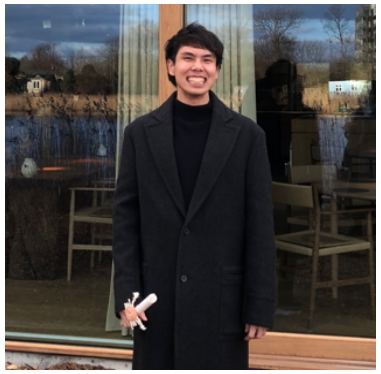
Image Recognition Challenge for Rooms (from Microsoft)

Group 4

Contents

smart acc.

Group members



Nattapat

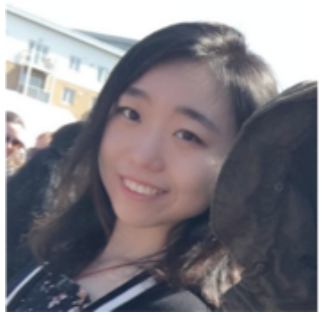
Suampa

WebDev Team

Tomasz

Lin

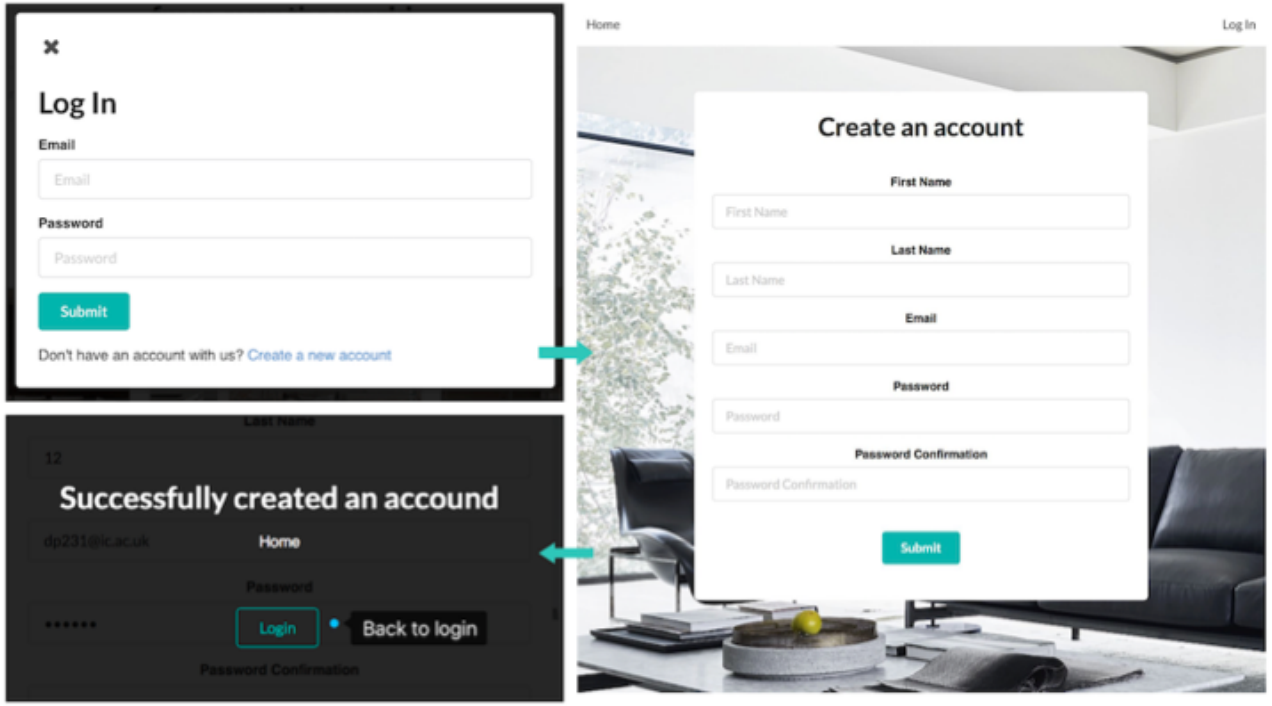
Yini

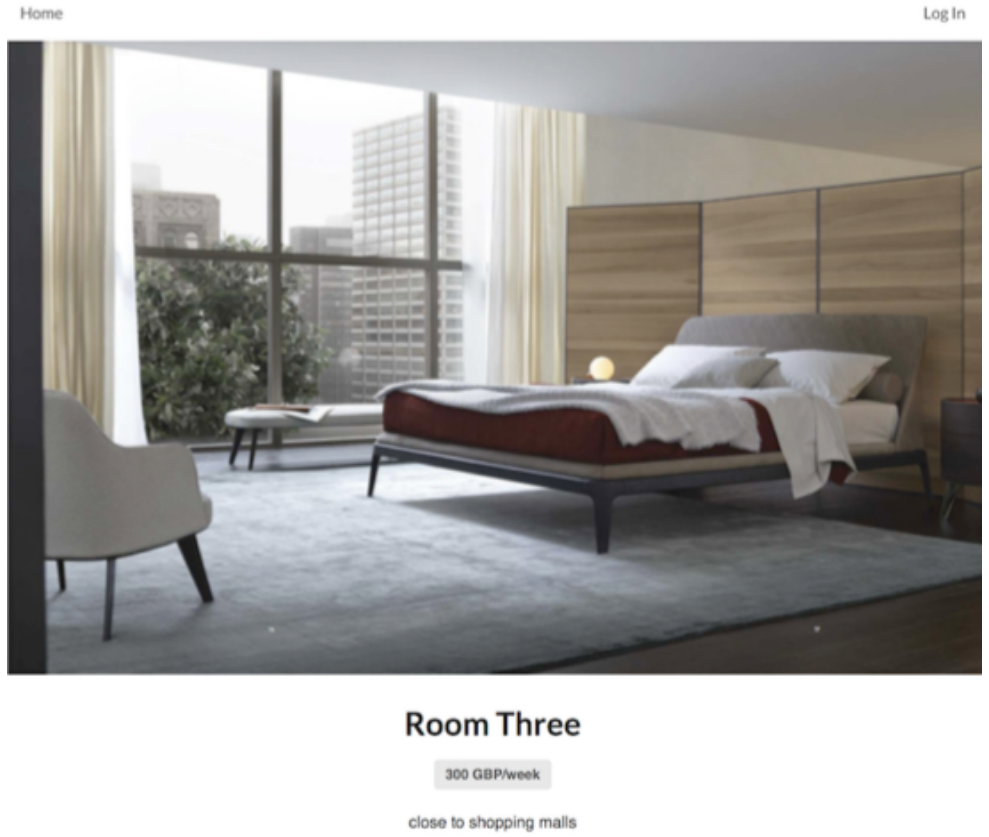


Danlin

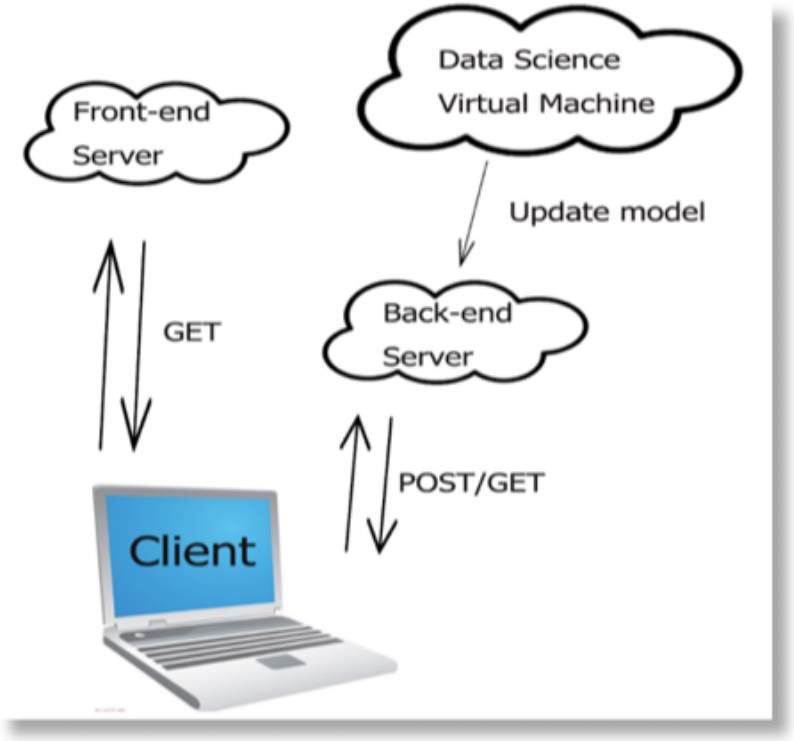
Machine learning Team

