Advanced Encoding

Alexandre Pasquiou - MIND (INRIA) / UNICOG (Neurospin)
Isil Bilgin - Courtois NeuroMod / SIMEXP / CRUIGM

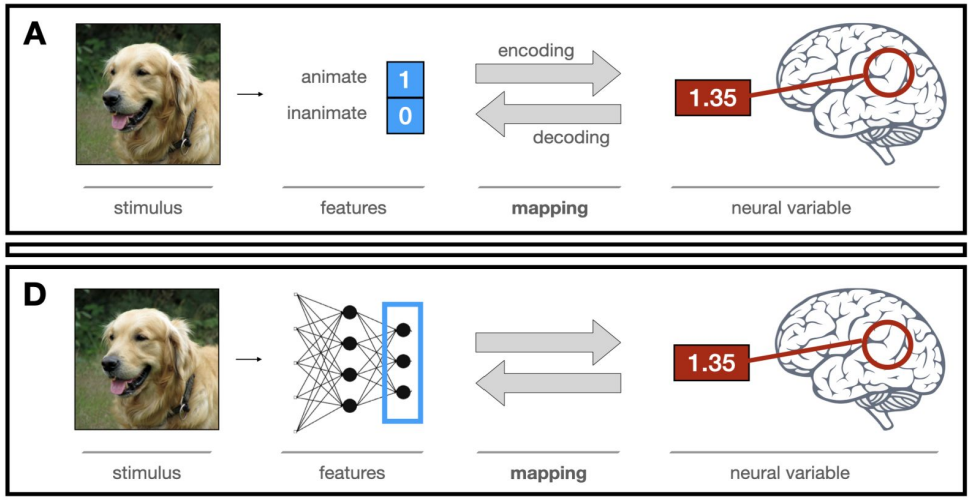
```
$ git clone git@github.com:AlexandrePsq/main_tutorial.git

$ pip install -r requirements.txt
$ pip install -e .

$ jupyter-notebook
```

Probing Brain Activity Using Model-Derived Representations

Manually derived predictors (animate vs inanimate) cannot account for the richness of information in the stimuli.

To build richer representations, we need ML model-derived features.

The richer your representations, the more fMRI signal it will explain.



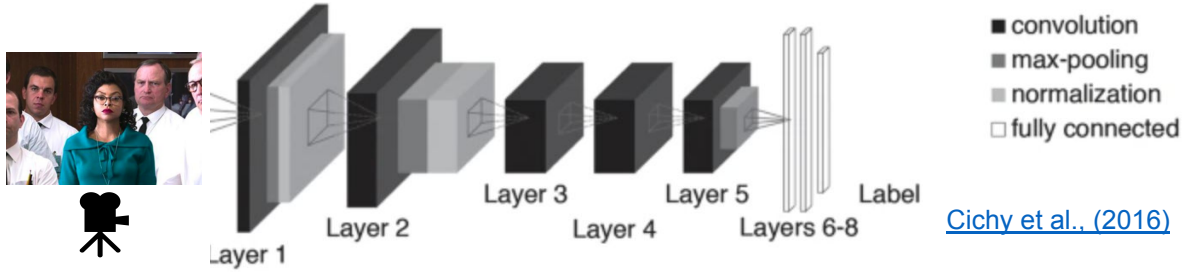
Underlying hypothesis

If my model explain well fMRI data in a brain region A.

Then the probability that A and my model process the same information is high.

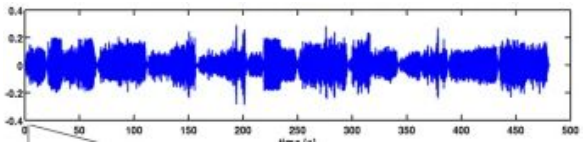
Different Stimuli, Different Models

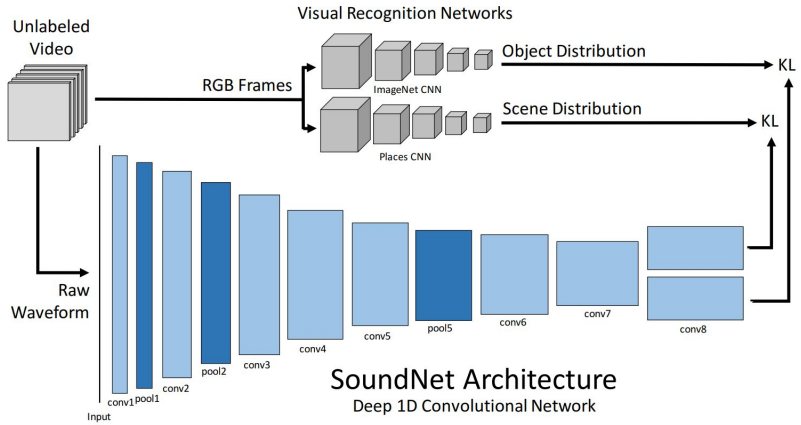
Visual Encoding (Convolutional Neural Networks - CNN)



