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Methods for large-scale image classification and application to biomedical data

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Image classification problem

- Classify images into classes
- Image recognition
- Detecting specific features and recurrent patterns
- Using AI methods

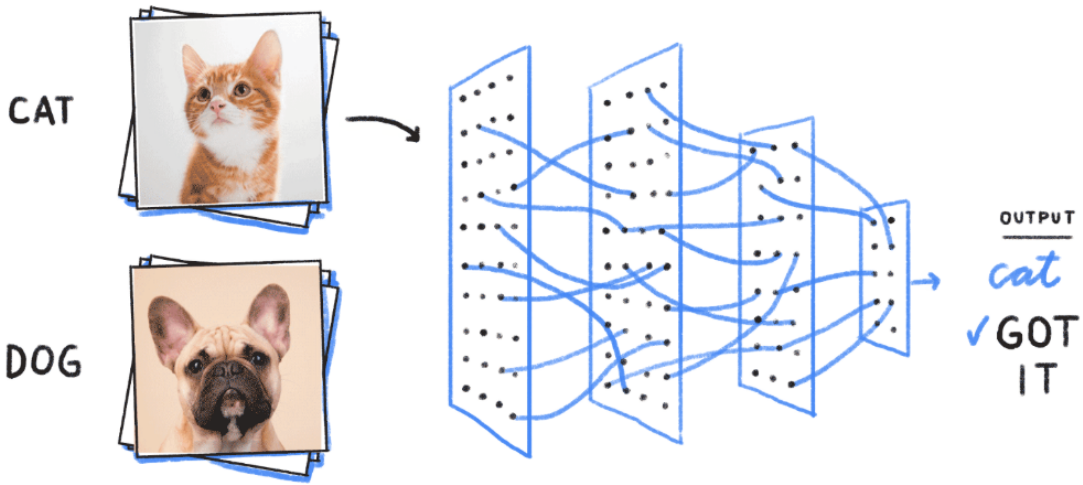

Figure 1: Dog/Cat image recognition

Life applications

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Some examples of application that are tackled in the thesis:

- Google Images
- Face recognition
- Musical images analysis (notes, spectrogram, ...)
- **Medical images analysis**

Figure 2: From left to right: Image labeling from Google, face recognition, music spectrogram

Medical field

- Radiography, magnetic resonance imaging, histological images, ...
- To detect tumors such as mammographic mass or brain lesions
- State-of-the-art on breast cancer detection

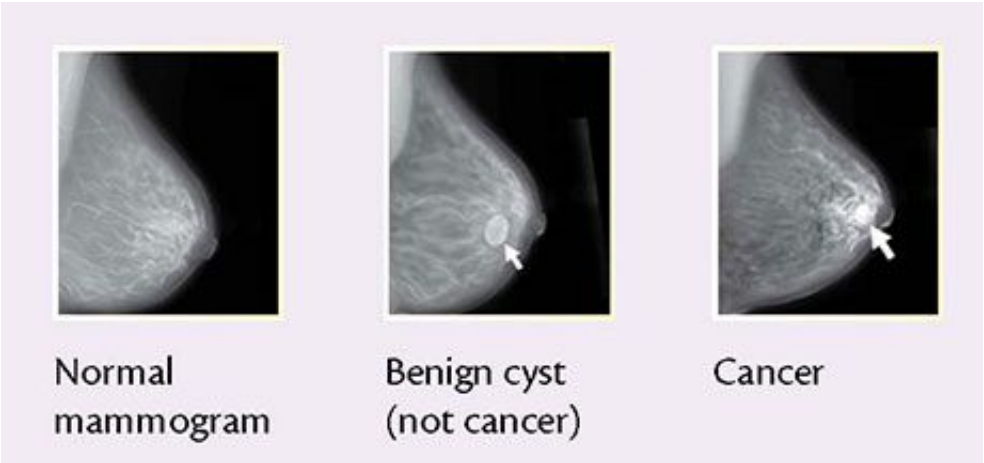

Figure 3: Breast cancer detection: benign vs malignant tumor

Classification methods

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Preprocessing on images:

- Image enhancement
- Image segmentation

Learning features and classification methods:

- Convolutional Neural Networks (CNN)
- Support Vector Machines (SVM)

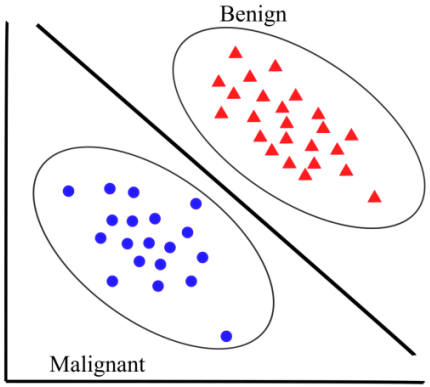

Figure 4: SVM classification output

Evaluation methods

- Compute prediction accuracy and precision
- Represented on ROC curves = $\frac{\text{True Positive Rate}}{\text{False Positive Rate}}$
- Overfit? Underfit?

Future work

- Extend the work on new challenges on many fields
- Tackle semi-supervised learning: solving approach to lack of dataset or knowledge
- Tackle the case of **noise** and lack of information: blurred images, cut images, ...
- Develop a classification system on these challenges

Thank you for your attention!