Smart accommodation (Smart acc.) - Demo

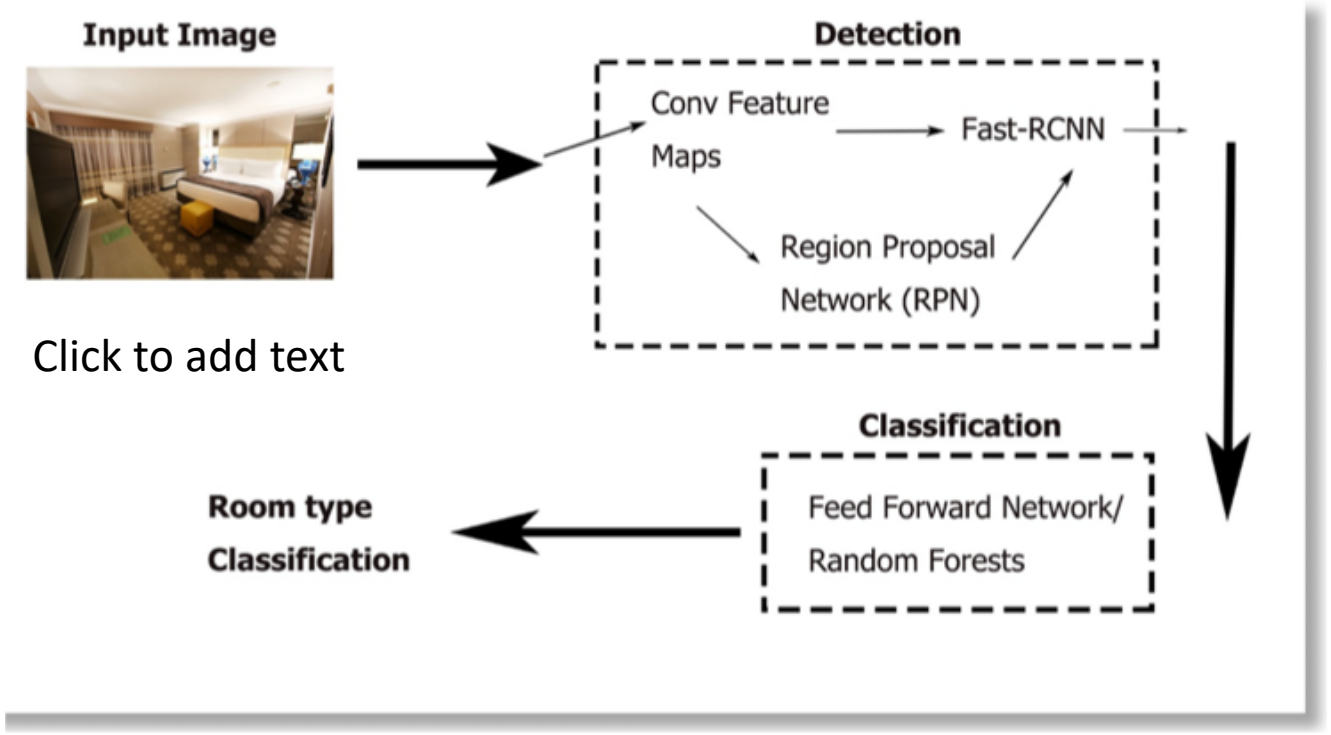




Architecture - high level view

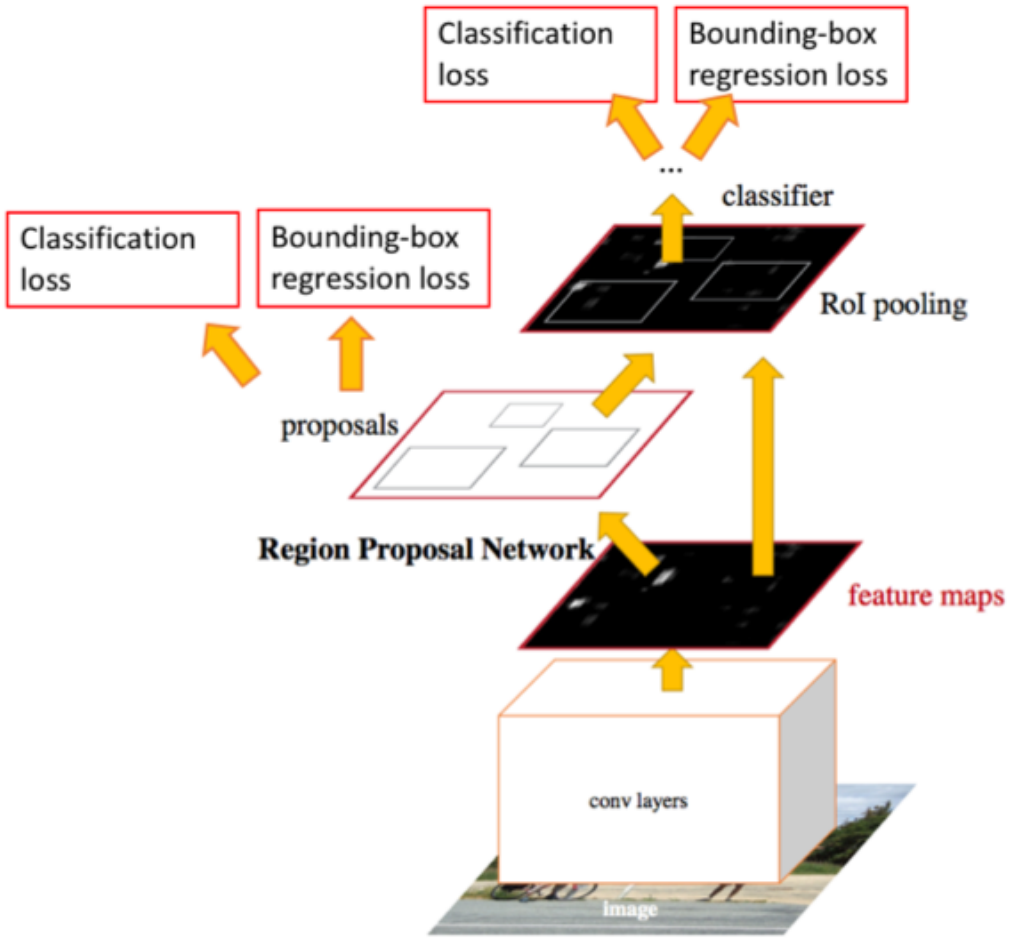


◎ **Web application architecture**



