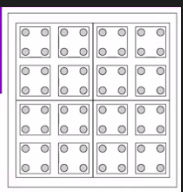
CNNs

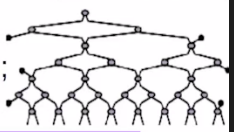
- Signals that comes to you in the form of (multidimensional) arrays.
- Signals that have strong local correlations

CNNs exploit local correlations

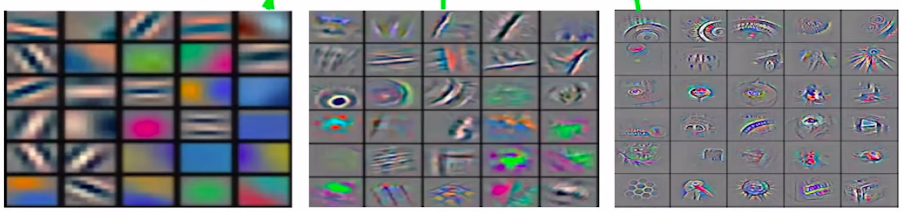
The world is compositional



- **Convolutional networks learn hierarchical representations**
  - Upper-layer representation are at a coarse spatial scale
    - Compositional hierarchies In physics: Renormalization group theory; Multi-scale entanglement renormalization ansatz (MERA); ....



Low-Level Features → Mid-Level Features → High-Level Features → Trainable Classifier

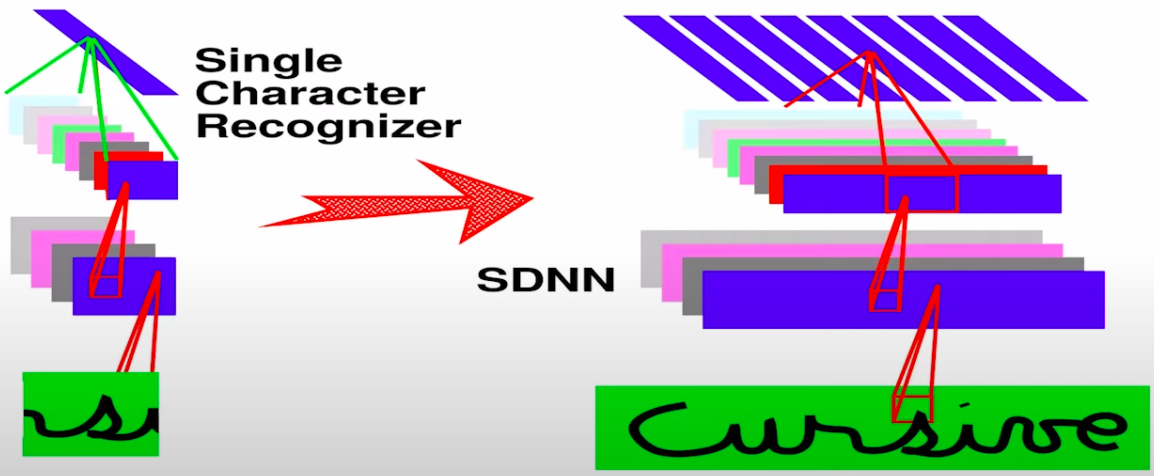


Feature visualization of convolutional net trained on ImageNet from [Zeiler & Fergus 2013]

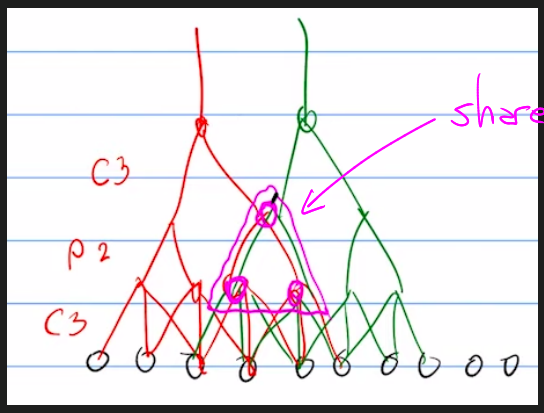
Multiple Character Recognition.

Multiple Character Recognition [Matan et al 1992]

- **Every layer is a convolution**



Non maximum suppression



shared! no need to recompute it

1×1 convolution

shared weights (multiple channels)