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# Optimizing Neural Networks for Cloud Detection

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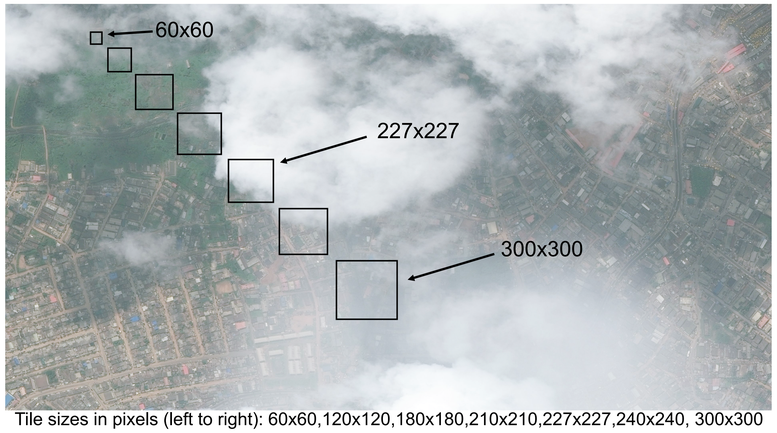
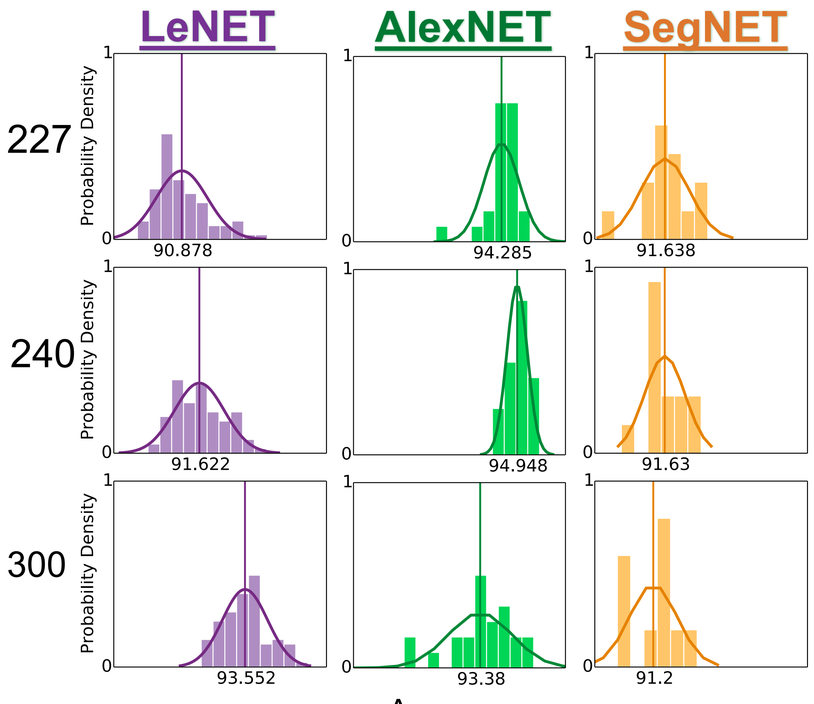
## Background

Neural networks are used extensively for image classification, and consist of an input layer, several hidden layers, and an output layer. The net works iteratively, progressing through each hidden layer, transforming its input, and outputting the input for the next layer. When the network reaches the final output layer, it makes a predictive classification: it then compares its prediction to the expected classification and 'learns' accordingly. Given a satellite image, can we use a neural network to locate clouds?

