Project Proposal: See more from a bird's-eye view

Bartosz Kudyba

232374

Project Pitch

Business Understanding

- When you travel to some destination you want to know what to expect, for example not to expect to hike when the area is flat. The idea was to make a model that provides information on the area based on satellite images. That could be highly beneficial not only for travellers, but also for potential investors that might seek for opportunities or asses their business decisions.

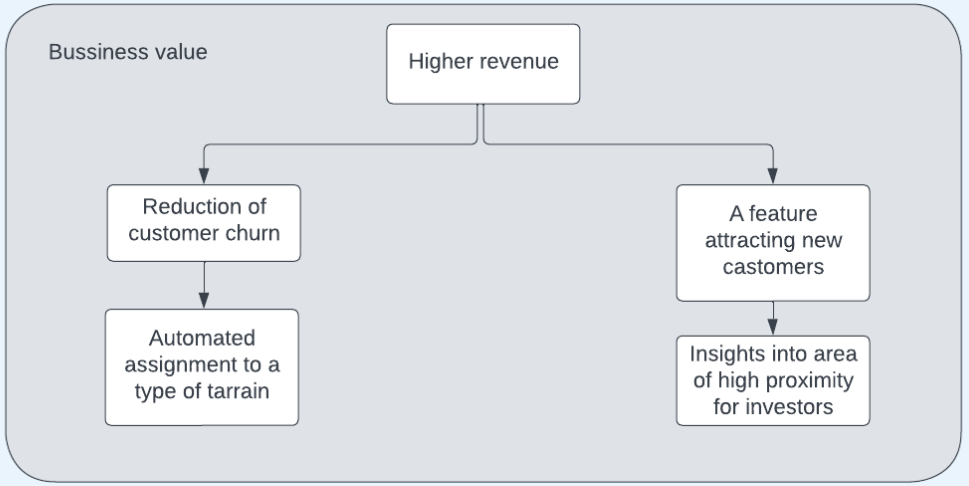
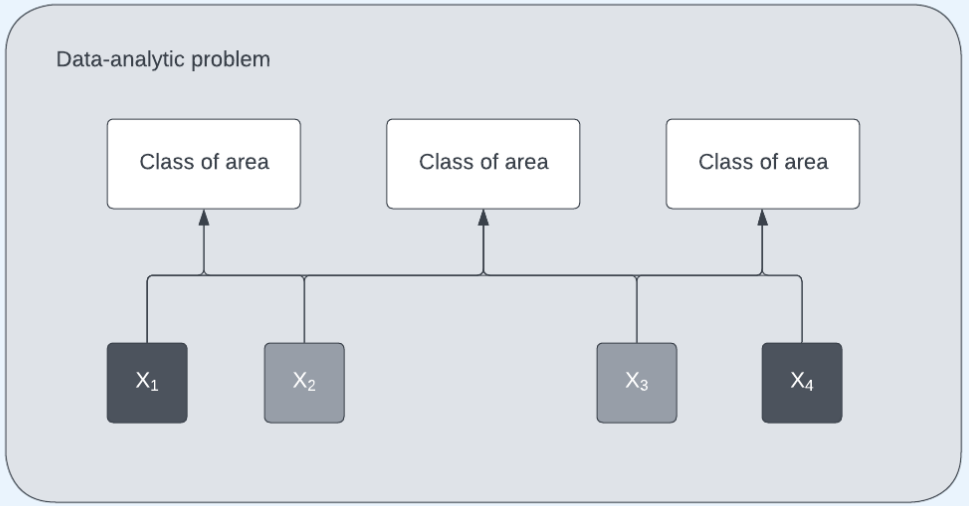


Image:



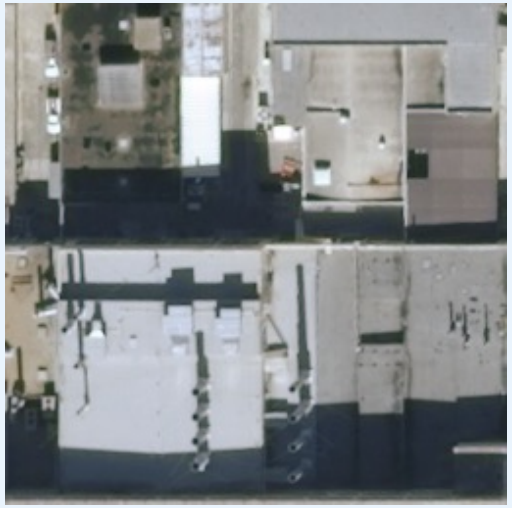
Problem Overview

Deep Learning

- The model I created classifies satellite images into 3 classes (buildings, beach, parking lot). Each class in the dataset consists of 500 images.

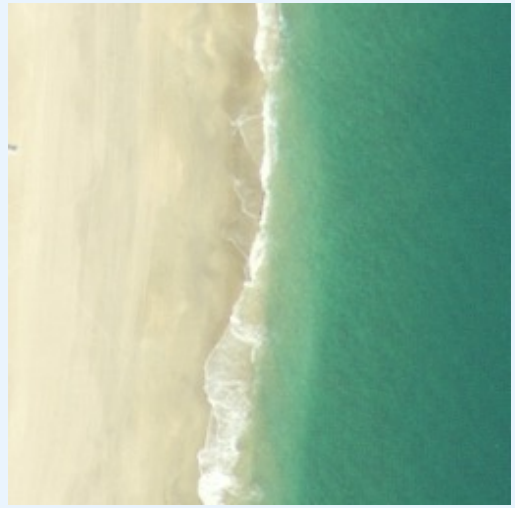
Baselines

- Random guess accuracy: 33%
- Human-level performance accuracy: 100%
- Basic MLP accuracy: 74%



Buildings

Parking Lot



Beach

Model Overview

Deep Learning

	Accuracy:
• 1st iteration – Basic CNN model (2 Conv2D layers trained for 5 epochs)	70%
•2nd iteration – Augmentation of training set (random rotation, brightness, contrast, etc.)	84%
•3rd iteration – Expansion of architecture (4 Conv2D layers, 2 more Dense layers, MaxPool2D etc.)	95%
•4th iteration – Transfer learning (MobileNet model, used smaller non-augmented dataset)	99%
•5th iteration - Transfer learning (MobileNet model, used original non-augmented dataset)	100%

Model Overview

Deep Learning

My final model consists of a bottom (convolutional) part of MobileNet model pretrained on ImageNet dataset, 3 Dense layers of 300, 150, 10 neurons each respectively, Dropout and then output layer.

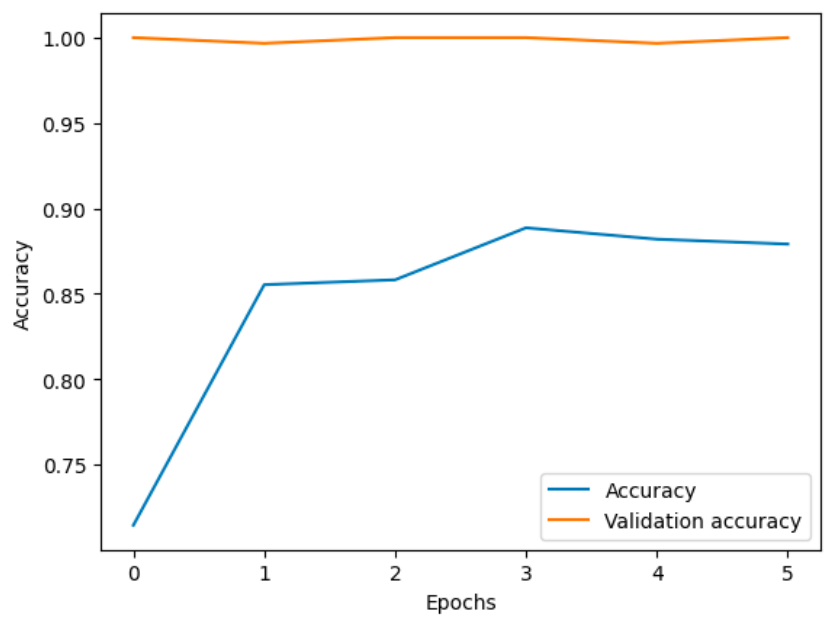
Layer (type)	Output Shape	Param #
mobilenet_1.00_224 (Functional)	(None, 8, 8, 1024)	3228864
flatten_1 (Flatten)	(None, 65536)	0
dense_4 (Dense)	(None, 300)	19661100
dense_5 (Dense)	(None, 150)	45150
dense_6 (Dense)	(None, 10)	1510
dropout_1 (Dropout)	(None, 10)	0
dense_7 (Dense)	(None, 3)	33

