

Neural networks in fMRI prediction

By: Hisham Ahmed, Ahmed Tarek, Ahmed Arafat, Eman Ali
Proud binturongs



Outline of the project

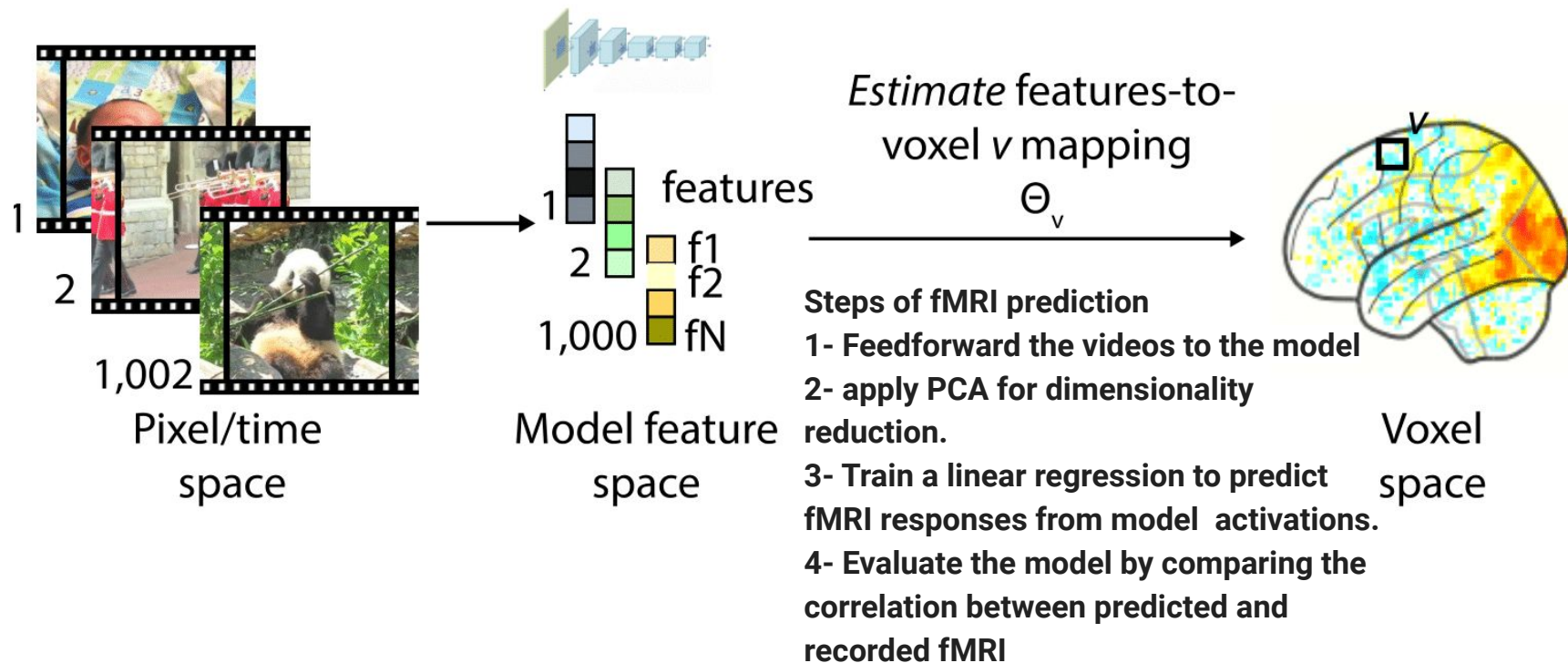
Is there a network that outperforms AlexNet in Feature extraction?

- The goal of our project is to assess the performance of different neural networks for feature extraction.
- We created different models and extracted features for fMRI prediction of AlexNet, ResNet and we compared between them.

