Understanding the Amazon from Space

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AGENDA

Project Overview

Classification of weather conditions
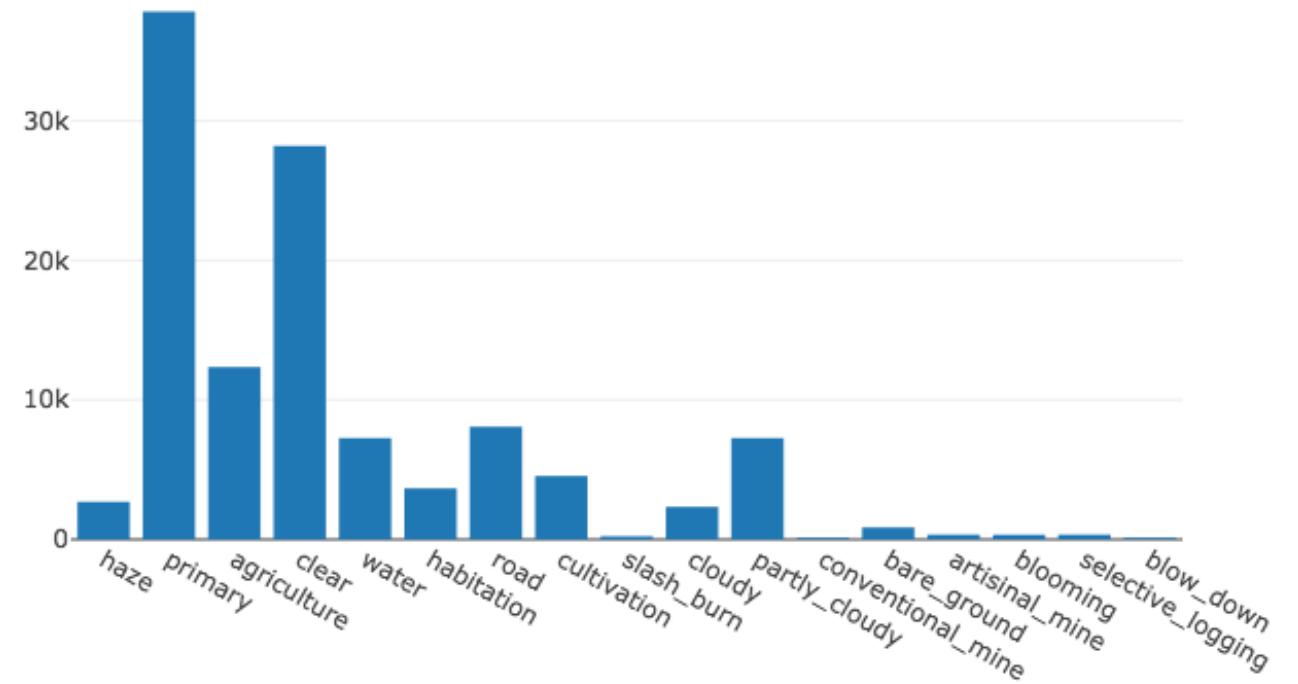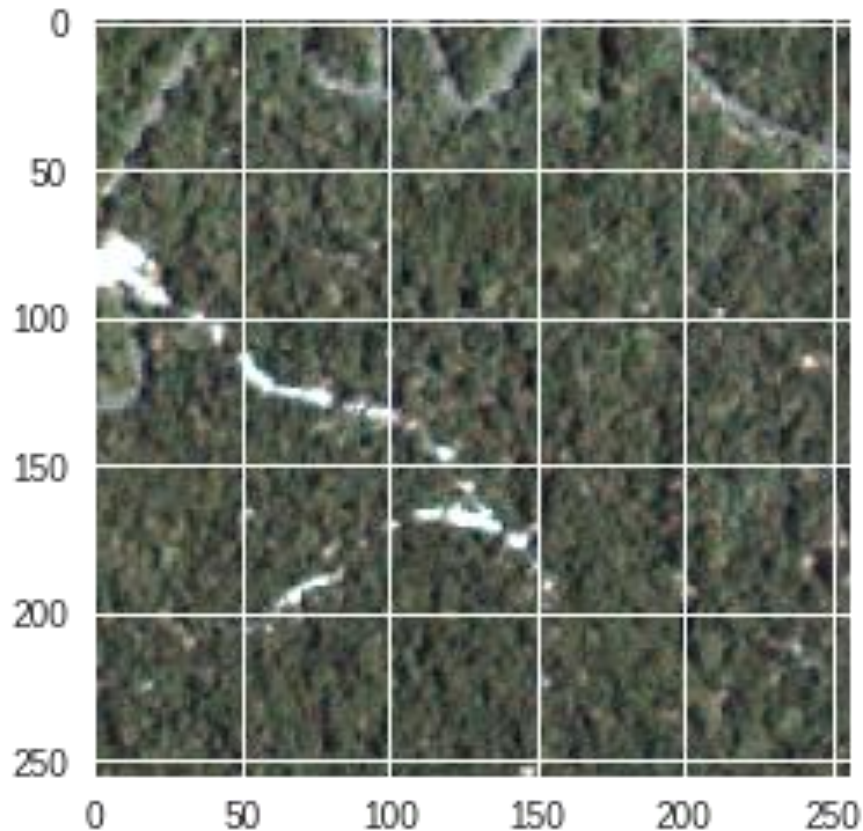
Object classification

