UNIVERSITÀ DEGLI STUDI DI PADOVA

Transfer learning

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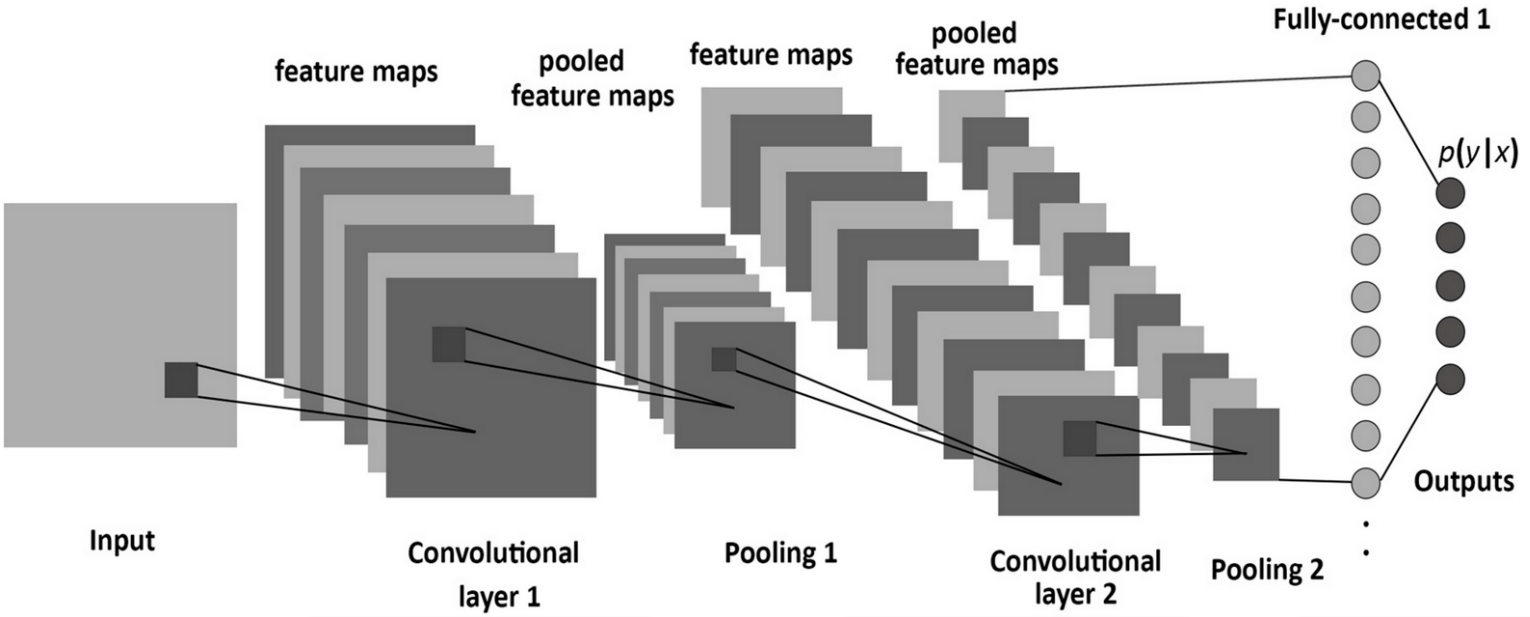
Agenda