Data

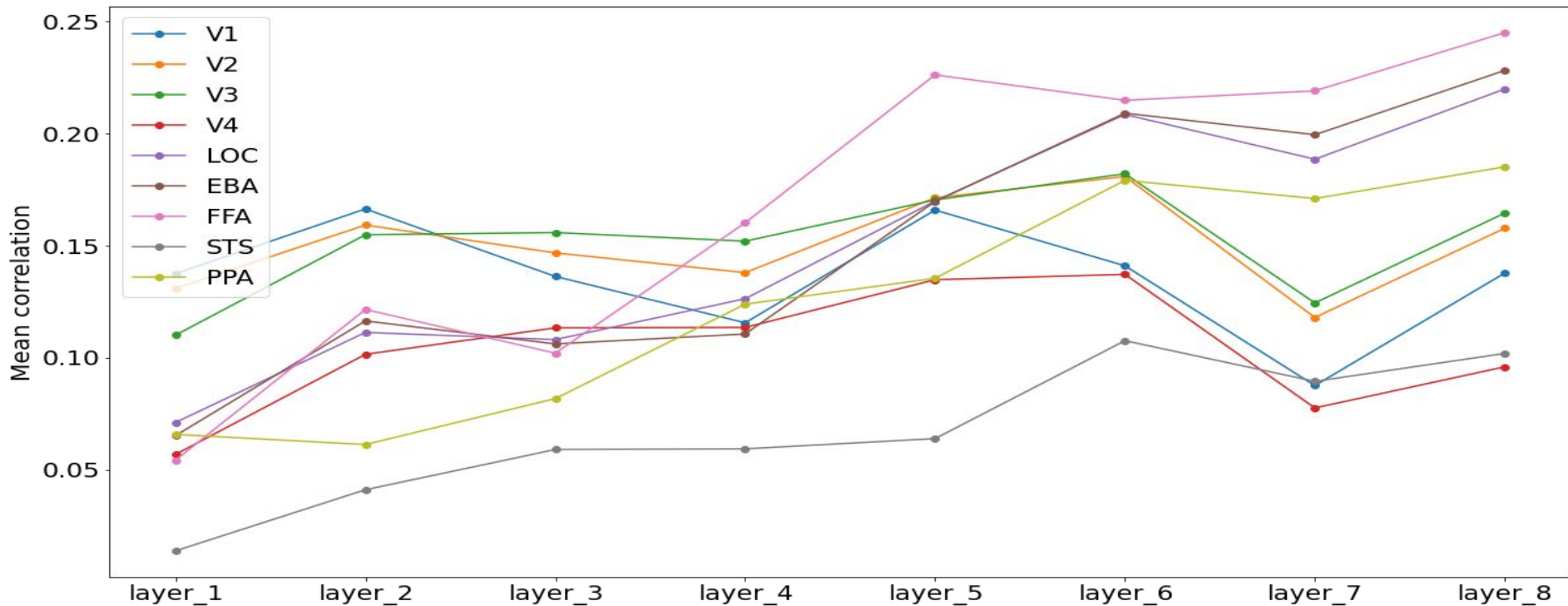
1000 clips, 3-s long video clips of everyday events.

The brain responses are measured with functional magnetic resonance imaging (fMRI)