◎ **Detection system architecture**

Object detector - Detector

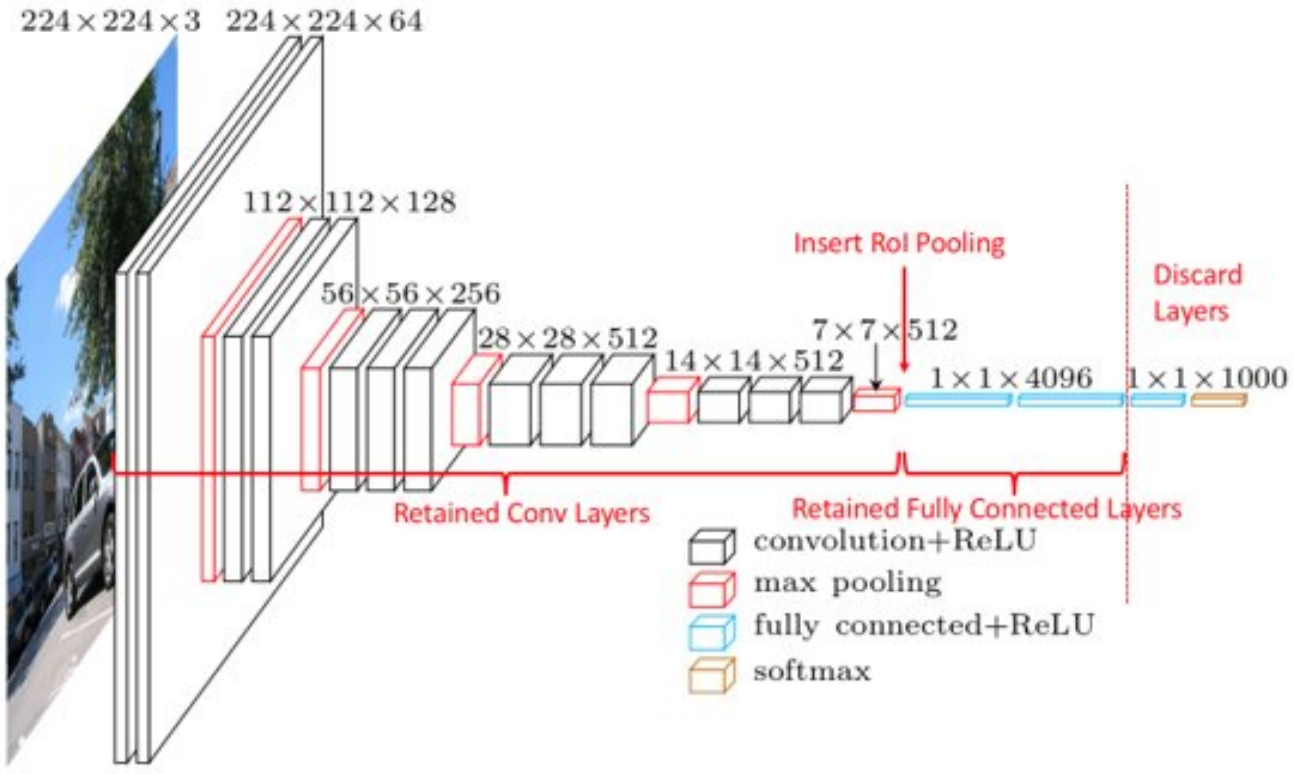


Feature extractor :
Extract convolutional features

Region proposal network:
Generate region proposals

Classifier:
Final prediction and refine the coordinates of the bounding box

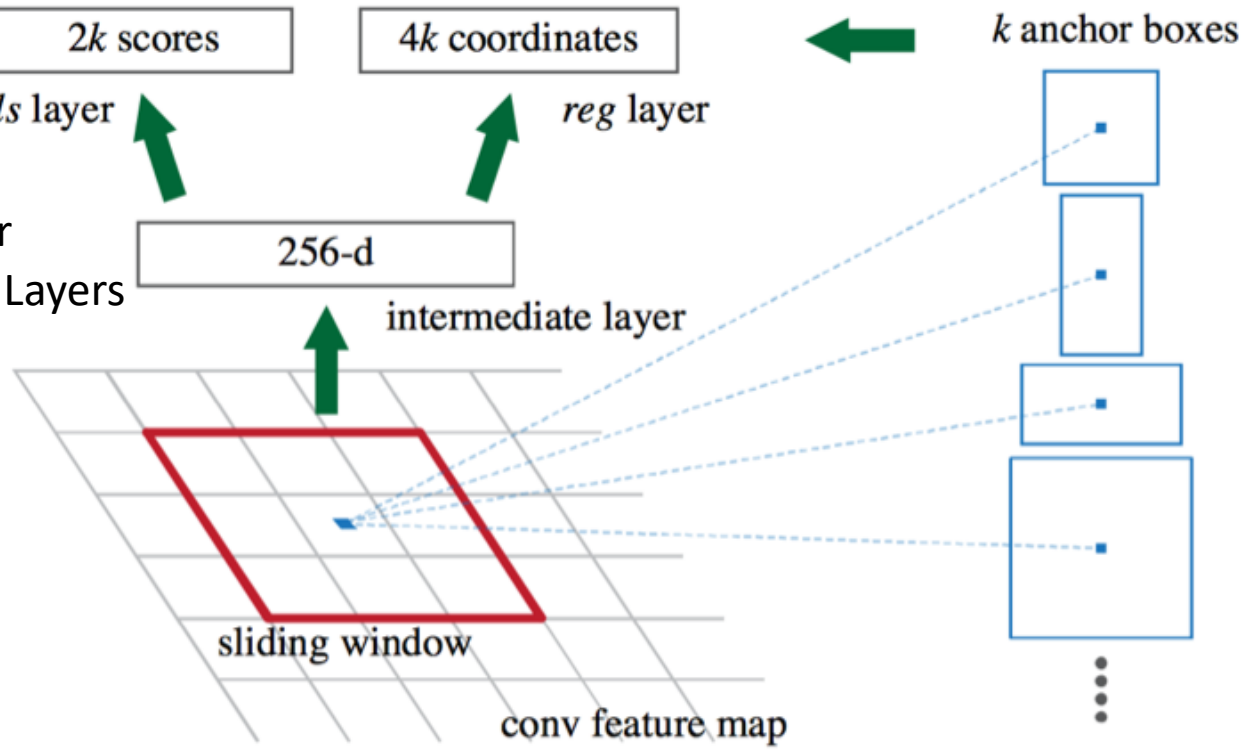
Object detector – Feature Extractor