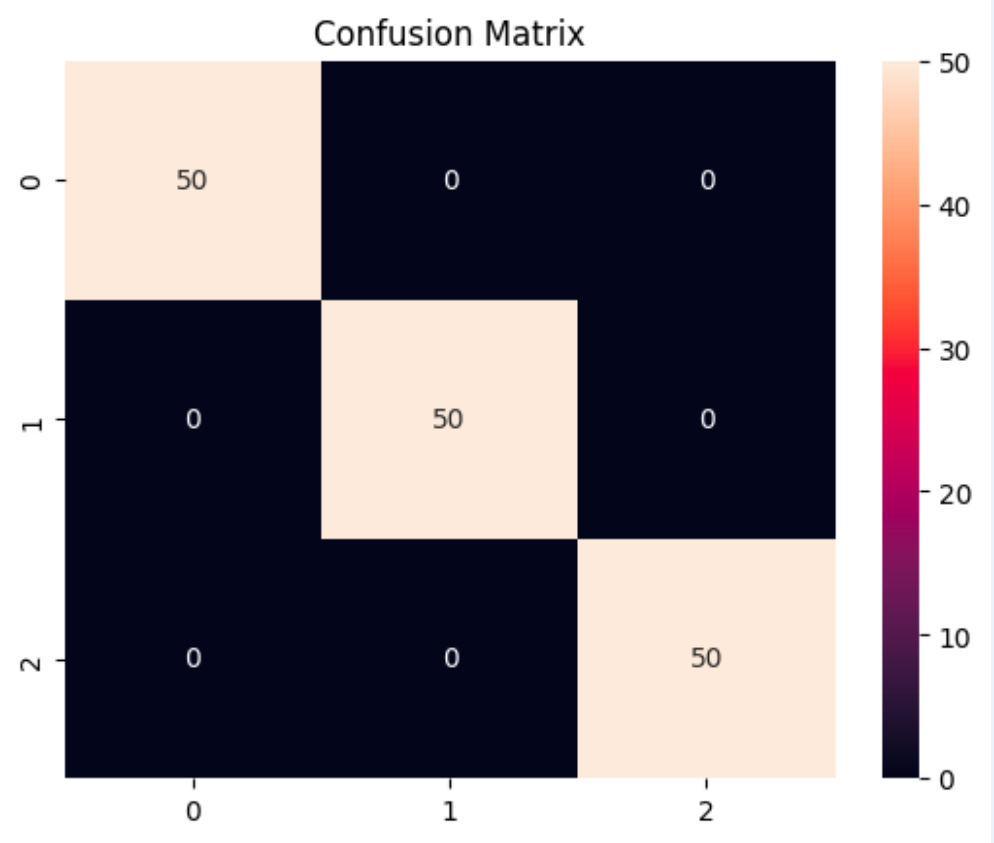
Total params: 22936657 (87.50 MB)
Trainable params: 19707793 (75.18 MB)
Non-trainable params: 3228864 (12.32 MB)