Different layers → Different brain regions

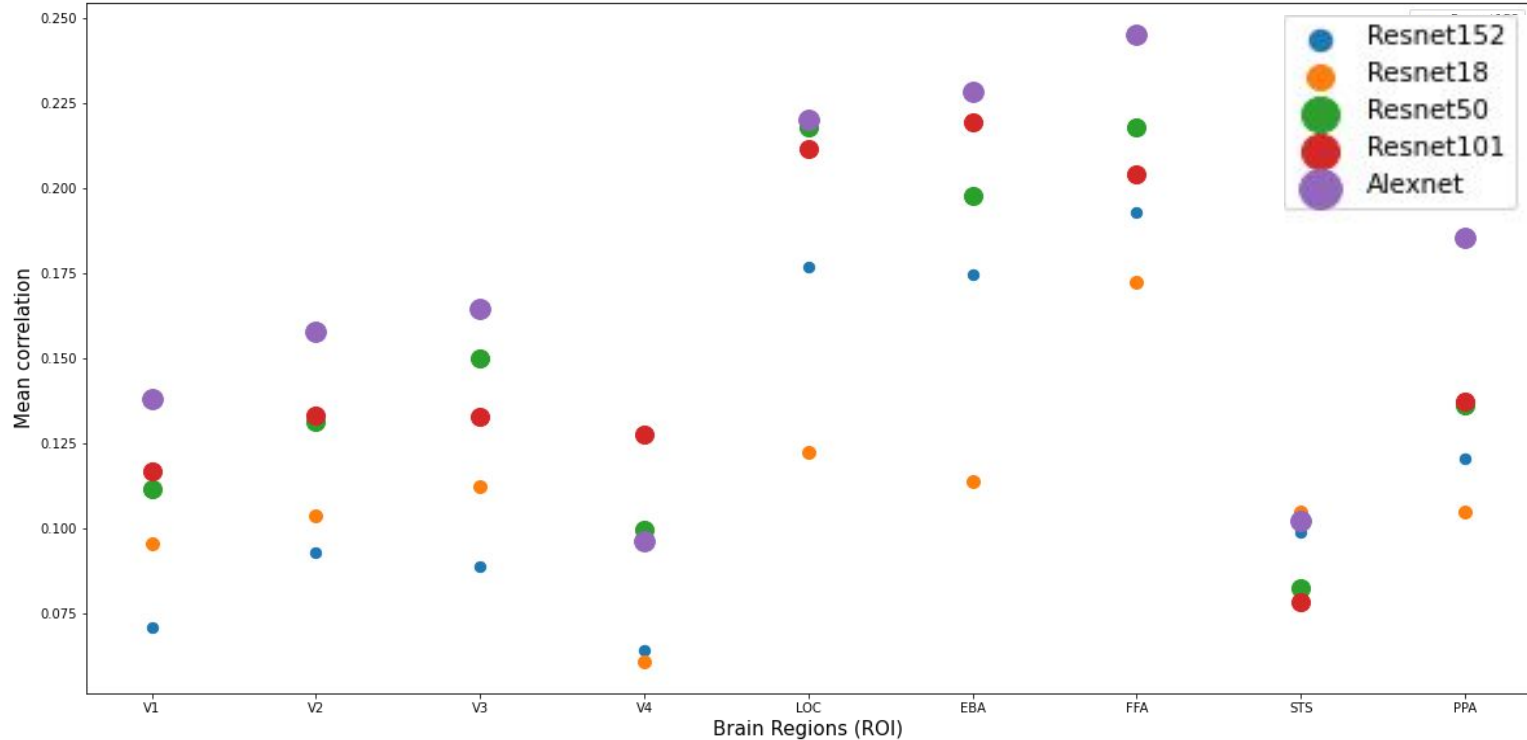
- Different layers behave differently on different brain regions
- We focused on using the last layer



