Department of Computer Science

Tecniche di machine learning per l'analisi di immagini biomedicali in ambito psichiatrico

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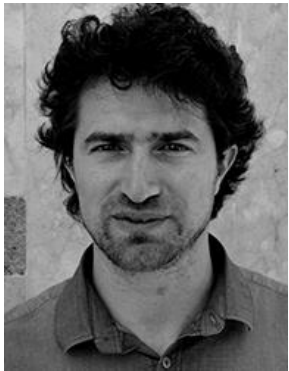
People

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Classification

▷ The overal aim of a classification framework consists of providing a theoretically sound prediction of an output decision given an input

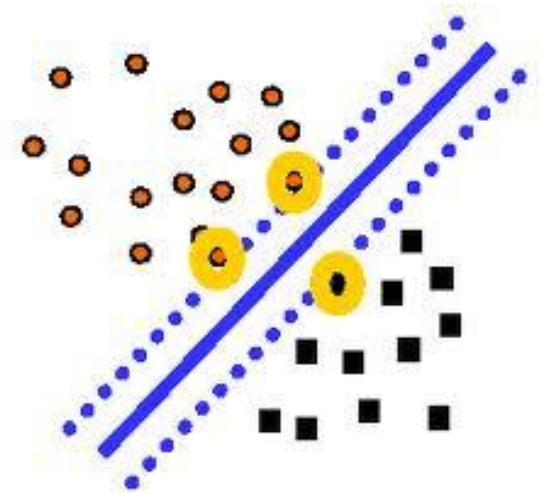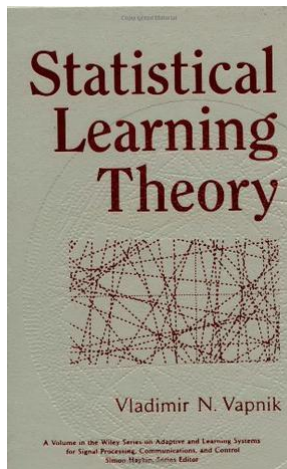INPUT

Classifier

OUTPUT

Healty ☺
or
Non-Healty ☹

Clasification

⊡ Usually classifiers are based on stastistics (i.e.,statistical learning theory),

- from 'stastistical significance' to 'predicition,'
- generalization properties,
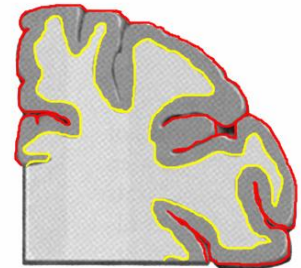- validation methods (i.e., loo cross validation),
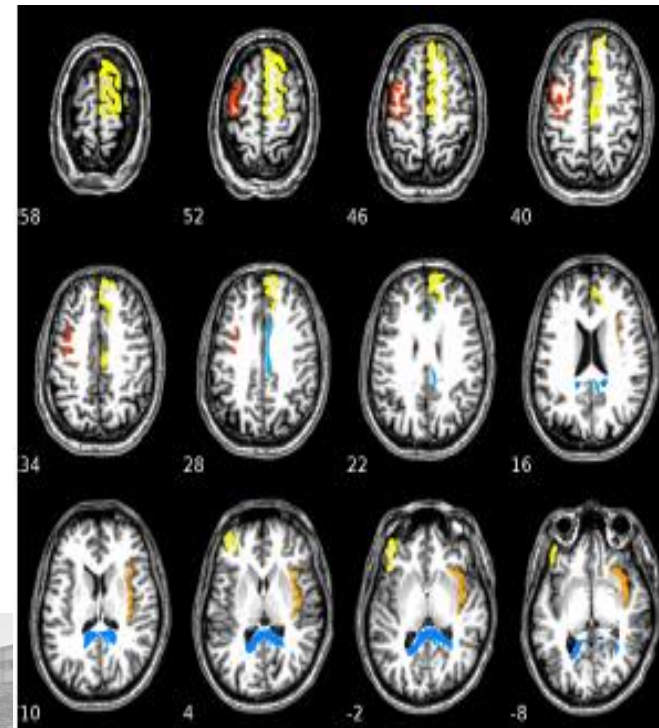

Support Vector Machines (SVM)