Understanding the object classification: Class activation maps

Q&A

THE CHALLENGE

To label satellite image chips with atmospheric conditions and various classes of land cover/land use. Resulting algorithms will help the global community better understand where, how, and why deforestation happens all over the world - and ultimately how to respond.

Working with multi-labeled satellite images
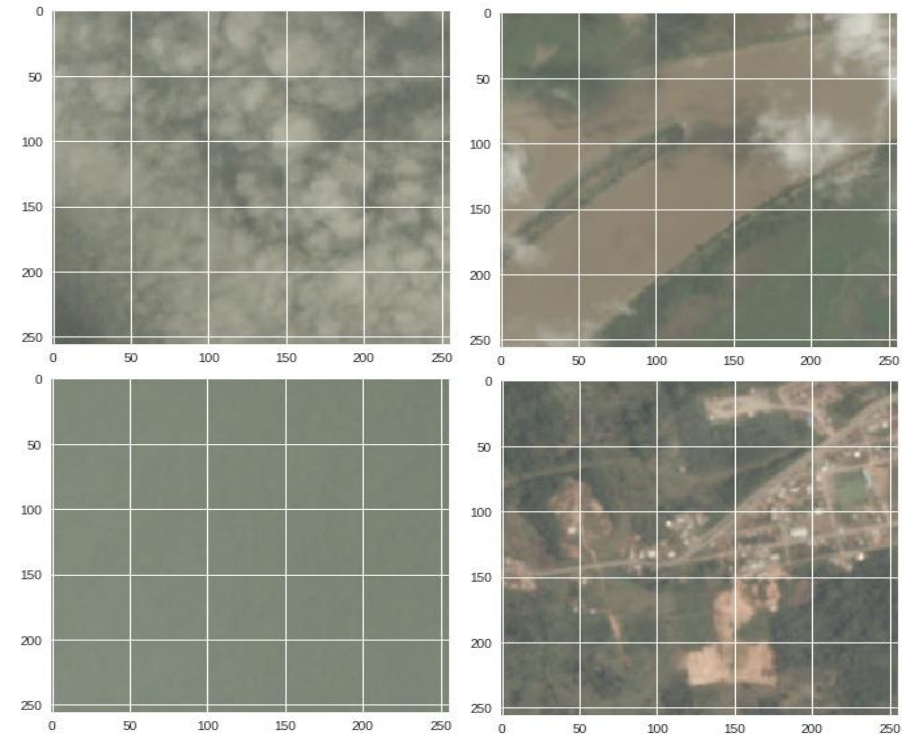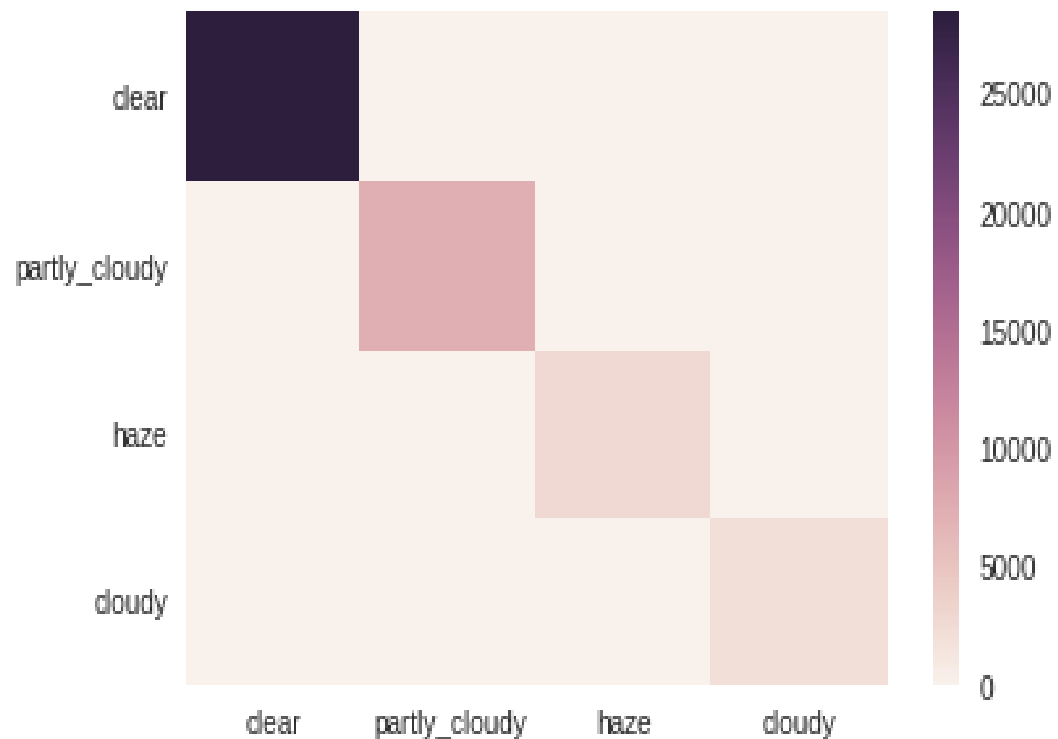
