ML in Applications

**Dipartimento di Automatica e Informatica
Politecnico di Torino, Torino, ITALY**

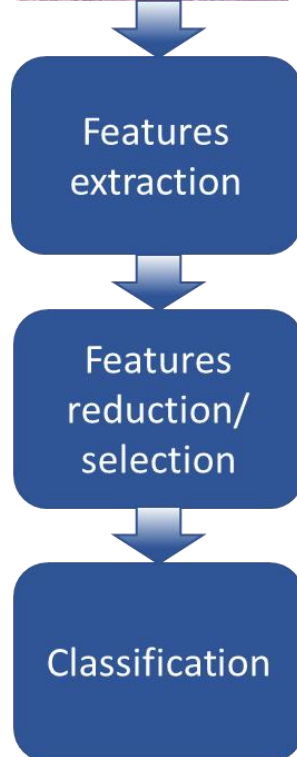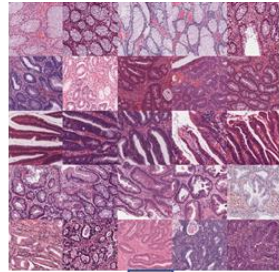**Politecnico di Torino**
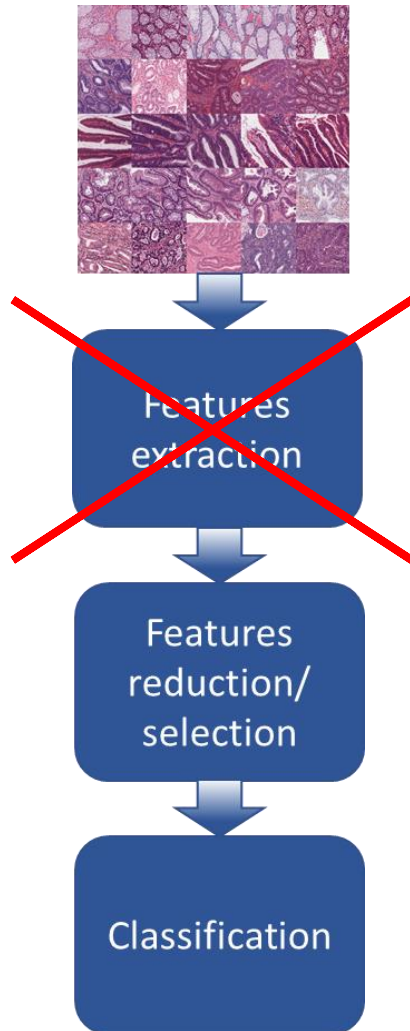
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Lab 5

Transfer learning

Standard image analysis

- Canonical machine-learning based images analysis:
  - Features extraction
  - Features reduction/selection
  - Classification

- The dependence on a **fixed set of handcrafted features** is a major limitation to the robustness
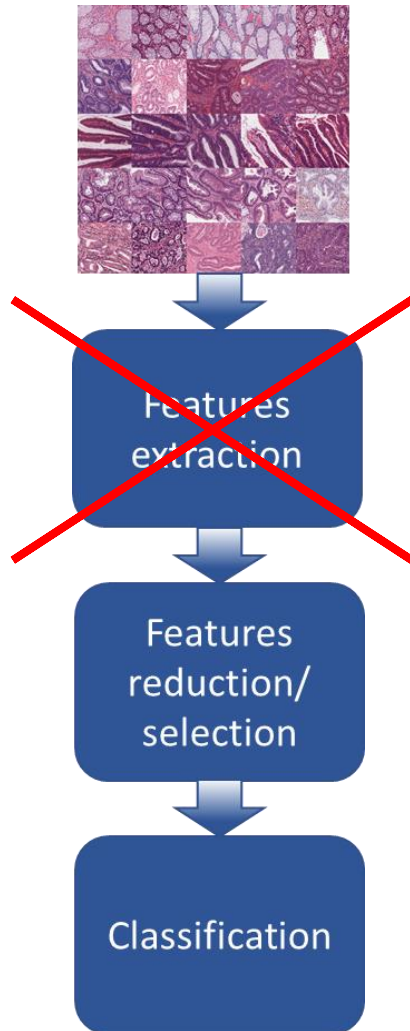
Why deep learning?

