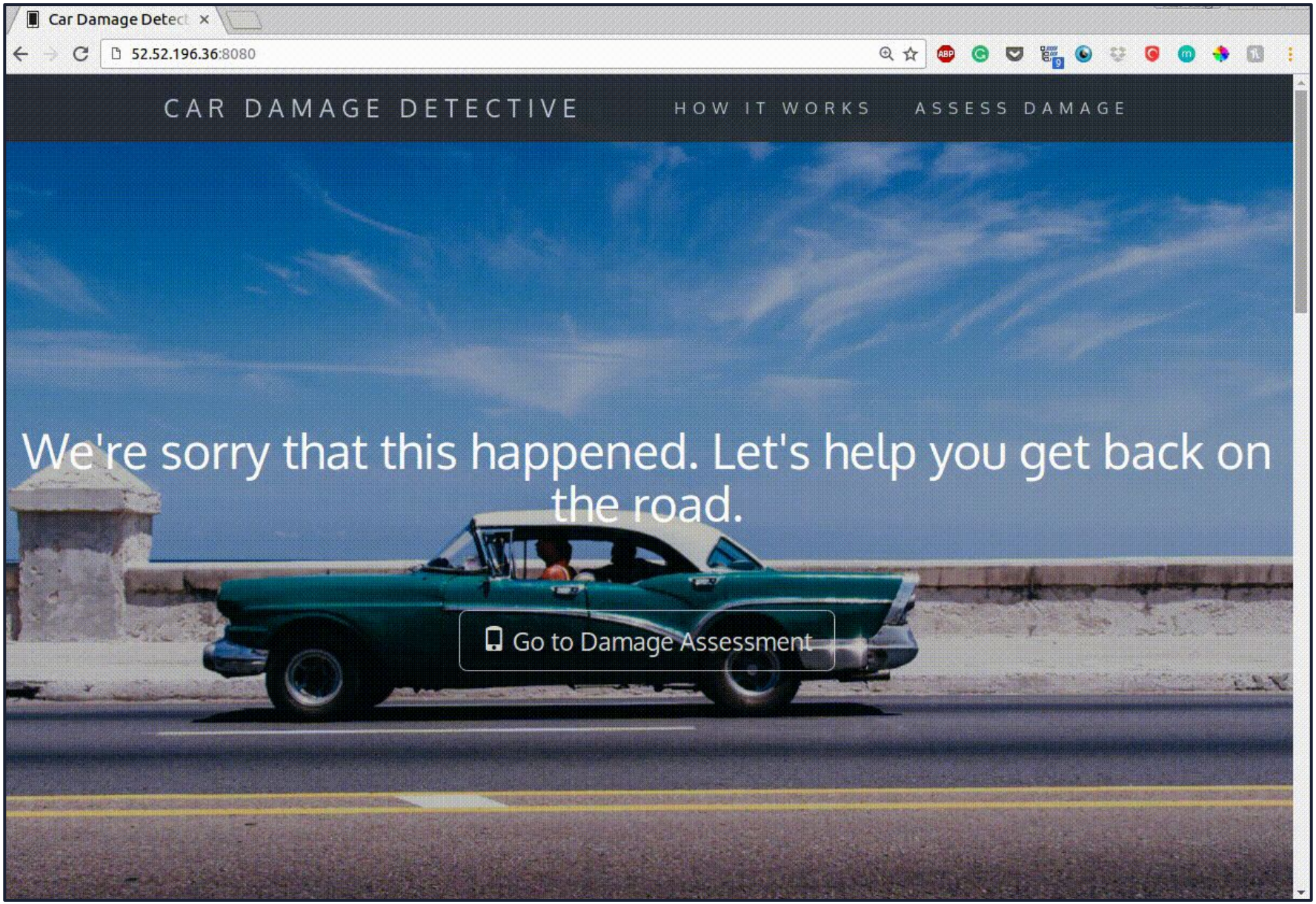
Choice of precision-recall threshold depends on perspective!

Car Damage Detective: Live!

http://bit.do/car-damage-detective



http://bit.do/car-damage-detective



Conclusions and future work

- Convolutional neural networks are accurate at evaluating car damage - even trained on only 1,150 damaged car images

- With a higher quality dataset (including make and model, location information, repair cost, etc.), we could go one step further and predict the cost of damage based on the image

Thank you!

Assessing Car Damage with Convolutional Neural Networks

Ting Neo

http://bit.do/car-damage-detective
neo.kaiting@gmail.com
github.com/neokt
linkedin.com/in/kai-ting-neo