Car Damage Assessment

Application of Computer Vision and Deep Learning to Assess Damaged Cars

Problem Statement

Use of computer vision to accurately classify vehicle damage and facilitate claim settlement.

- Automobile industry is growing and car accidents are increasing everyday.
- 350 fraudulent insurance claims in the UK every day, worth over £1.3 billion a year.
- 1% improvement in loss ratio for a £1 billion insurer, with better use of data, is worth £10 million.

- With advancement in technology, insurance firms are looking for faster damage assessment and settlement of claims.

- Increasing cost of man-power has led the industry to rely heavily on artificial intelligence and machine learning.

- Millions of photos of damaged vehicles from phone cameras, drones, and satellites databases.

- Develop algorithms and train computers to recognize vehicle damage across all makes and models .

ASSESSING CAR DAMAGE:

- Convolutional Neural Networks (CNNs):

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

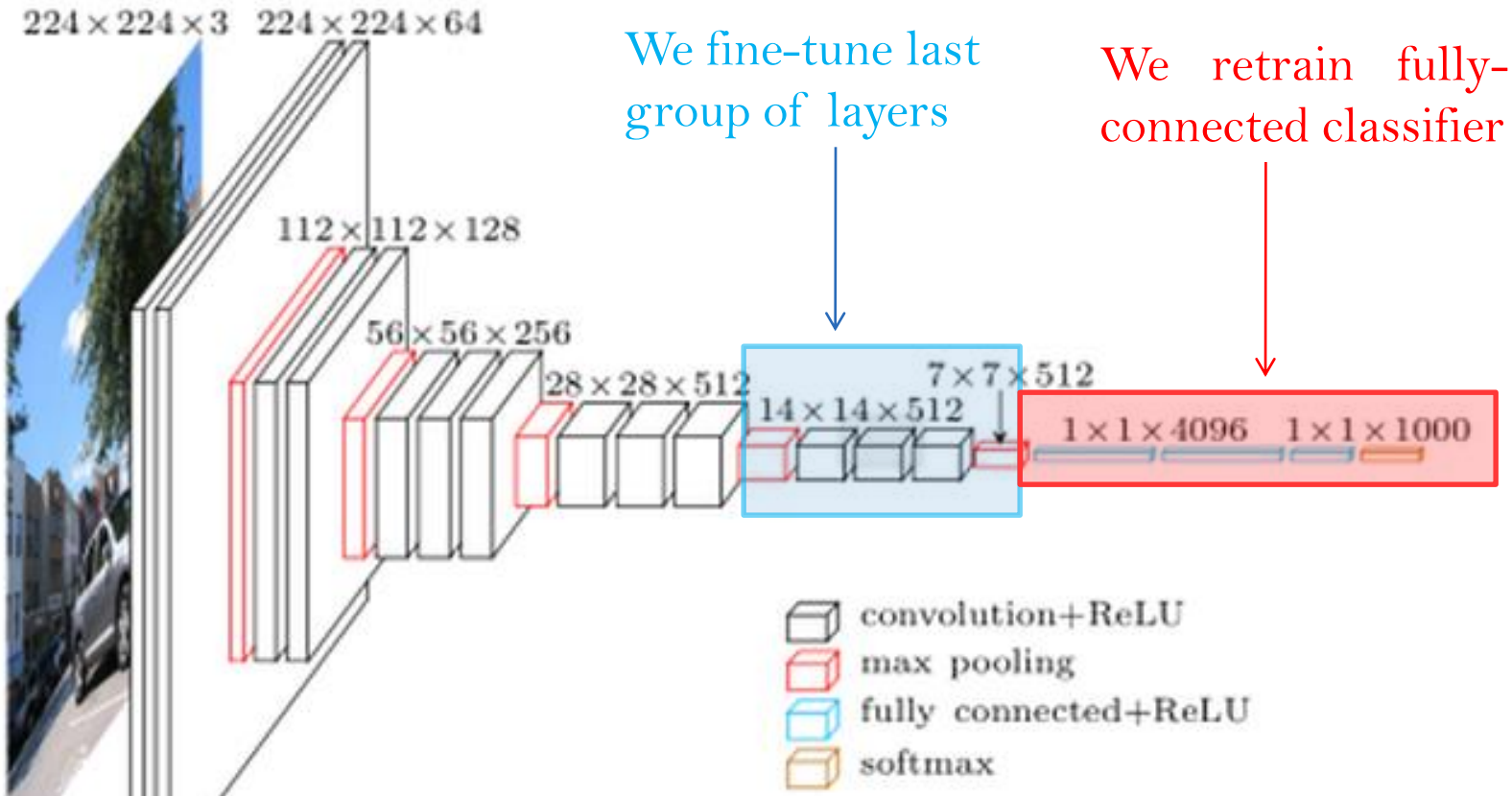
- Train a fully-connected classifier on top of a pre-trained CNN:

  Allows training a CNN with as little as ~300 images per class

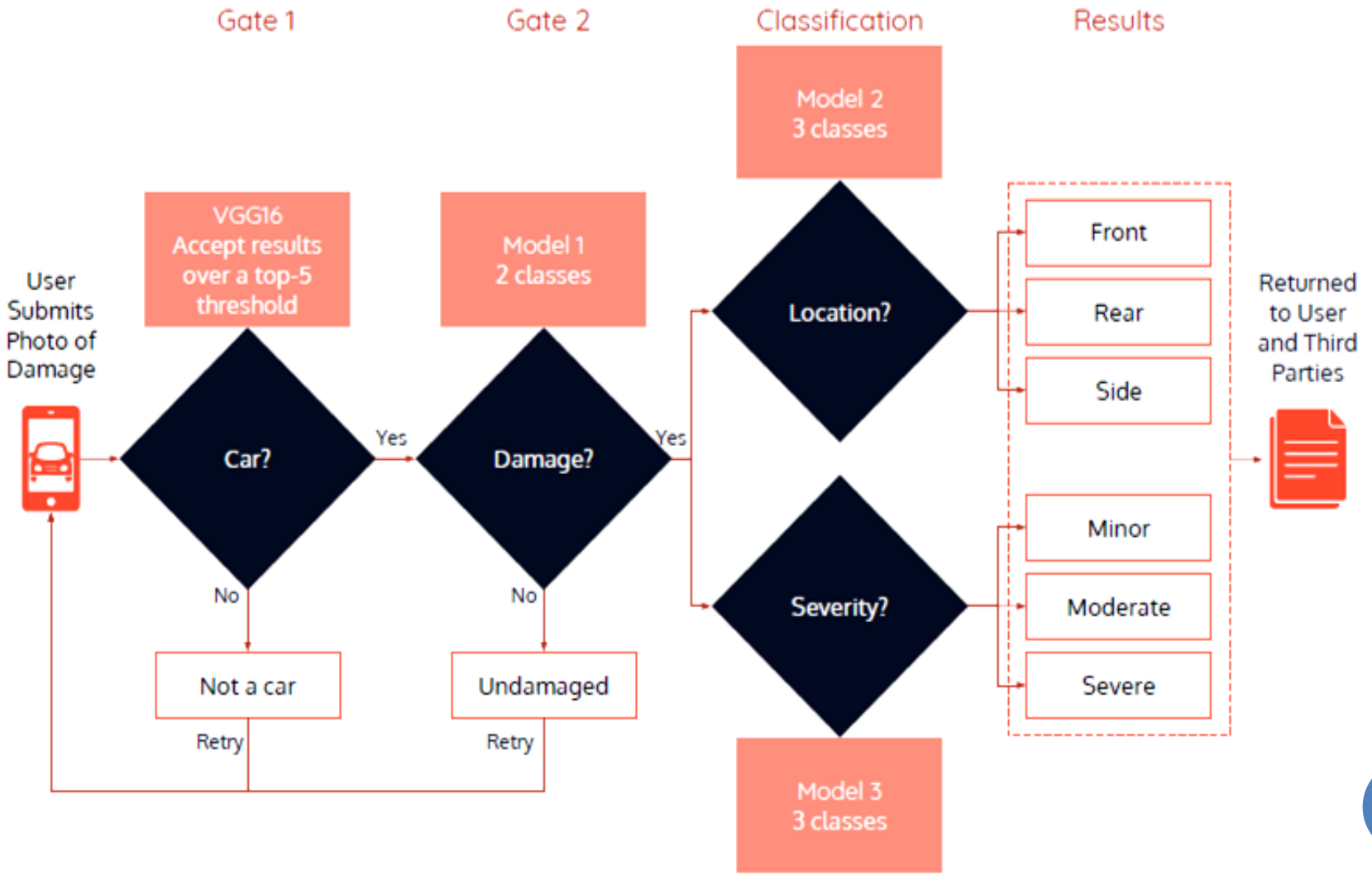
- Fine-tuning:

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

VGG16 ARCHITECTURE:



DEVELOPING A PIPELINE:



TOOLS AND FRAMEWORKS:

Data Collection

Google

Data Source

Stanford Car Image Dataset

Selenium

Webscraper

Model Development

TensorFlow

Deep Learning Library

Keras

Deep Learning Library

Web Development

Bootstrap

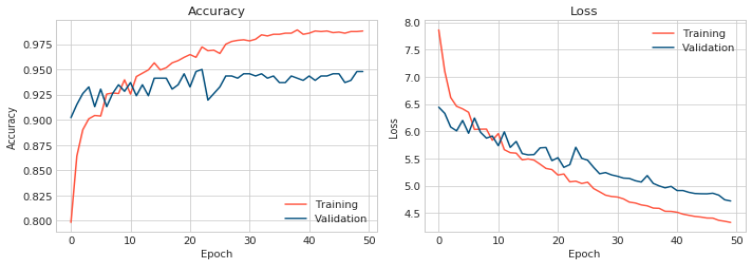
Javascript, HTML, CSS Framework

Flask

web development, one drop at a time

Python Web Framework

python™

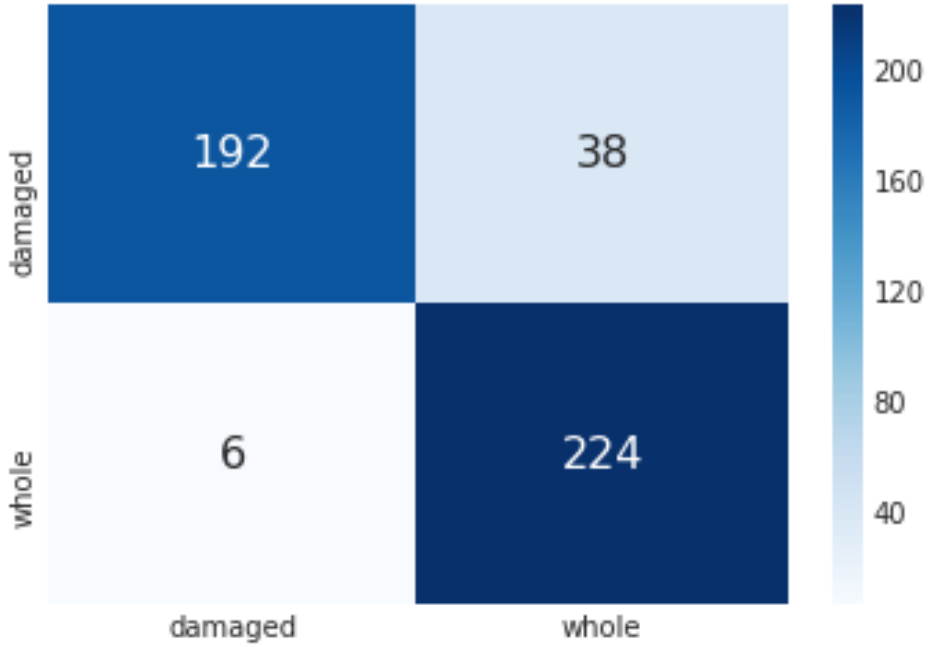


1,150 Undamaged cars

1,150 Damaged cars

Evaluating pipeline components:

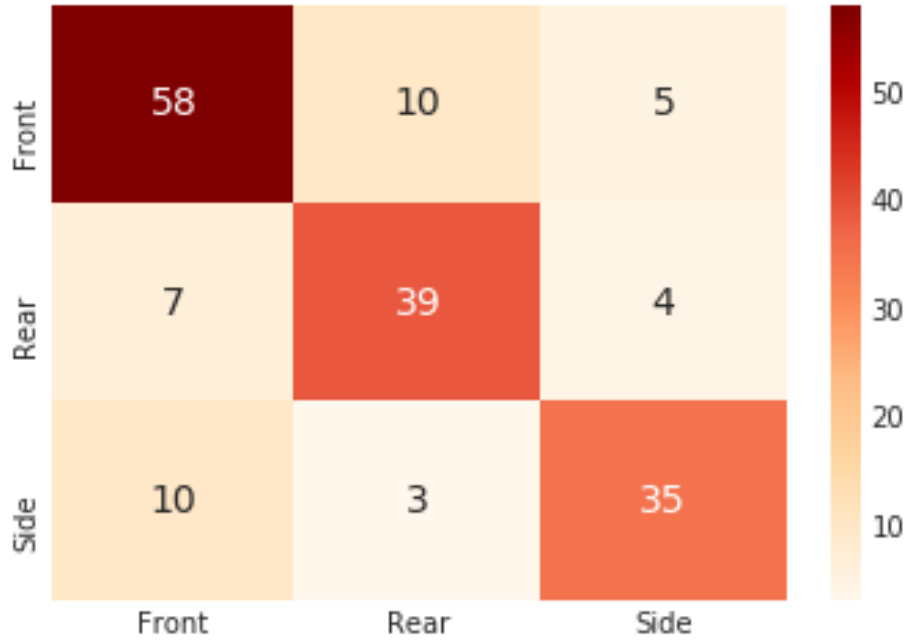
Model 1 → Damaged or Whole?



- Accuracy: 90.44%
- Precision: 91.23%
- Recall: 90.44%

Evaluating pipeline components:

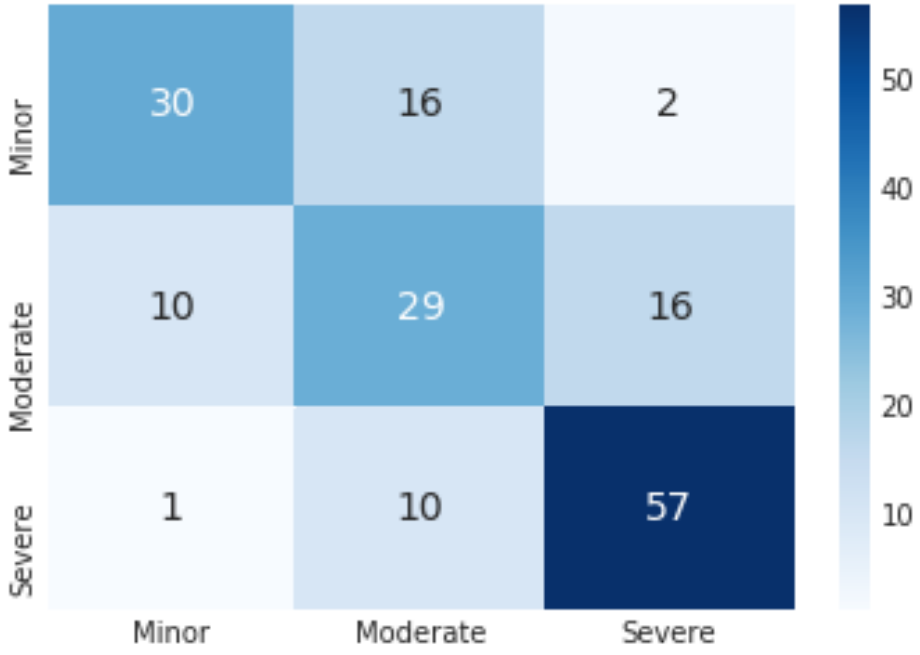
Model 2 → Damage Location



- Accuracy: 77.19%
- Precision: 77.29%
- Recall: 76.79%

Evaluating pipeline components:

Model 3 → Severity of Damage



- Accuracy: 67.84%
- Precision: 67.30%
- Recall: 66.35%

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