# Aligning Deep Neural Networks and Visual Cortex

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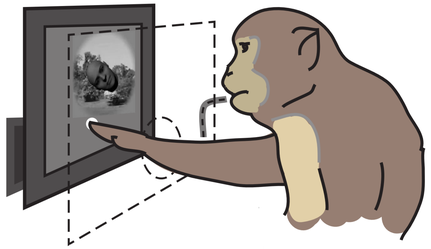
## How can we compare artificial and biological neural networks?

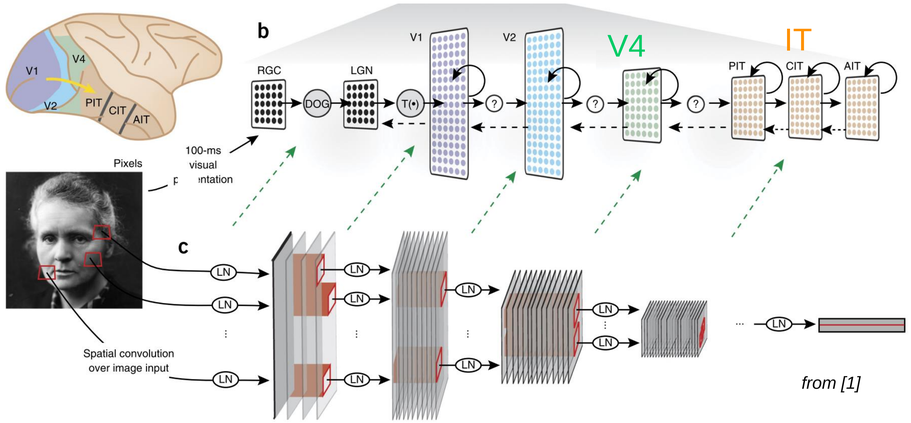
Artificial neural networks in computer vision as well as the brain's visual cortex aim to solve the task of object recognition.

To compare the biological and silicon implementation, we compute a similarity score between the two systems.



We analyze the internal representations of an artificial network by comparing to neural recordings. These are obtained from macaque monkeys performing a visual task on the same images.

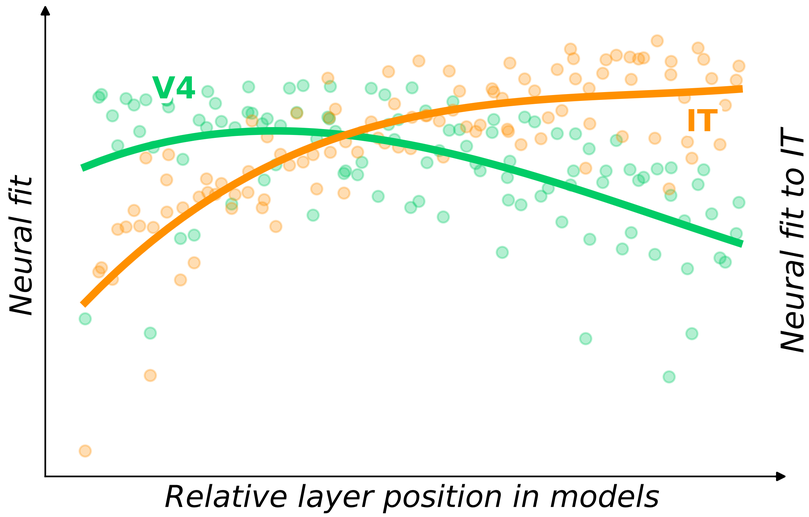
## Neural Metrics




A neural metric outputs a score based on how similar model and cortex are: we take a subset of the images, fit the model representations to the neural recordings with linear regression and test predictivity on the held-out images

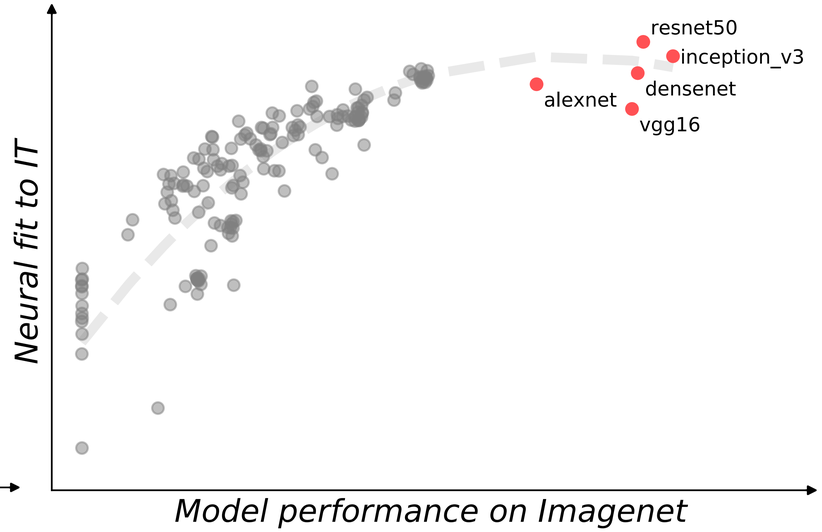
## Ordering of areas preserved in model layers

Early layers in silicon are best at predicting early area V4 in the visual cortex, later layers best predict downstream area IT.




## Correlation with performance flattens out

Neural predictivity is correlated with model performance, but seems to flatten out at the performance level of current models.




## Conclusion

Measuring similarity between models in machine learning and neural recordings with metrics such as the neural fit is an exciting recent development [1,2].

Neural metrics allow us to

- relate early layers in the model to early regions in cortex and later layers to later regions
- analyze factors contributing to promising models
- explore new models such as recurrence in vision [3]

*[1] Yamins, DiCarlo, 2016 [2] Yamins et al., 2014 [3] Tang, Schrimpf, Lotter et al., 2017*

## Future Directions: Online Platform