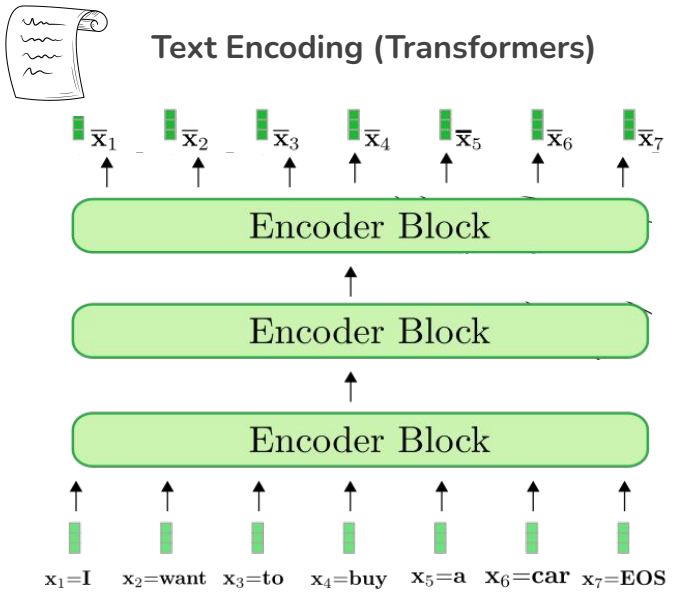
Cichy et al., (2016)

Video Encoding (SoundNet Architecture)





Text Encoding (Transformers)



"I want to buy a car"

https://huggingface.co/blog/encoder-decoder

Loading the data

+

Preprocessing the data

Building Richer Stimuli Representations

Each model has its own specificities:

- It's architecture (Number of Layers, Embeddings dimension, Operations performed)
- The data it was trained on (quantity and nature),
- The task it was trained for,
- The objective function it was trained to optimize.

→ When studying brain data with model-derived features, the choice of the model and its training will impact the results !! (Pasquiou et al, ICML 2022).

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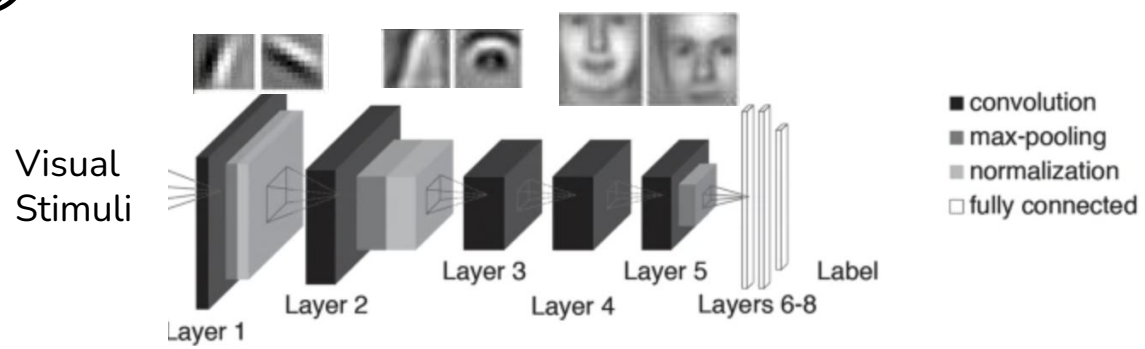

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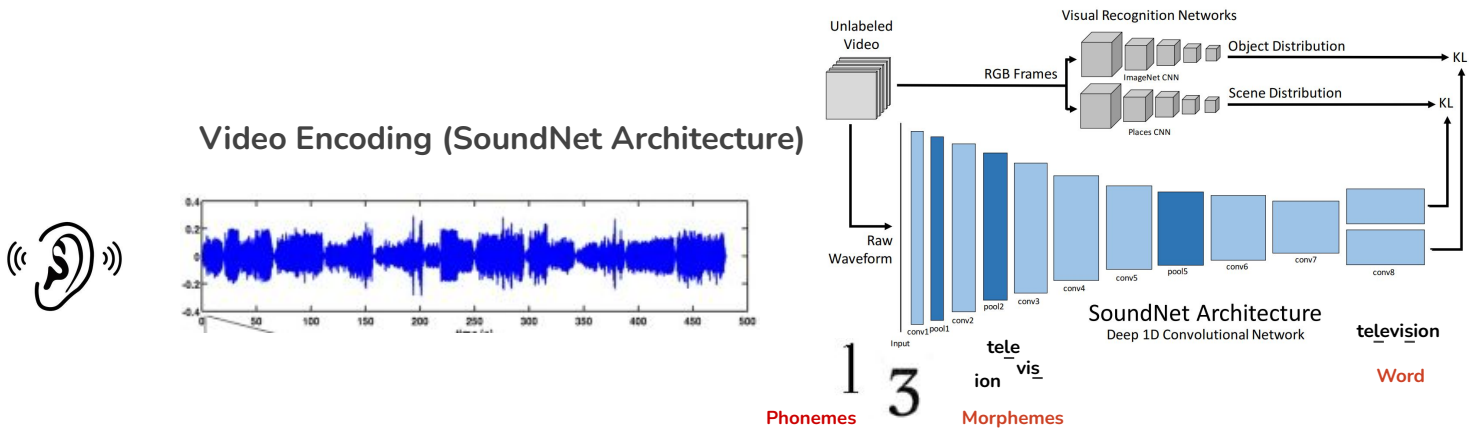