Source: https://www.cs.toronto.edu/~frossard/post/vgg16/

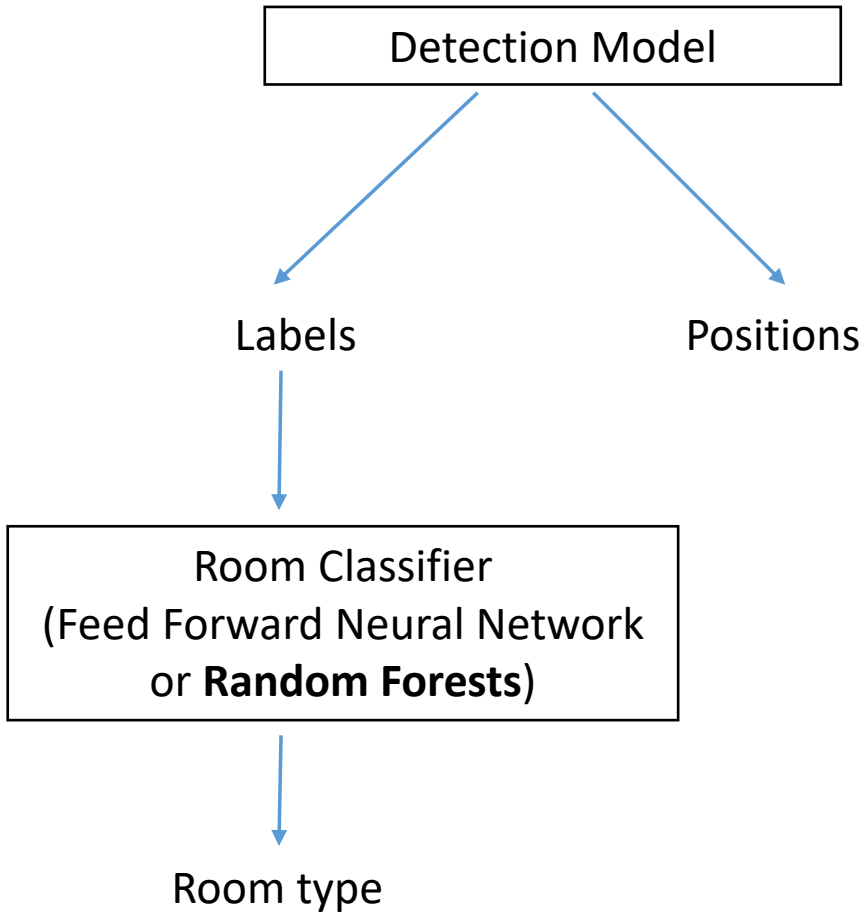
Object detector - RPN Anchor

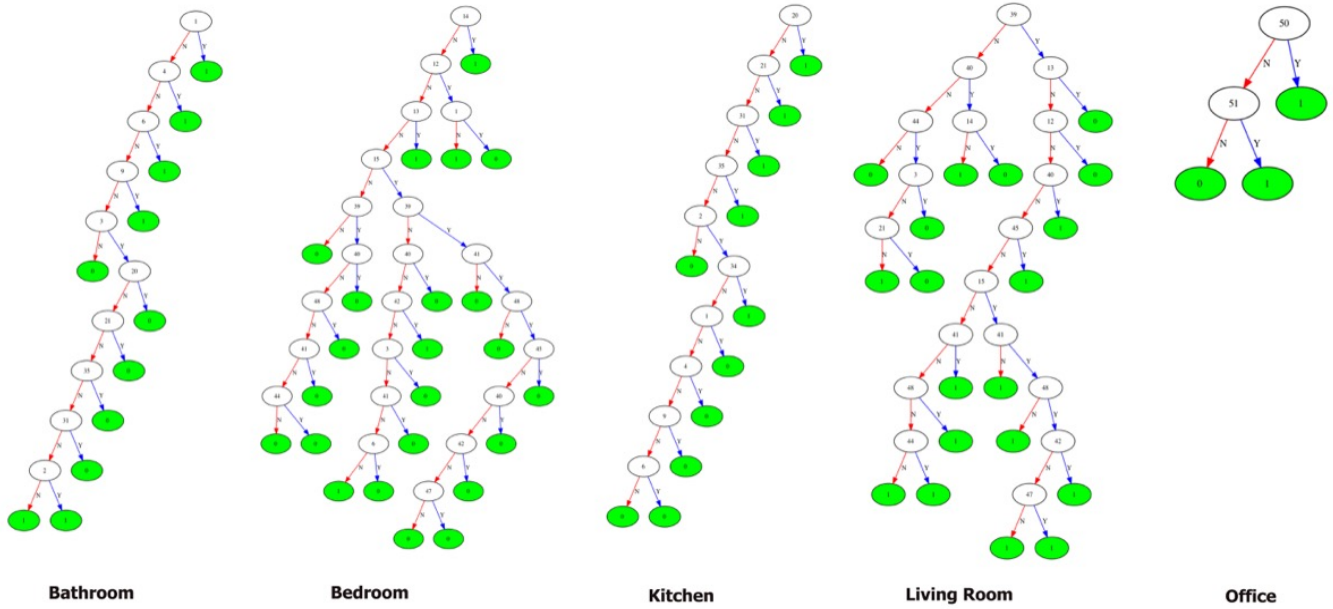
RoI Pooling Layer
Fully Connected Layers