Different Neural Networks

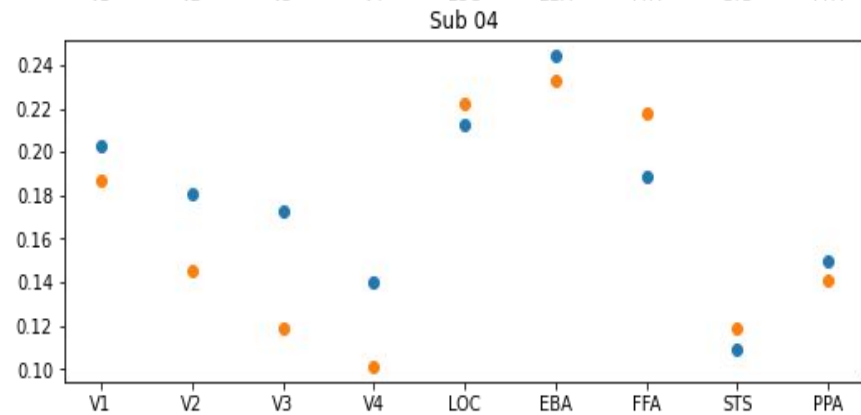
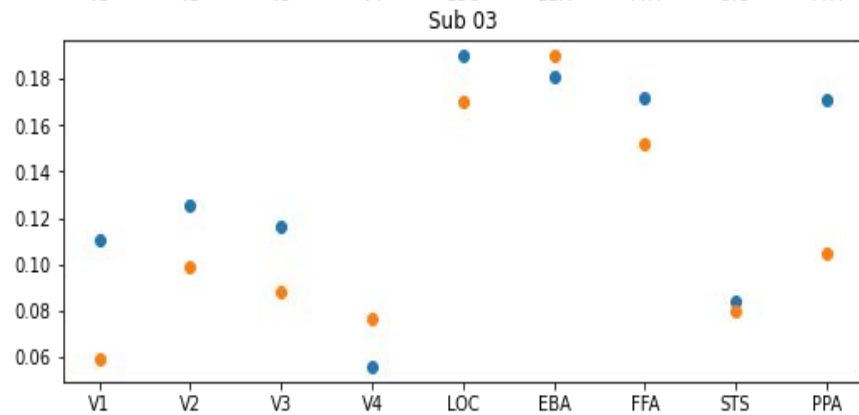
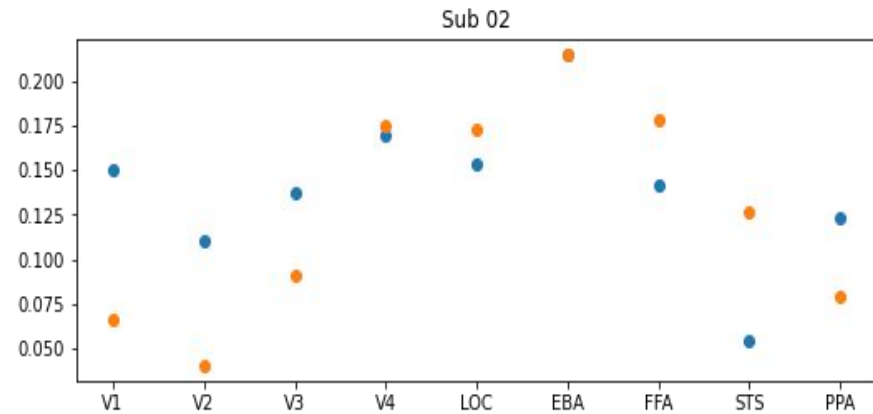
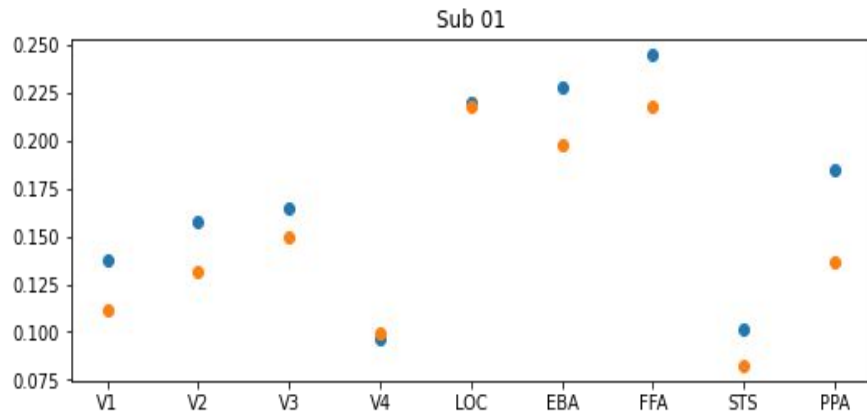
We used the following networks to do the feature extraction: AlexNet - ResNet18 - ResNet 50 - ResNet 101 - ResNet 152