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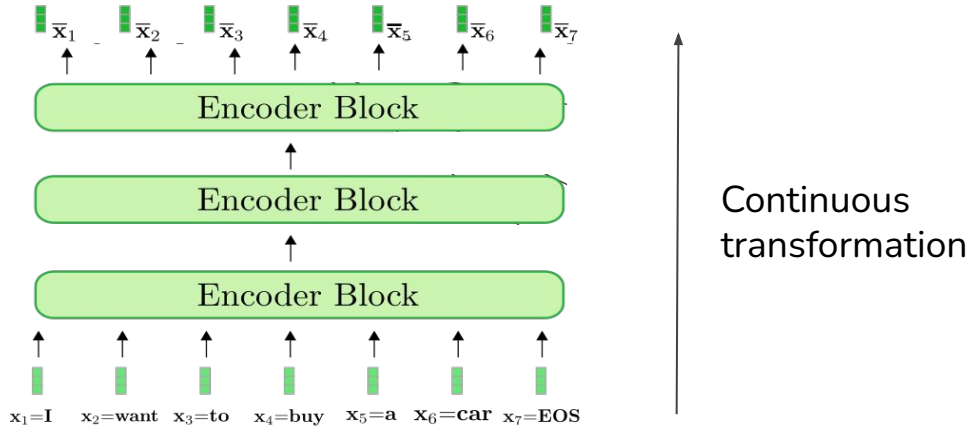


Continuous transformation

"I want to buy a car"