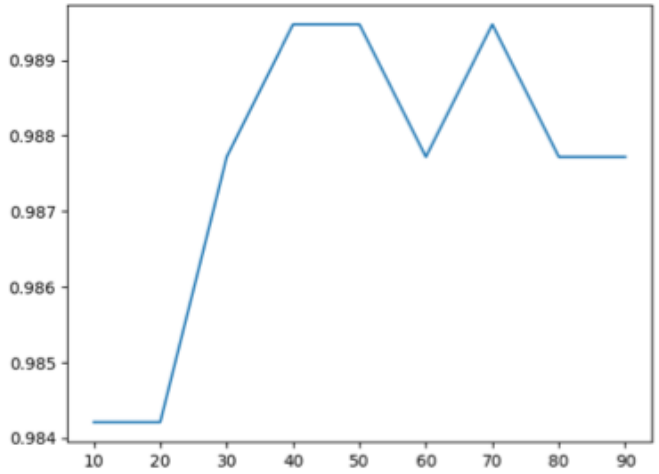
Source: Faster-RCNN

3 Room classification





Tree Visualisation



The number of trees vs. classification rate

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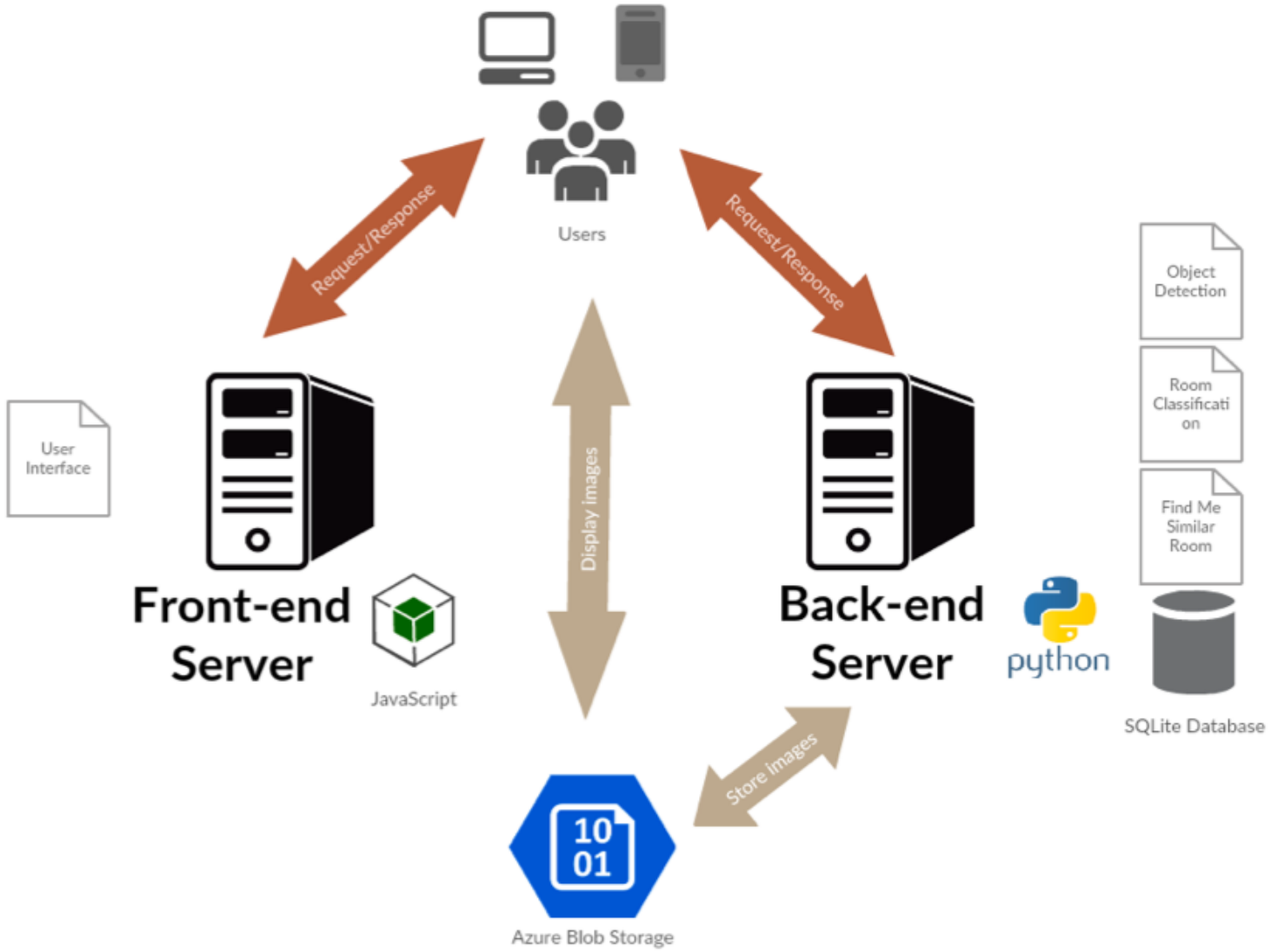
4 Web application