Model Performance

Deep Learning

Accuracy of my final model is 100%

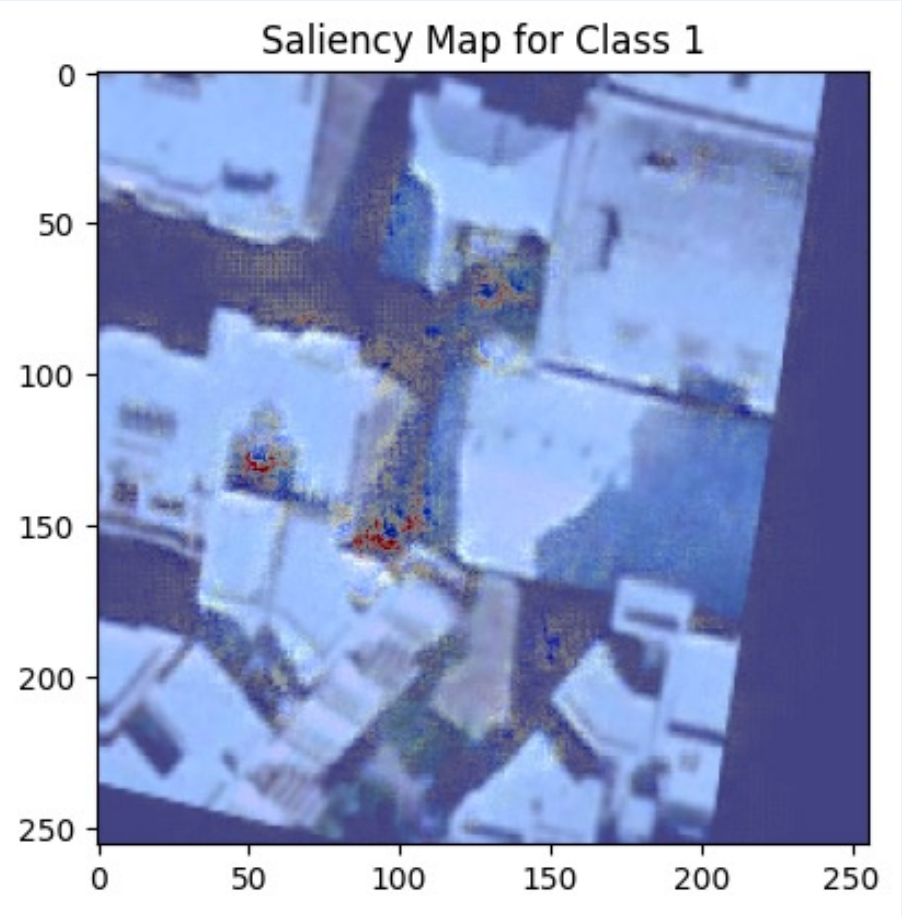




Model Interpretability

Responsible AI

- My problem clearly requires possibly the best accuracy and the interpretability isn't very important, although by using the methods I could gain useful insights into my models predictions.
- I have applied 3 XAI methods: Vanilla Gradients, LIME and SHAP
- The methods showed that the model focuses mostly on area around the objects that it identifies. Also shadows of buildings, waterlines on beaches and densely parked cars are helpful in classification for those classes.