AlexNet showed the best performance while ResNet 50 come in the 2nd place



AlexNet vs ResNet 50

Alexnet (in blue) outperformed ResNet 50 (orange) in all of the 10 subjects

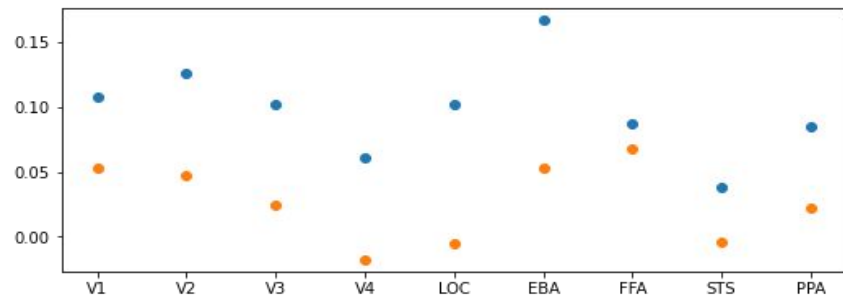


AlexNet vs wide_ResNet 50

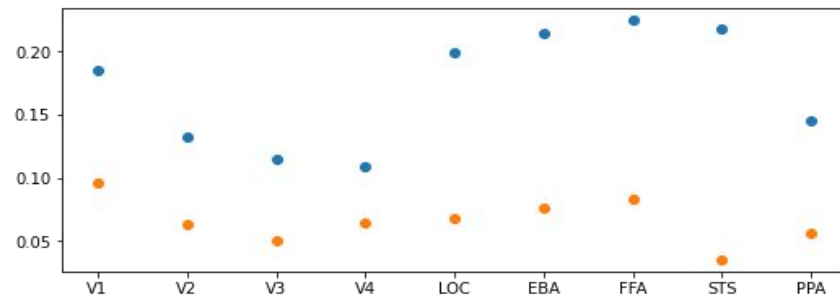
The model is the same as ResNet50 except for the number of channels which is twice larger in every block.. last block in ResNet-50 has 2048-512-2048 channels, and in Wide ResNet-50-2 has 2048-1024-2048.

Alexnet outperformed wide resnet in all of the 10 subjects

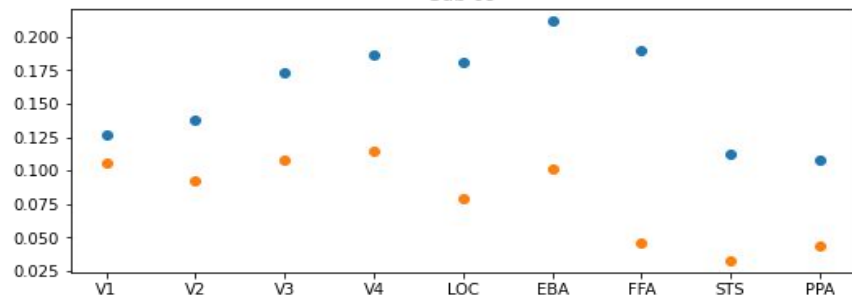
Sub 07



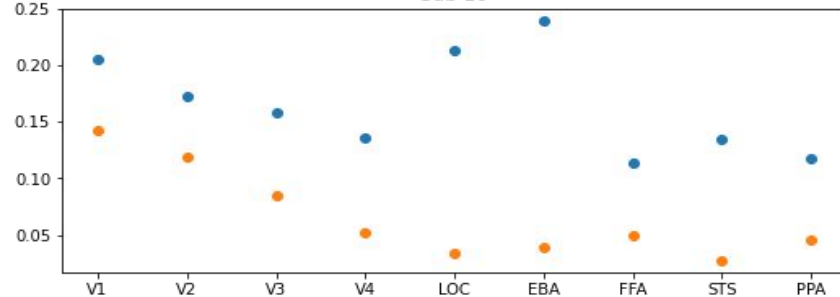
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Sub 09



Sub 10



Limitations and future plans

Limitations

- It was difficult to collect more data from the model due to the limitation of the GPU and RAM enforced by Google colab.

Future plans

- use more layers in the prediction comparison to verify results
- bring more network types in the comparison to assess their performance
- Find a better IDE than google colab, or run on a strong PC

*Thank
you!*

Any Question?