Classification

□ Classifiers are useful to detect brain abnormalities due to the disease
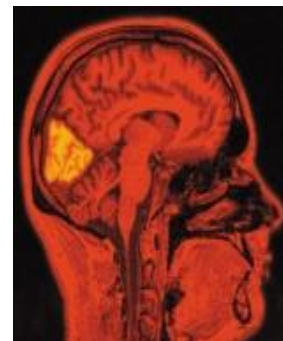
⬇

Biomarker identification
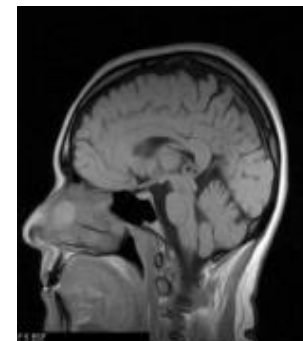
Information available

▸ ## Large amount of data:

- Nowadays several data is available for diagnostic purposes.

▸ ## Multimodal:

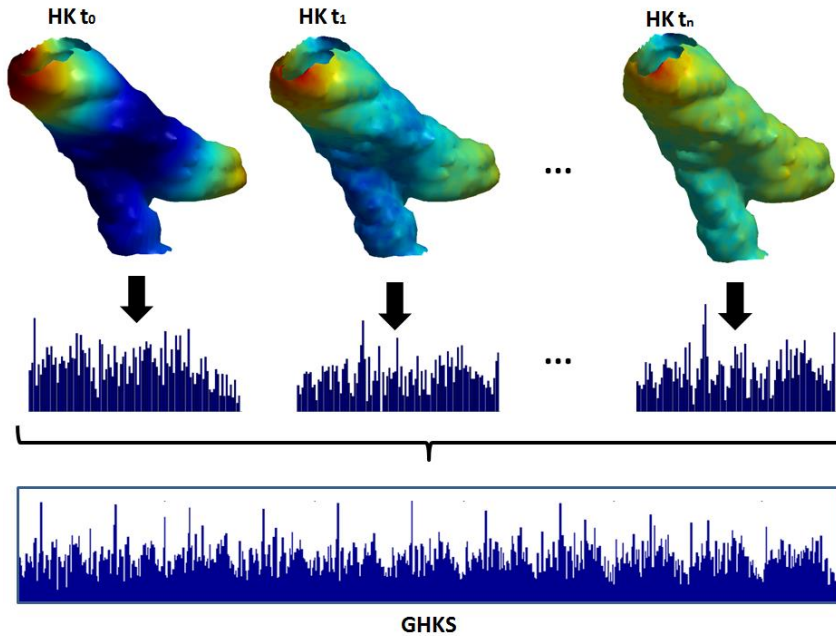- Information can be acquired from different modalities.

- How to organize such data?
- How to deal with missing data?
- How to deal with multicentric data?
- How to deal with longitudinal data?
- How to merge information coming from different sources?
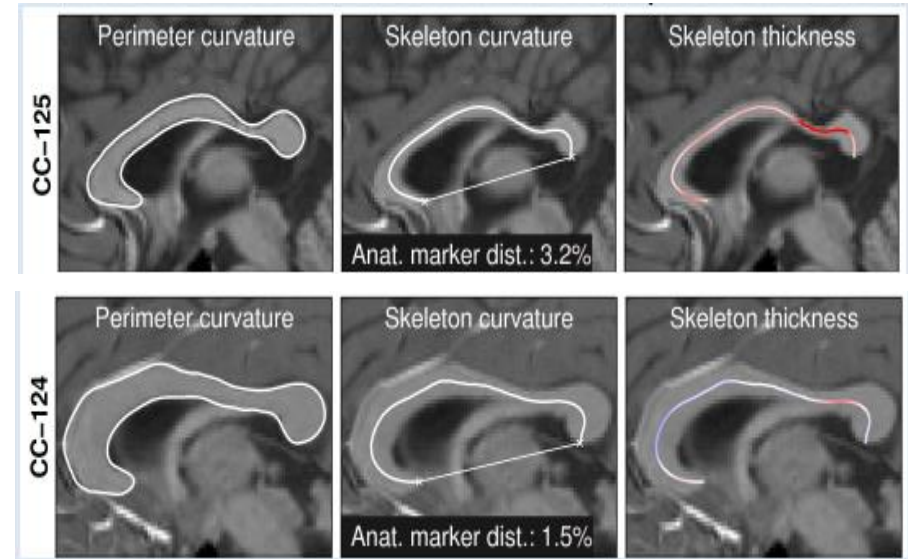- How to exploit complementary information?