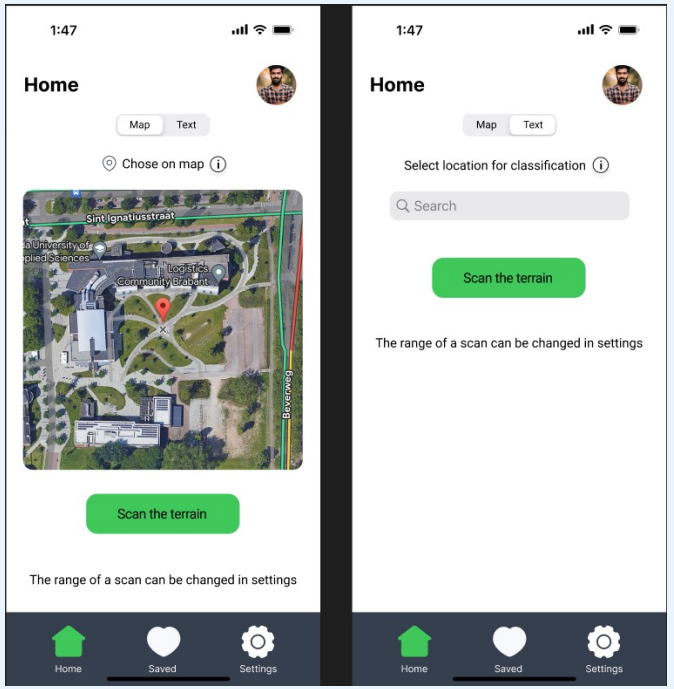
User Study

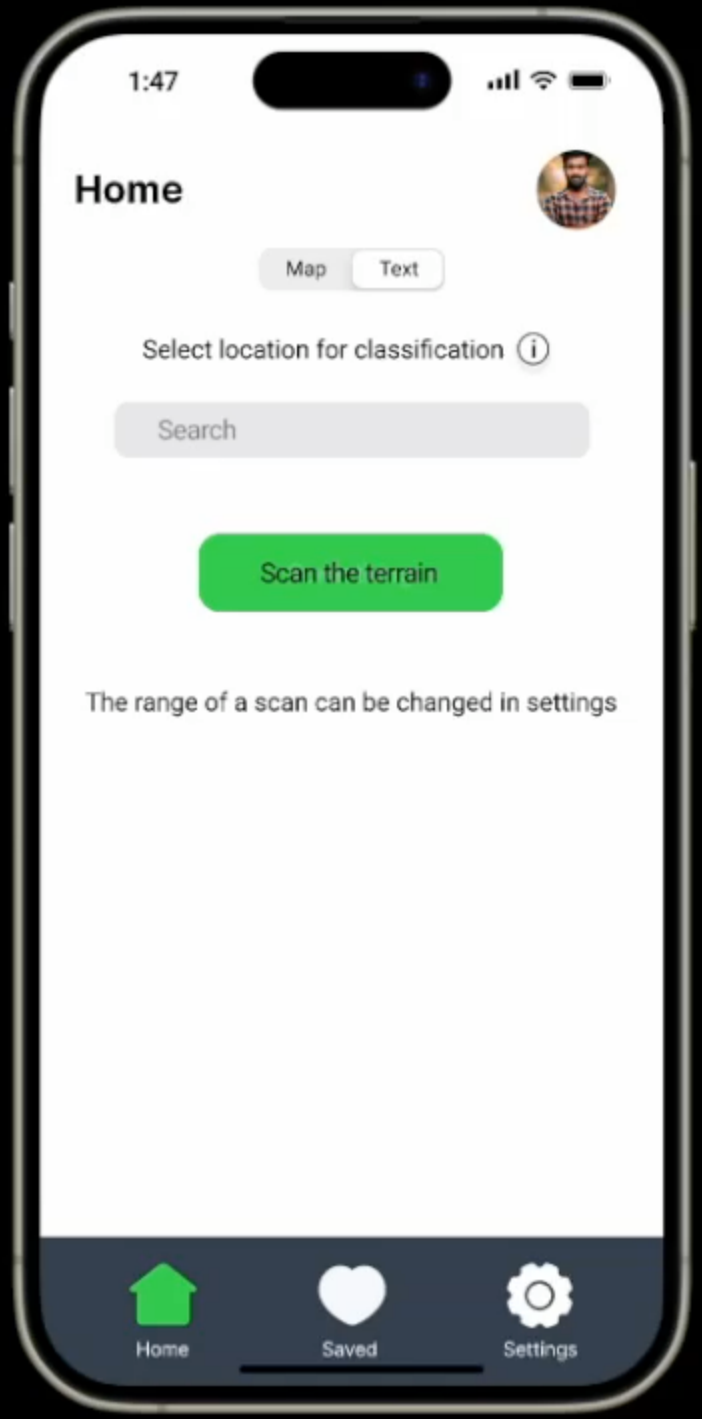
Human-Centered AI

- For conducting A/B Test on my prototype I designed two versions that only differ with home page layout.
- I supposed that the reason for uncertainty in purpose of the application is caused by crowdedness of its home page.
- The study didn’t show any significant difference in user experience, so the final designed was chosen by the enjoinment of its usability.

Version A

Version B




1:47
Home
Map
Text
Select location for classification
Search
Scan the terrain
The range of a scan can be changed in settings
Home
Saved
Settings

Thank you!

Any questions?