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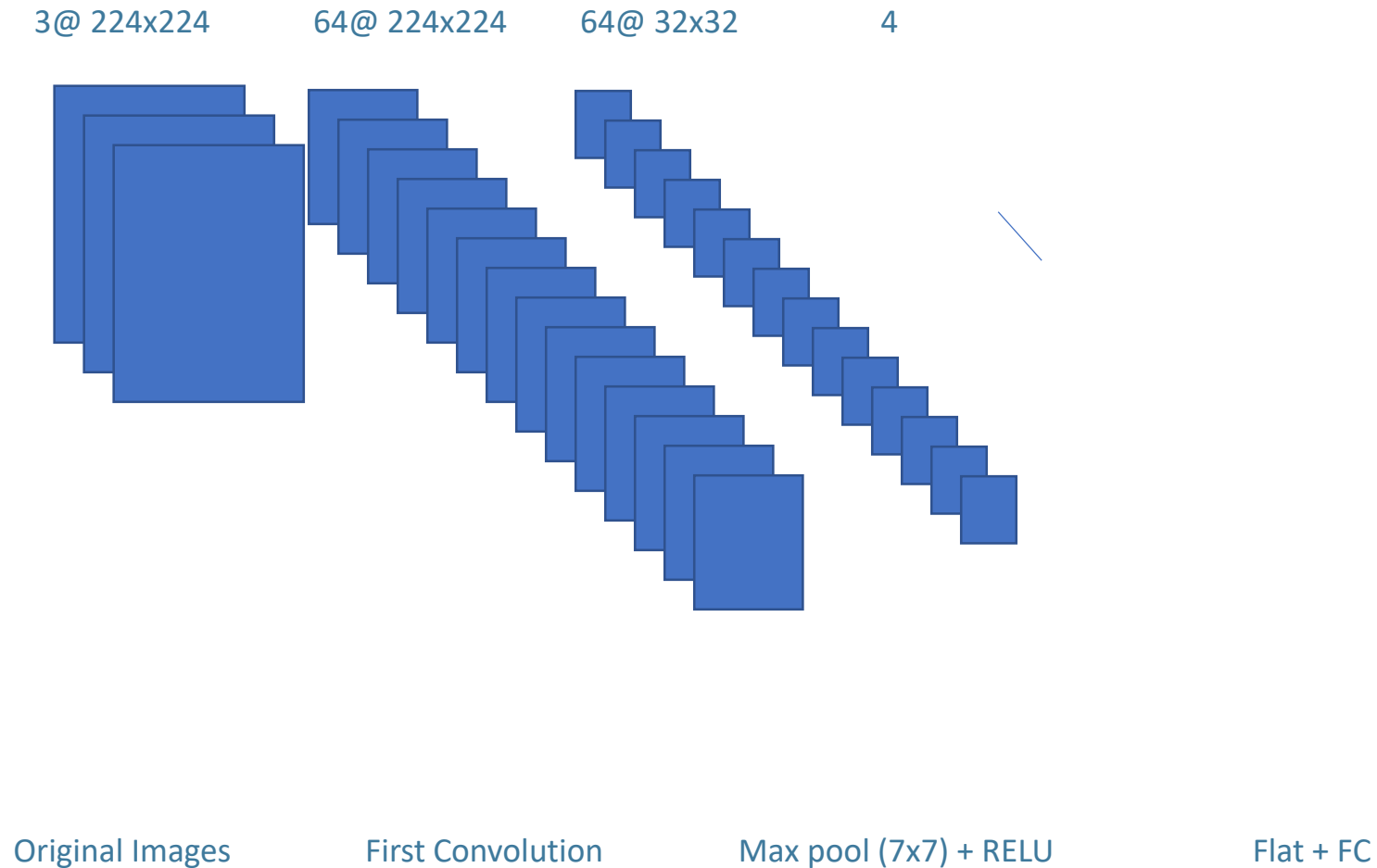**Understanding the object classification: Class activation maps**
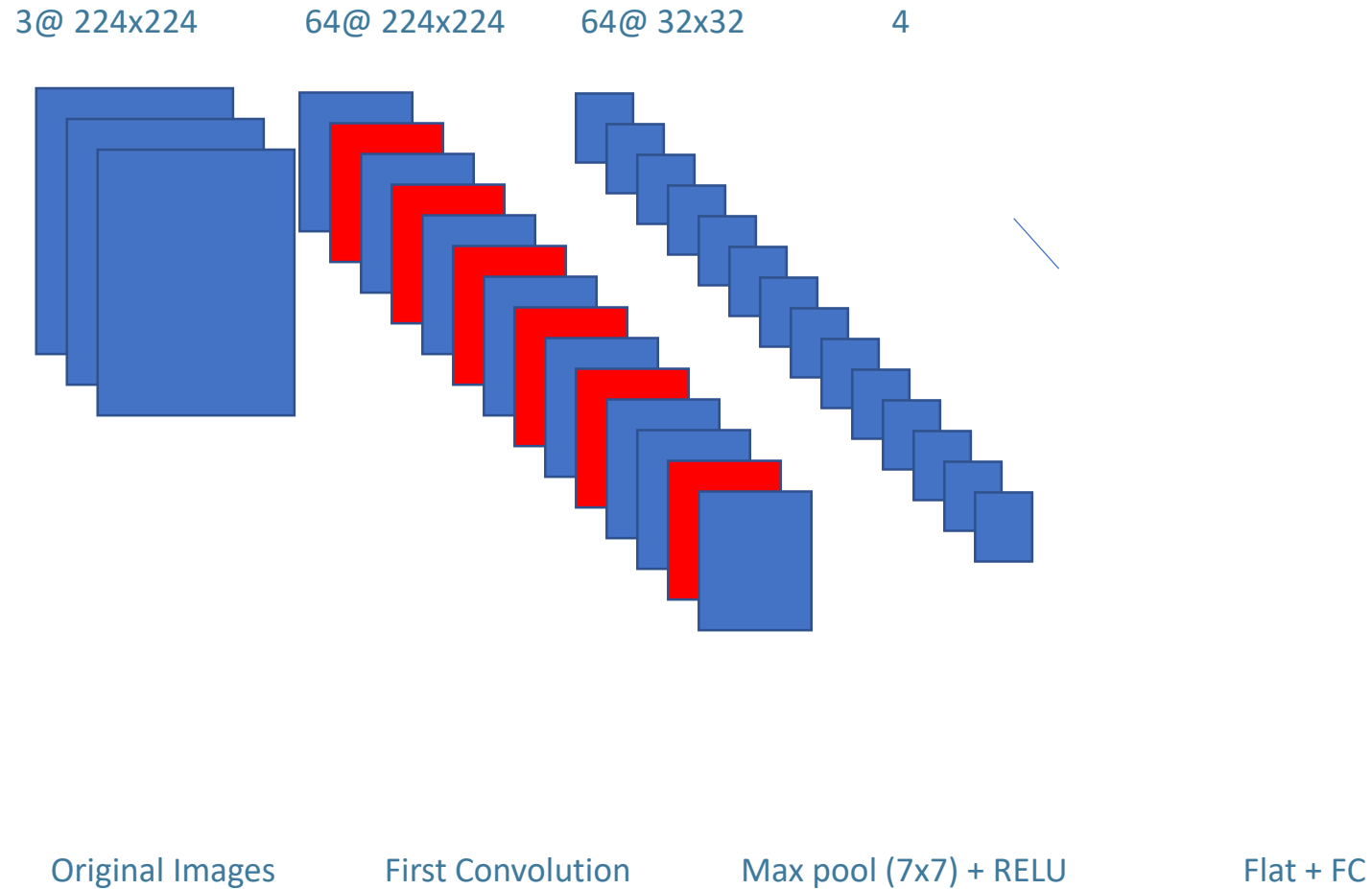
Q&A