- Transfer learning & fine tuning
- Transfer learning patterns

Transfer learning: concept

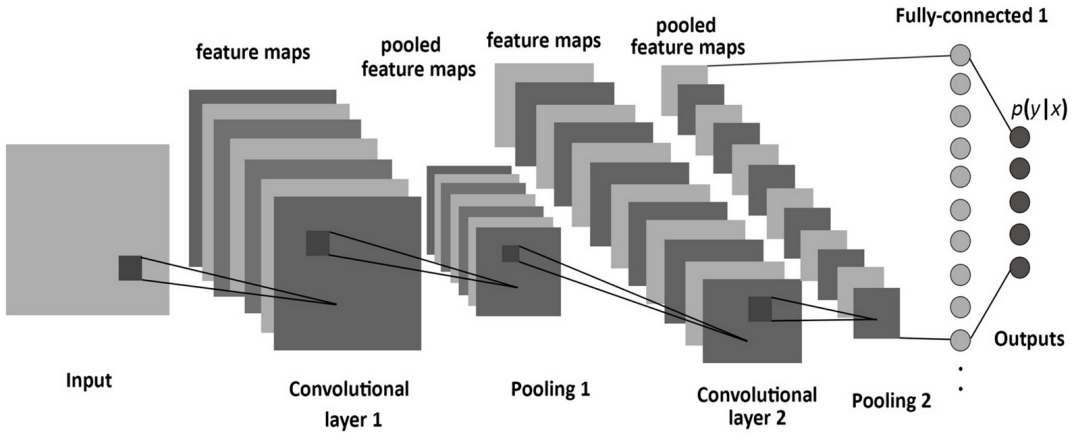
- Solve one problem, then apply (part of) the solution to a different, but related, problem
- Motivation
  - Exploit trained network: no need to train from scratch
    - Shorter time
    - Small datasets are ok
  - In a nutshell: "Don't try to be an hero" ~Andrej Karpathy

Generic vs specific features



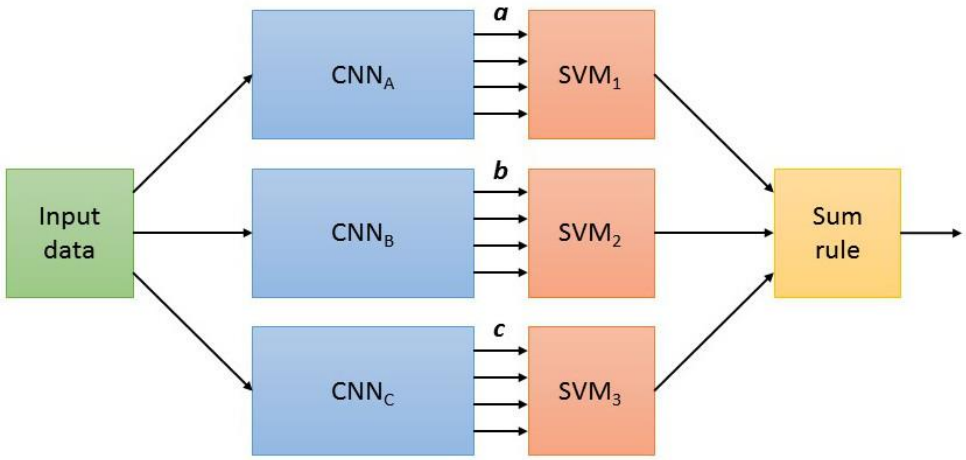
Transfer learning: patterns

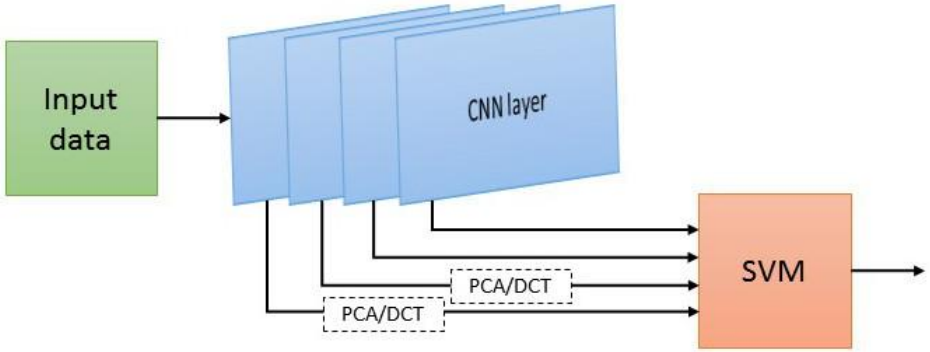
- Simplest pattern:
  - Take a pre-trained network
  - Reset the last layers
  - Freeze the deeper layers
  - Train



Transfer learning: patterns

- Several other patterns and combinations
- Some examples:
  - Exploit the output of pretrained networks as feature vector
    - Useful when the output stage provides multiple values
  - Exploit the features provided by inner layers
    - High feature dimensionality, reduction might be needed





Fine tuning

- Fine-tuning is slightly different
  - Optionally: **reset or remove** part of the network (typically, classification stage)
  - Resume training on the new dataset
- Needs larger datasets WRT transfer learning
- **Warning:** definitions of transfer learning and fine tuning are not coherent across different authors, blogs, …

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