Front-end Server

- UI element
- Implementing React library

Back-end Server

- Relational database/machine learning model deployment
- Implementing Flask-RESTful API
- User authentication

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Problems and challenges – Web application

Web application

a

Adaptable user interface

Problem:
- Adapt UI across different screen sizes

Solution:
- CSS media size query function

b

High response time

Problem:
- Long-running process

Solution:
- Multithreading

Problems and challenges – Machine learning

01 Base model adaptation

Problem:
How to adapt new base model

Solution:
- Slice the base model
- Fit the output of the final conv layer with the input of the remaining layer.

02 Hyper-parameters

Problem:
Search optimal hyper-parameters
- Long training time
- Thousands of possible hyper-parameter values

Solution:
- Bayesian Optimization
  - Gaussian Process
  - Expected Improvement

03 Duplicated Boxes

Problem:
How to keep the correct detection boxes which are overlapped.

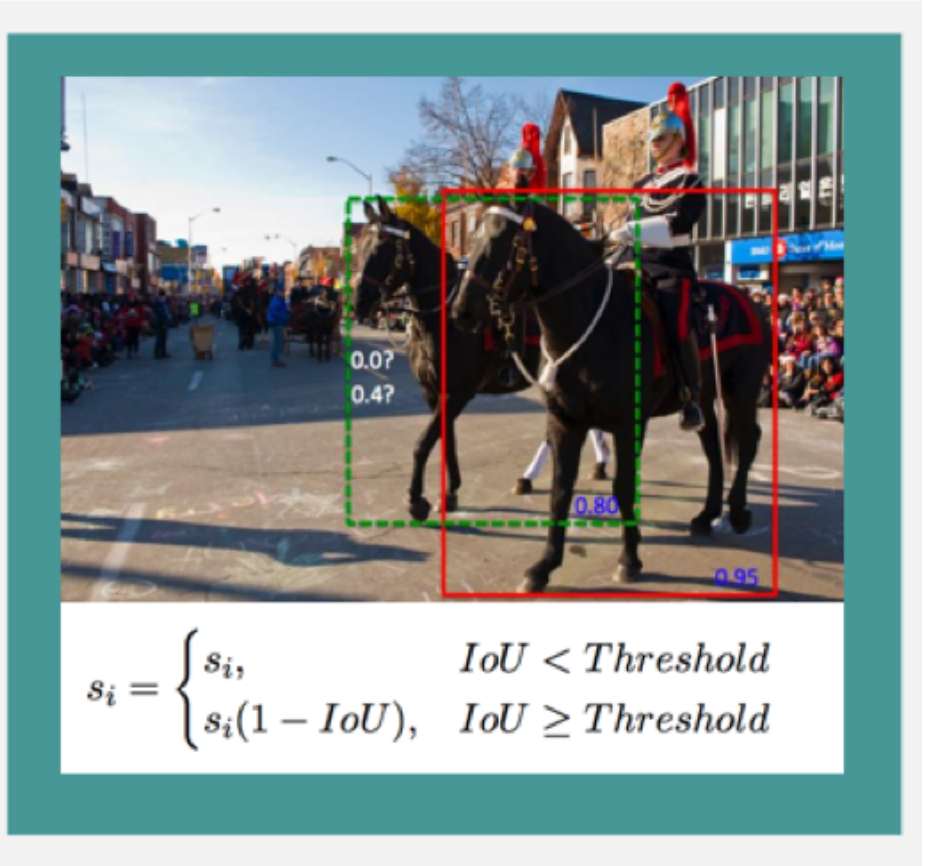
Solution:
- Soft-NMS: Gradually decay on the detection score.

Source: soft-NMS

136,797,594 parameters need to be updated & 6 hours training

Problems and challenges – Machine learning

Soft-NMS:



6 Conclusions and evaluation

Web App

1. Web application deployment
2. Machine learning model integration
3. Additional features

Detection system

1. Faster-RCNN improvement
2. Hyperparameter optimization
3. NMS algorithm improvement
4. Dataset enhancement

Thank you!

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