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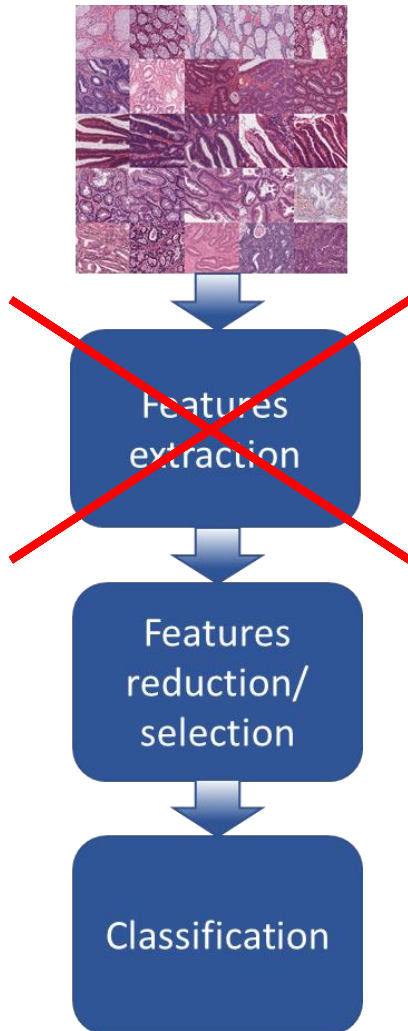
Why deep learning?

Pros:

✓ DL extract **hierarchical** knowledge from the data itself.

✓ No needs for handcrafted features

Why deep learning?

Cons:

x Huge dataset (10^6 images)

x High computational power
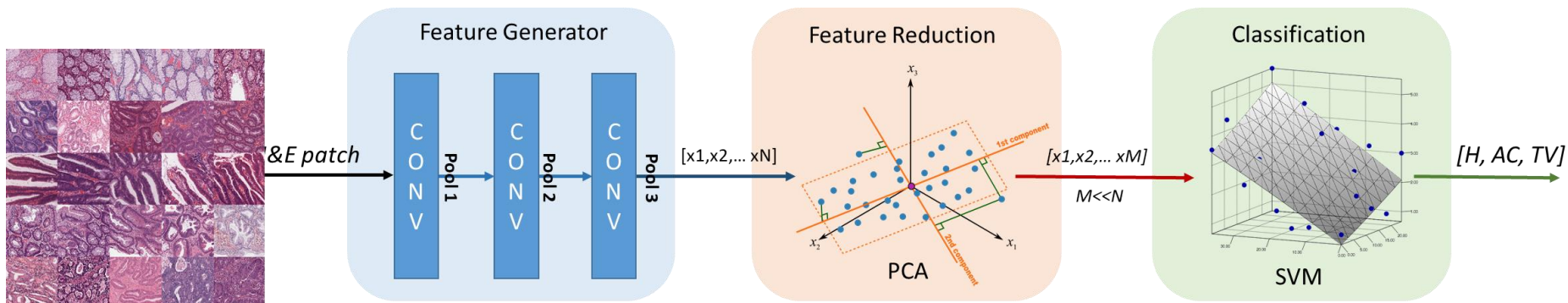
x Difficult to find in everyday clinic.