First we focused on the weather classification

There are four weather related labels, which are mutually exclusive

Starting from scratch, a single-layer CNN

3@ 224x224   64@ 224x224   64@ 32x32   4

Original Images   First Convolution   Max pool (7x7) + RELU   Flat + FC
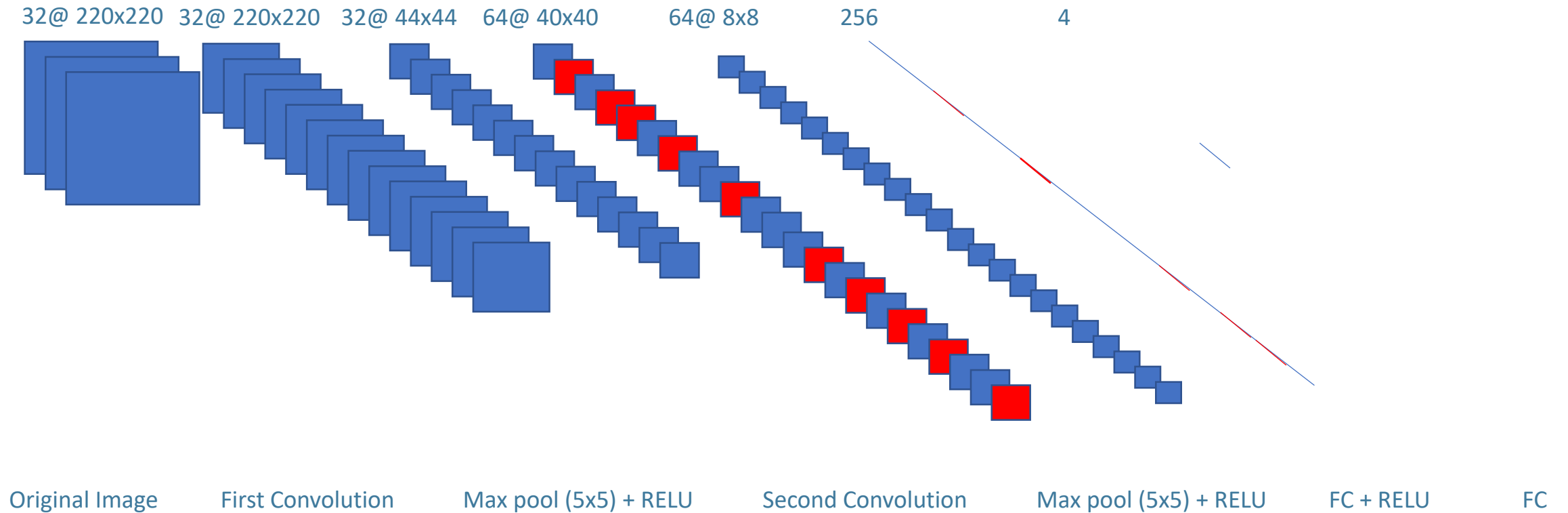
- The model was trained on 6400 images for 20 epochs

- The training accuracy was 0.87

- The testing accuracy was 0.67

- The model is performing worse in the test set, than in the train set, which means is **overfitting** the data