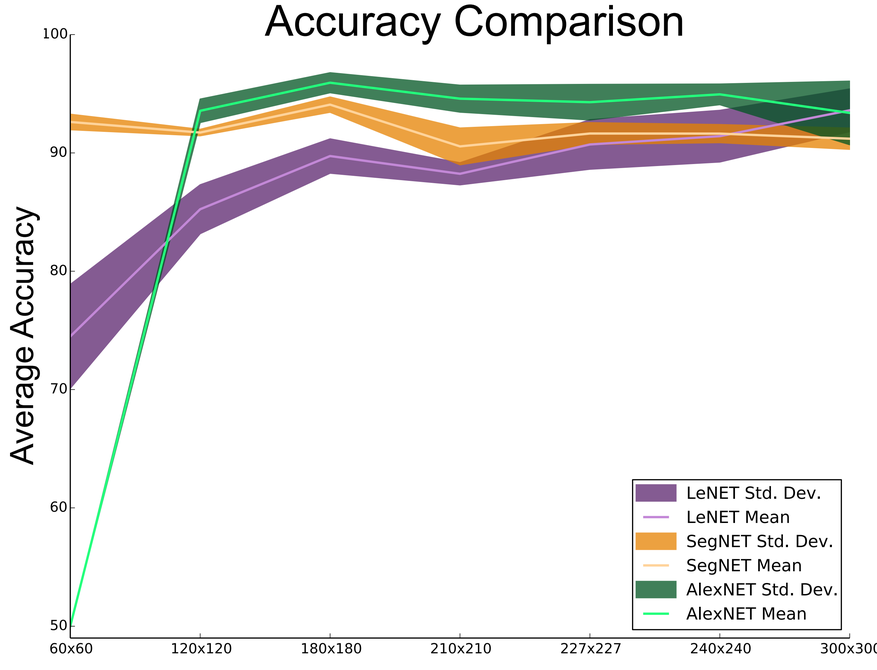



Tile sizes in pixels (left to right): 60x60,120x120,180x180,210x210,227x227,240x240, 300x300

## Experiment



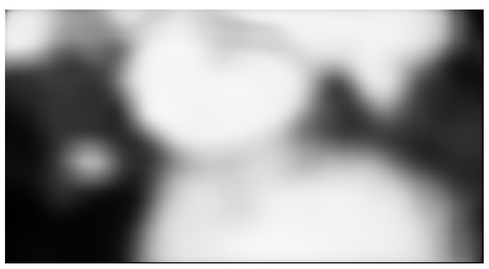

- Increases with size
- Nearly constant
- Nearly constant



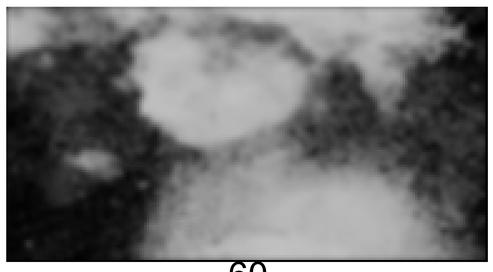

- Train and test network for each tile size
- Record max test accuracy for each test run

## Results

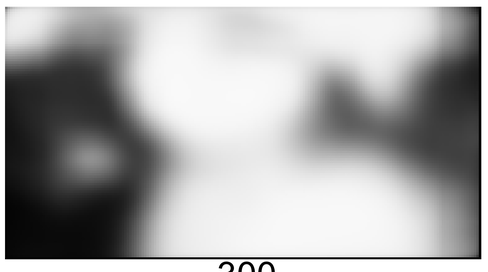
Original



227



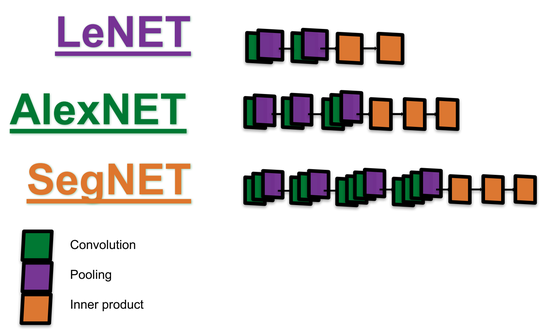
60



300

### What is the optimal tile size?

- Tile the full image into X by X squares
- Use network to classify each tile as cloud or no cloud
- Iterate over the the full image with overlapping tiles
- Calculate an average score for each pixel
- Create an image from the matrix of average scores




## Discussion

Overall, our study shows that optimal tile size depends on the neural network used. In the future, we would like to explore the effect of a random crop for certain tile sizes. For example, would a 300x300 tile randomly cropped down to 227x227 yield a higher accuracy than a 300x300 tile? We also would like to investigate the correlation between a higher classification accuracy and the resulting prediction map. Does tile size factor into the prediction map? Would a smaller tile size with a low classification accuracy create a better map than a larger tile size with a more accurate classification?

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