Transfer learning

- The **pretrained** model are trained on the ImageNet 2012 dataset (1.2 million photographs from 1000 different categories of natural objects).
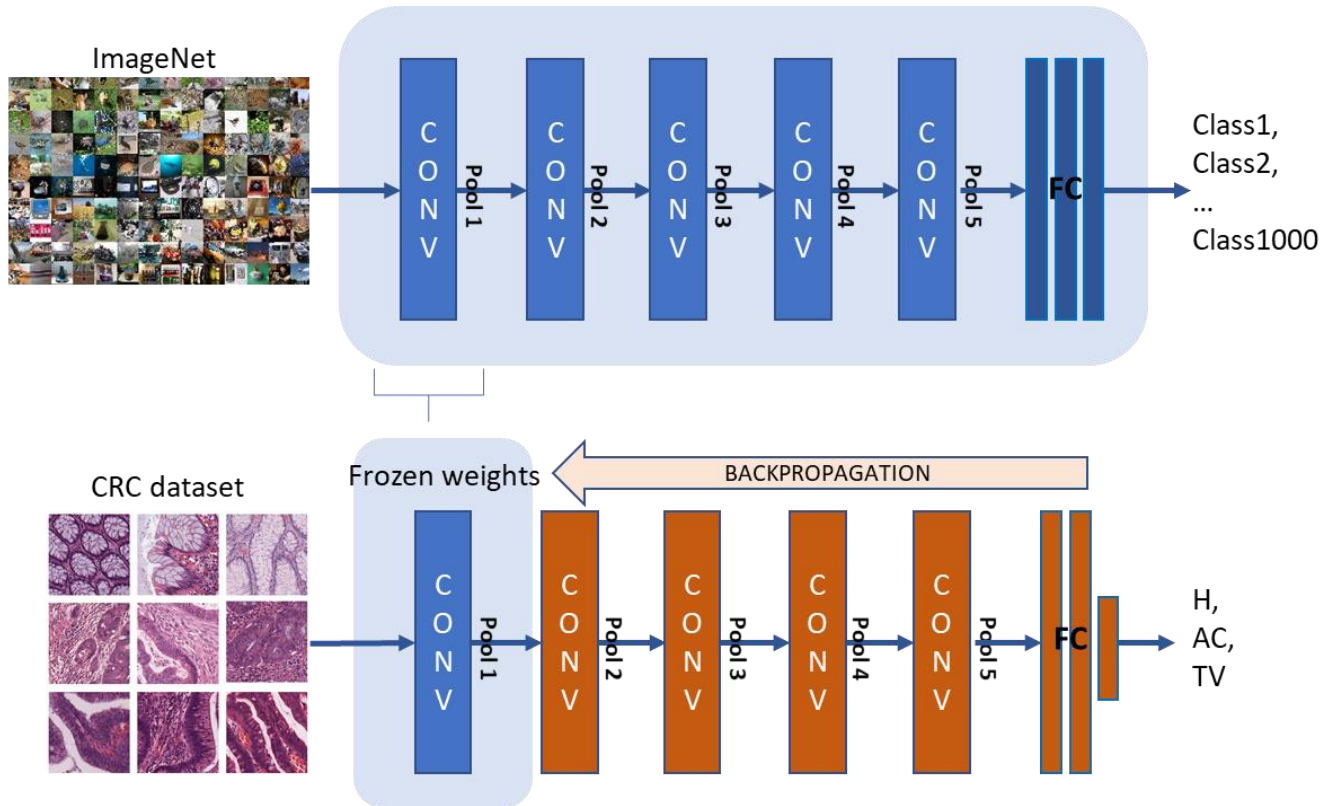

- Content and characteristics are completely different from our target.