Then we add a dropout layer to reduce overfitting

3@ 224x224   64@ 224x224   64@ 32x32   4

Original Images   First Convolution   Max pool (7x7) + RELU   Flat + FC

- The model was trained on 6400 images for 20 epochs

- The training accuracy was 0.73

- The testing accuracy was 0.68

- We are able to reduce overfitting, but that doesn't translate into an improved test accuracy
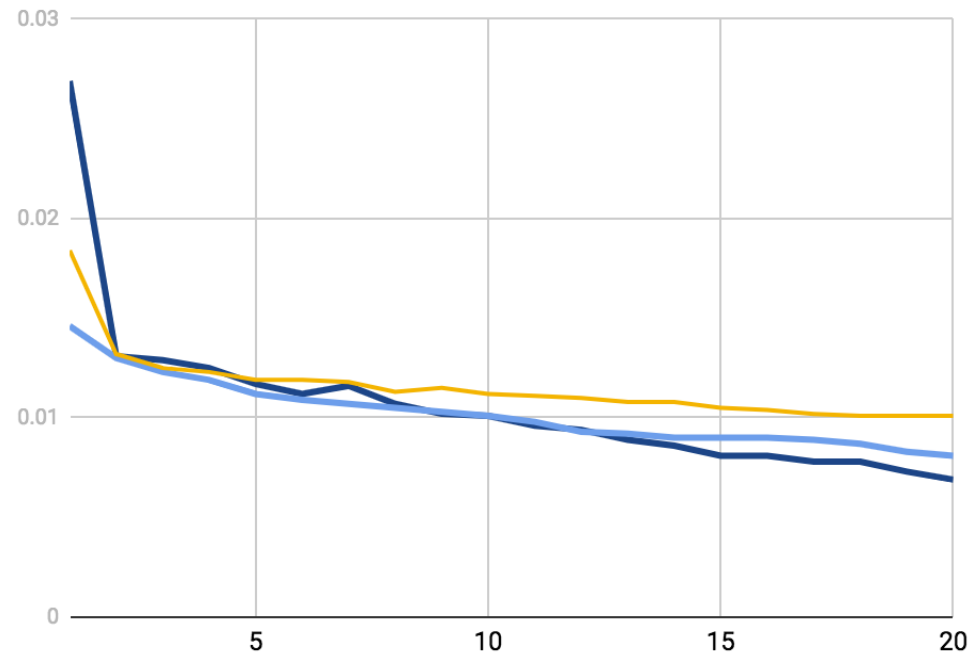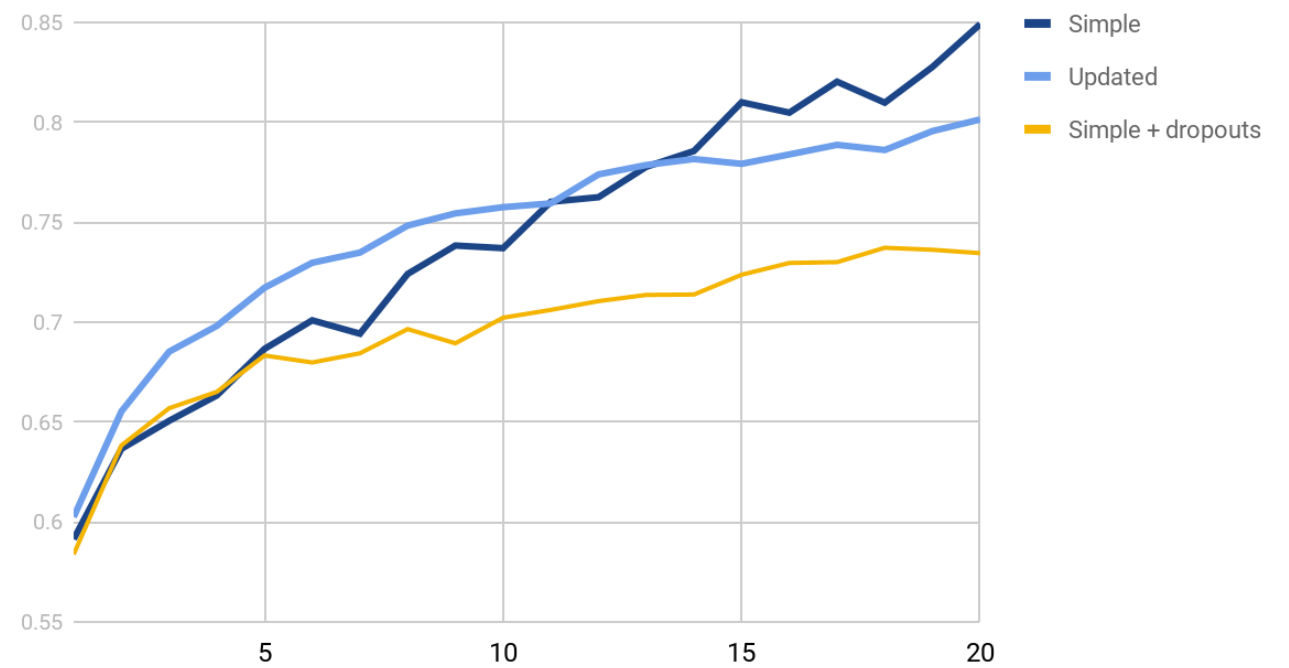
Finally, we use a deeper architecture

32@ 220x220   32@ 220x220   32@ 44x44   64@ 40x40   64@ 8x8   256   4

Original Image   First Convolution   Max pool (5x5) + RELU   Second Convolution   Max pool (5x5) + RELU   FC + RELU   FC

We achieved an accuracy of 0.80 in train, and 0.78 in test.

