Neural networks Sparse coding - relationship with VI



# **RELATIONSHIPWITHVI**

**Topics:** VI neurons vs. sparse coding

- Natural image patches:
  - small image regions extracted from an image of nature (forest, grass, ...)



# RELATIONSHIP WITH VI

#### **Topics:** VI neurons vs. sparse coding

- When trained on natural image patches
  - the dictionary columns ("atoms") look like edge detectors
  - each atom is tuned to a particular position, orientation and spatial frequency
  - VI neurons in the mammalian brain have a similar behavior



Emergence of simple-cell receptive field properties by learning a sparse code of natural images. Olshausen and Field, 1996.

# RELATIONSHIP WITH VI

**Topics:** VI neurons vs. sparse coding

- Suggests that the brain might be learning a sparse code of visual stimulus
- Since then, many other models have been shown to learn similar features
  - they usually all incorporate a notion of sparsity



Emergence of simple-cell receptive field properties by learning a sparse code of natural images. Olshausen and Field, 1996.