Features extraction

Feature Generator | Feature Reduction | Classification

H&E patch → CONV Pool 1 | CONV Pool 2 | CONV Pool 3 → [x1,x2,... xN] → PCA
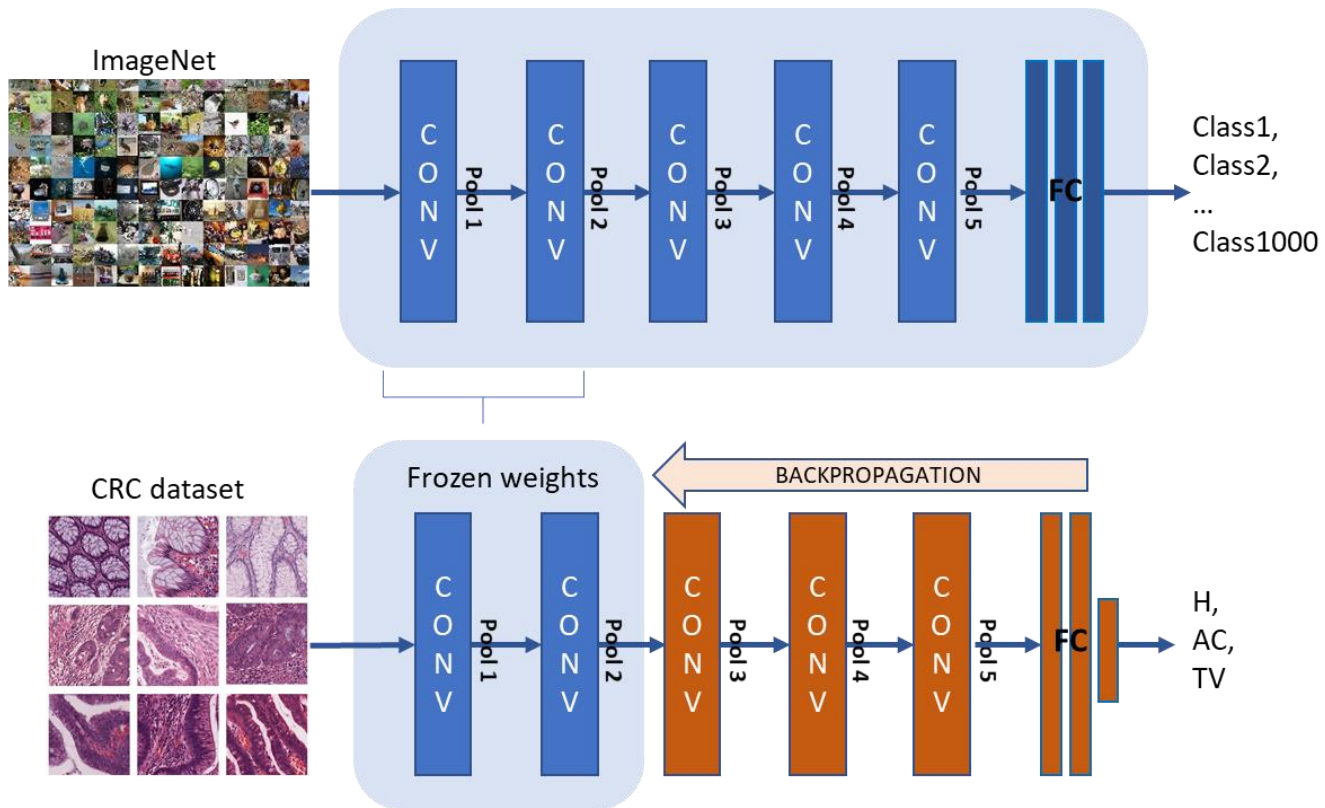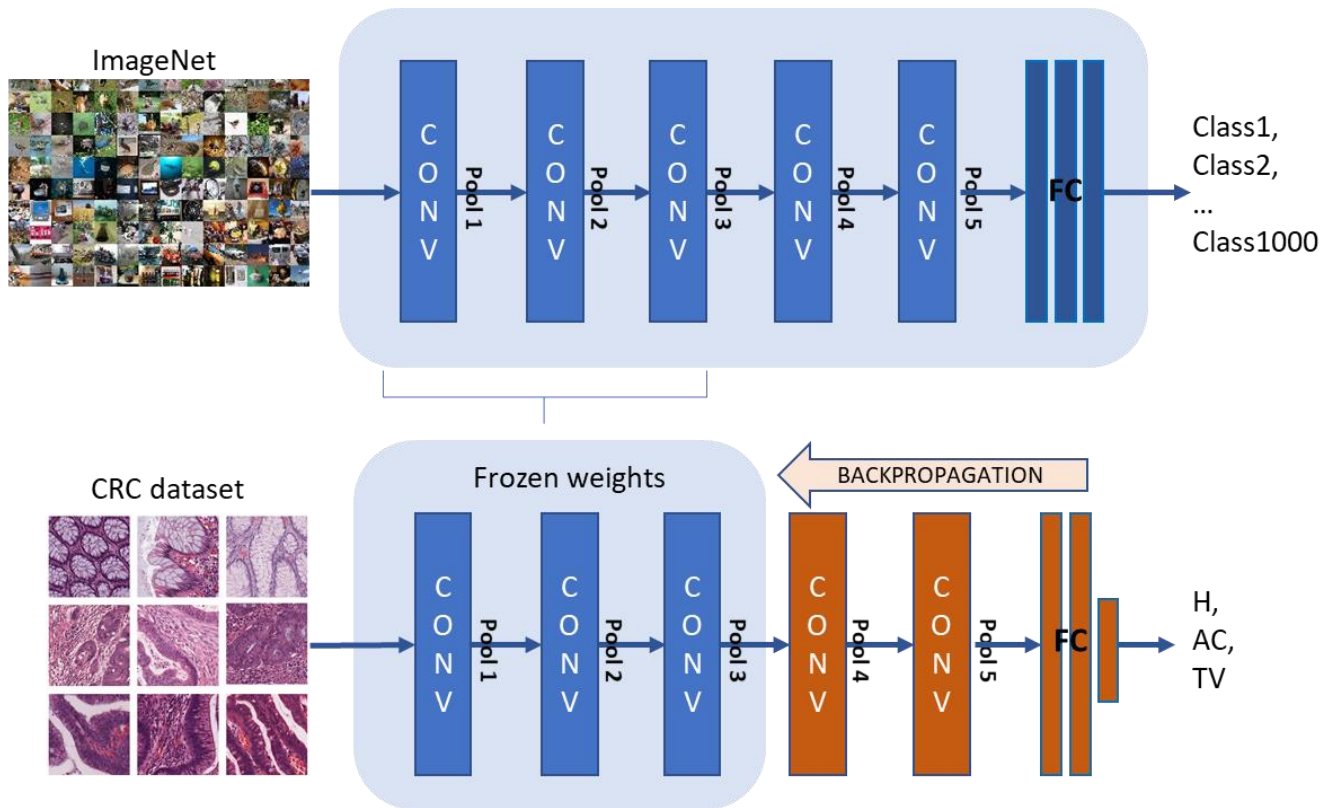
[x1,x2,... xM] M<<N → SVM → [H, AC, TV]

Fine tuning

Fine tuning

Fine tuning

Fine tuning