Comparison across models

Loss

Accuracy

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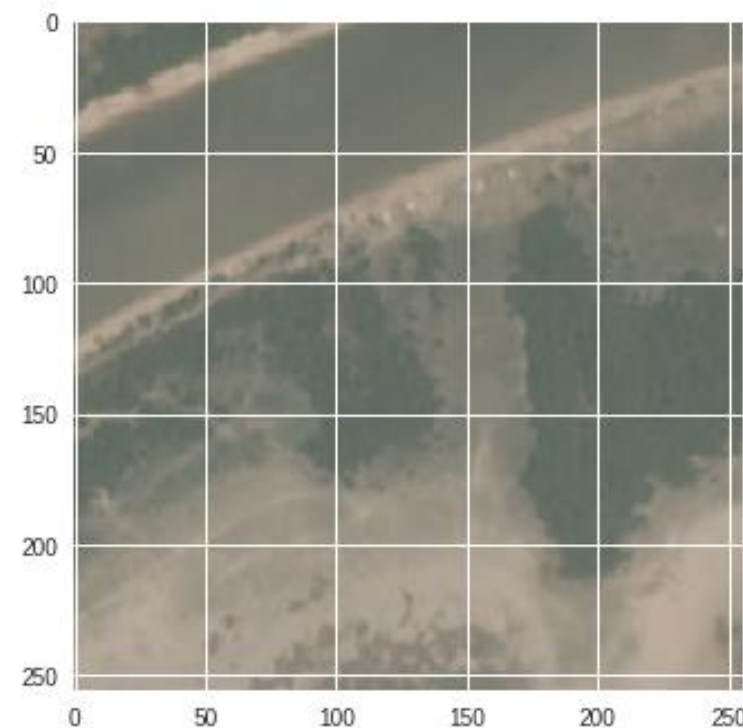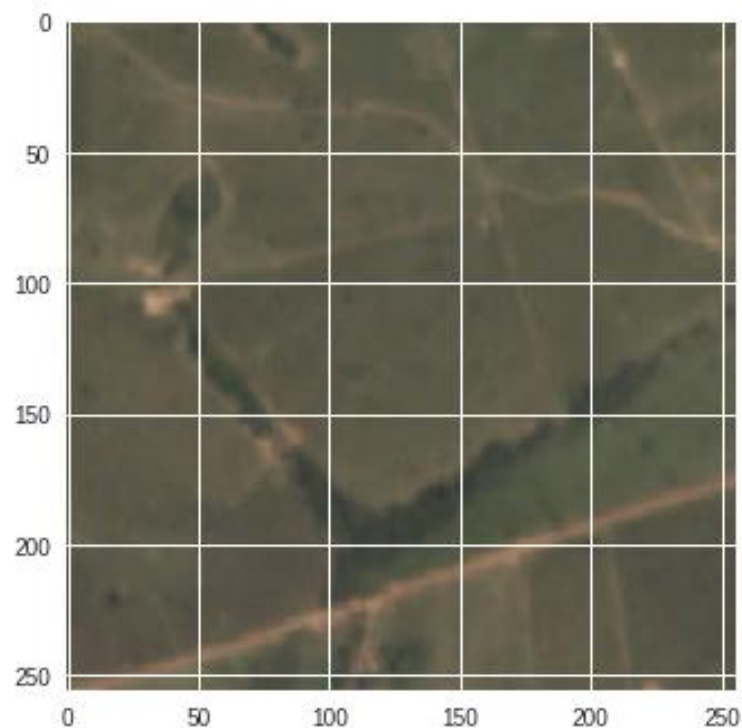
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Now we identify roads and water bodies

Among the clear images we classify the presence of roads and water

We fine tuned Resnet18 for binary classification

```
model_resnet = models.resnet18(pretrained=True)

for param in model_resnet.parameters():
    param.requires_grad = False
model_resnet.fc = nn.Linear(512, 2, bias = True)
```