Load the models

+

Extract representations from the models

Extracting features from a text

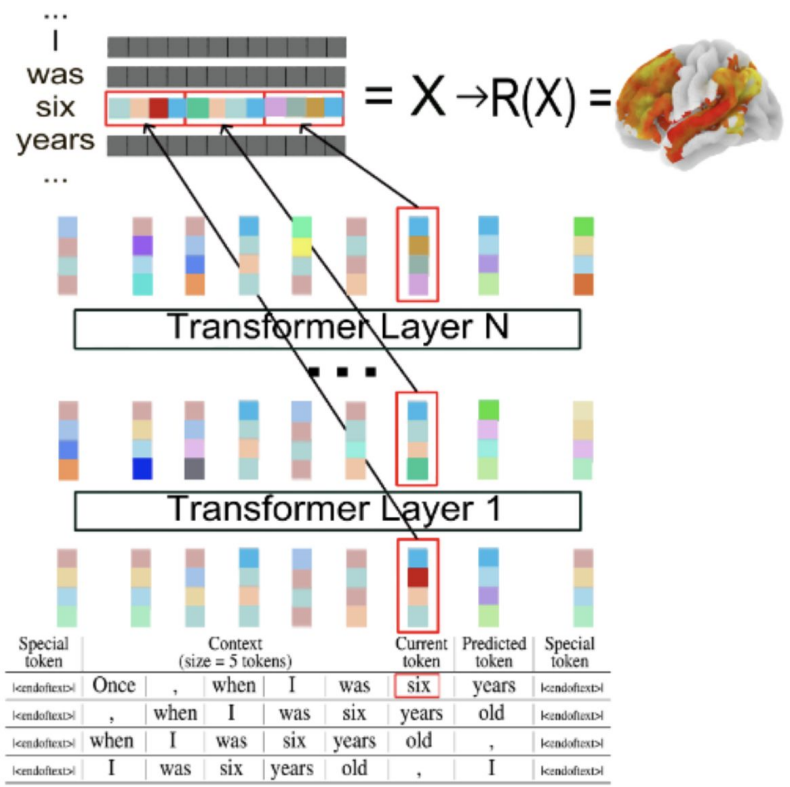
GloVe

Once →

When →

I →

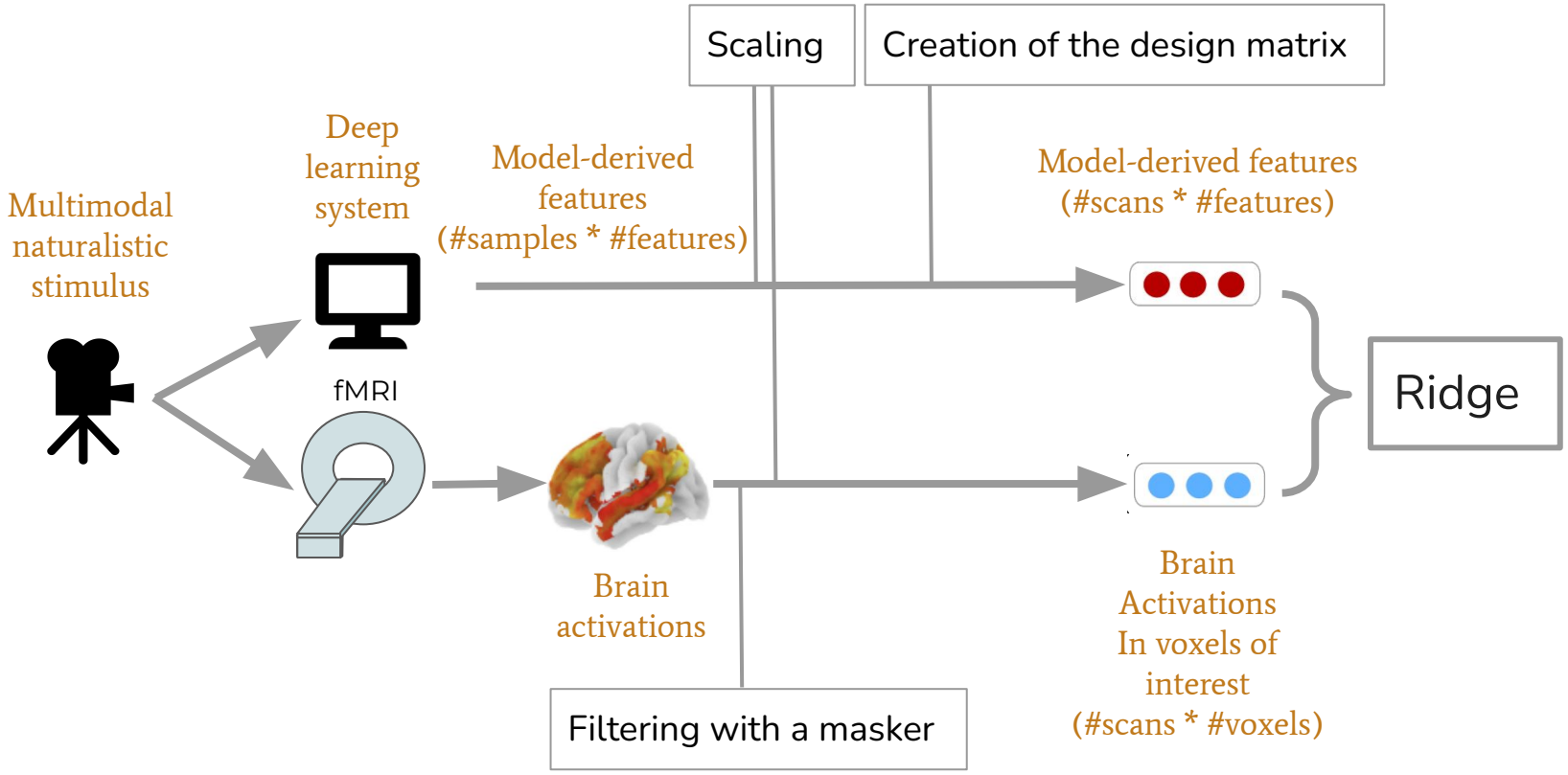
GPT-2

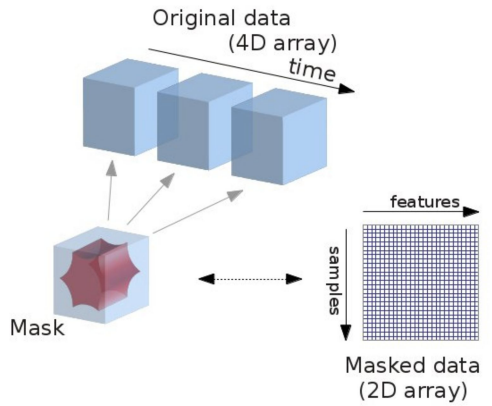


Pasquiou et al., 2023 (in prep.)

Encoding Pipeline

Extracting features from a text





Tutorial Time!