Some Work...

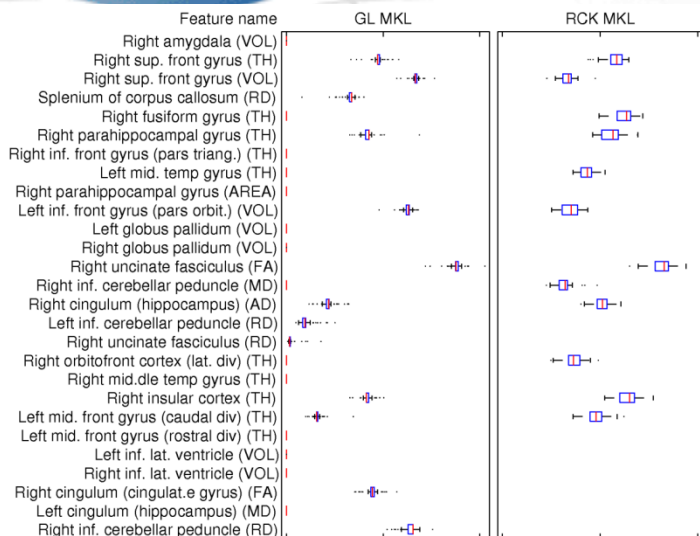Brain classification based on Heat Kernel Signature descriptors [MICCAI11]

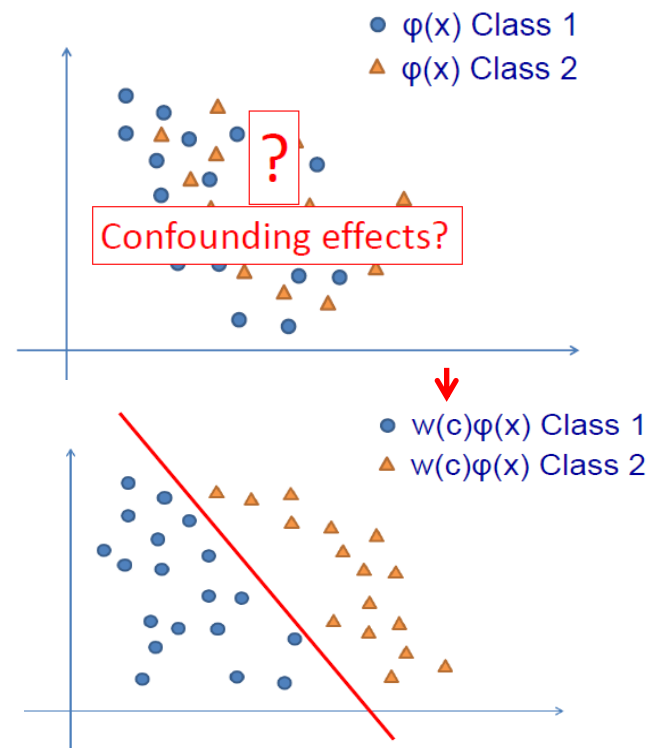Abnormal shape identification [MICCAI14]

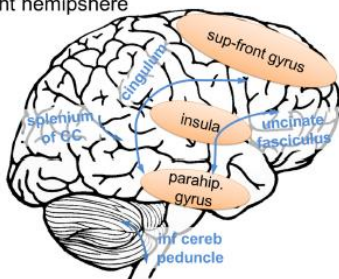Classification of first-episode- psychosis: a multi-feature multi-modal approach integrating structural and diffusion imaging[JNT2014]

Classification of first-episode psychosis in a large cohort of patients using support vector machine and multiple kernel learning techniques [Neuroimage2016]

Conclusion

- Proliferation of large amount of medical data need automatic method to organize information,
- Machine learning and pattern recognition methods are useful to deal with open issues in brain analysis:
  - Prediction can be improved by exploiting advanced classification models,
  - New biomarkers can be detected to better characterize the disease.

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