- The model was trained on 3200 images for 15 epochs, and tested it on 800

- It achieved a 0.8409 accuracy on the train set and 0.8425 on the test set
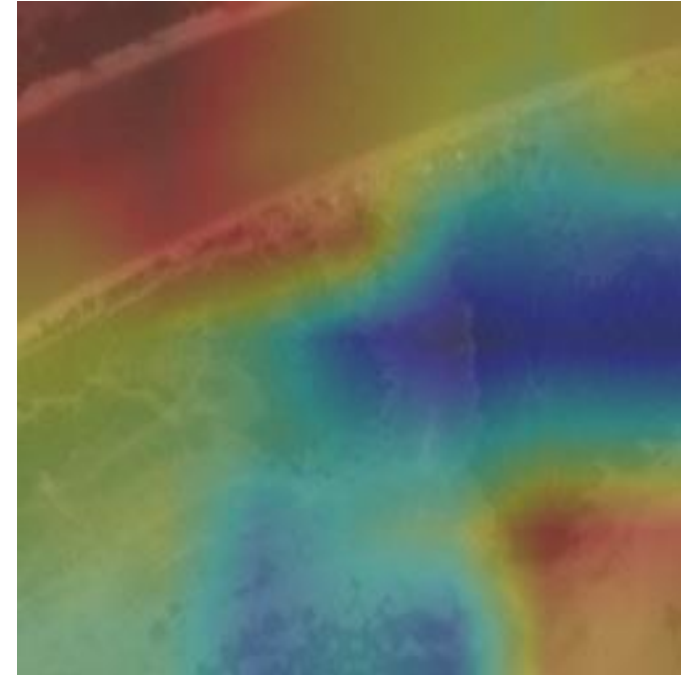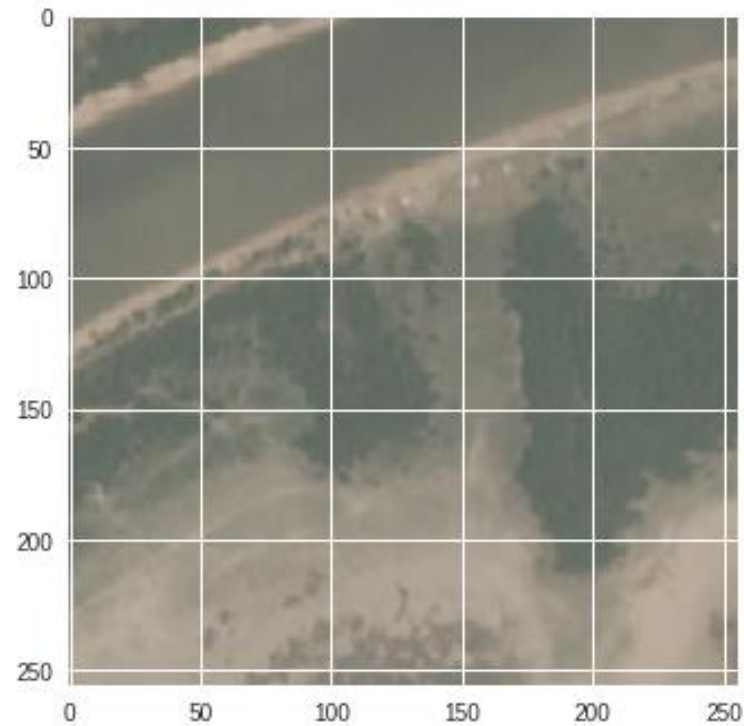
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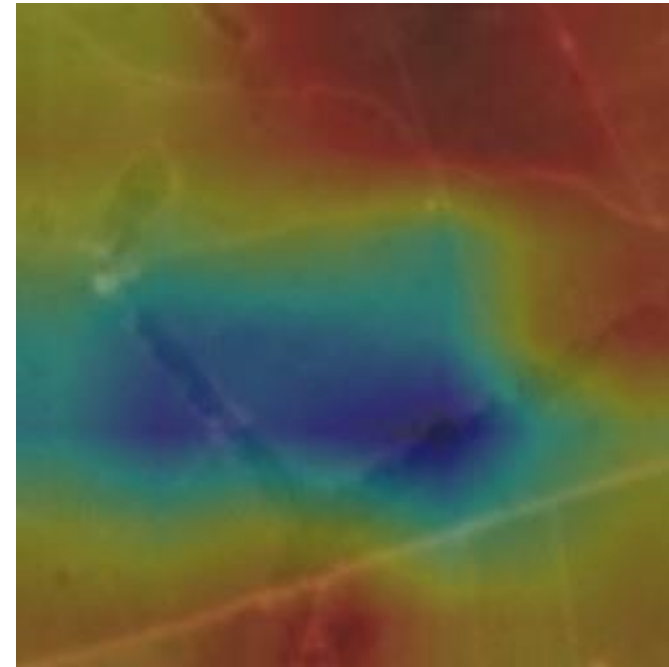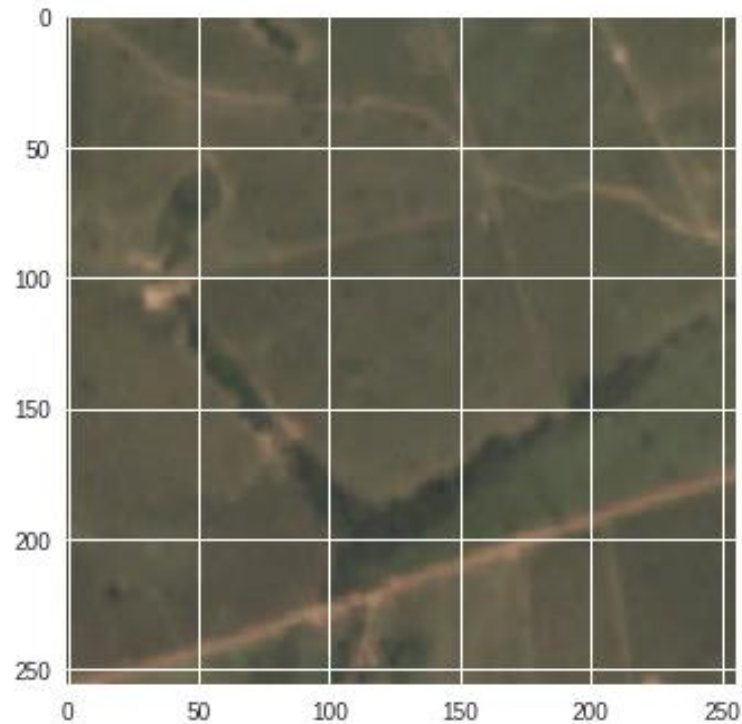**Understanding the object classification: Class activation maps**

Q&A

Plotting the discriminative image regions used by the CNN

The model uses the activated areas (red) to predict the probability of having water in the image

Plotting the discriminative image regions used by the CNN

The model uses the activated areas (red) to predict the probability of having road in the image

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