Machine Learning applied to Planetary Sciences

PTYS 595B/495B

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https://leonpalafox.github.io/MLClass/

News of the day

Figure showing the relationship between unlabeled video frames at x_t and x_{t+1} and their corresponding feature representations $\phi(x_t)$ and $\phi(x_{t+1})$ in feature space. The task is to Predict Future Visual Representation.

a) Unlabeled Video
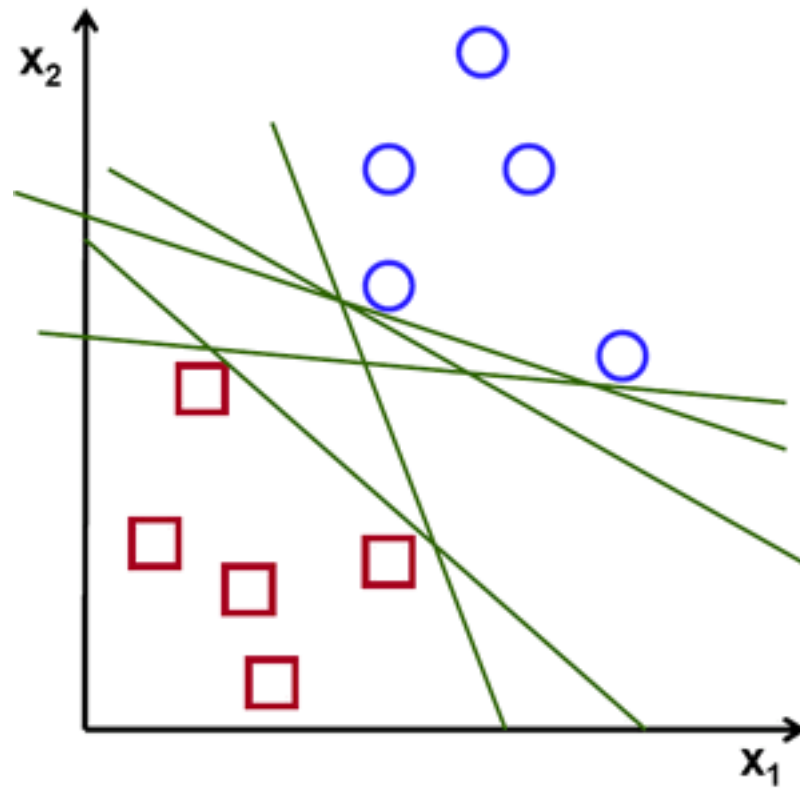
b) Feature Space (d dim)
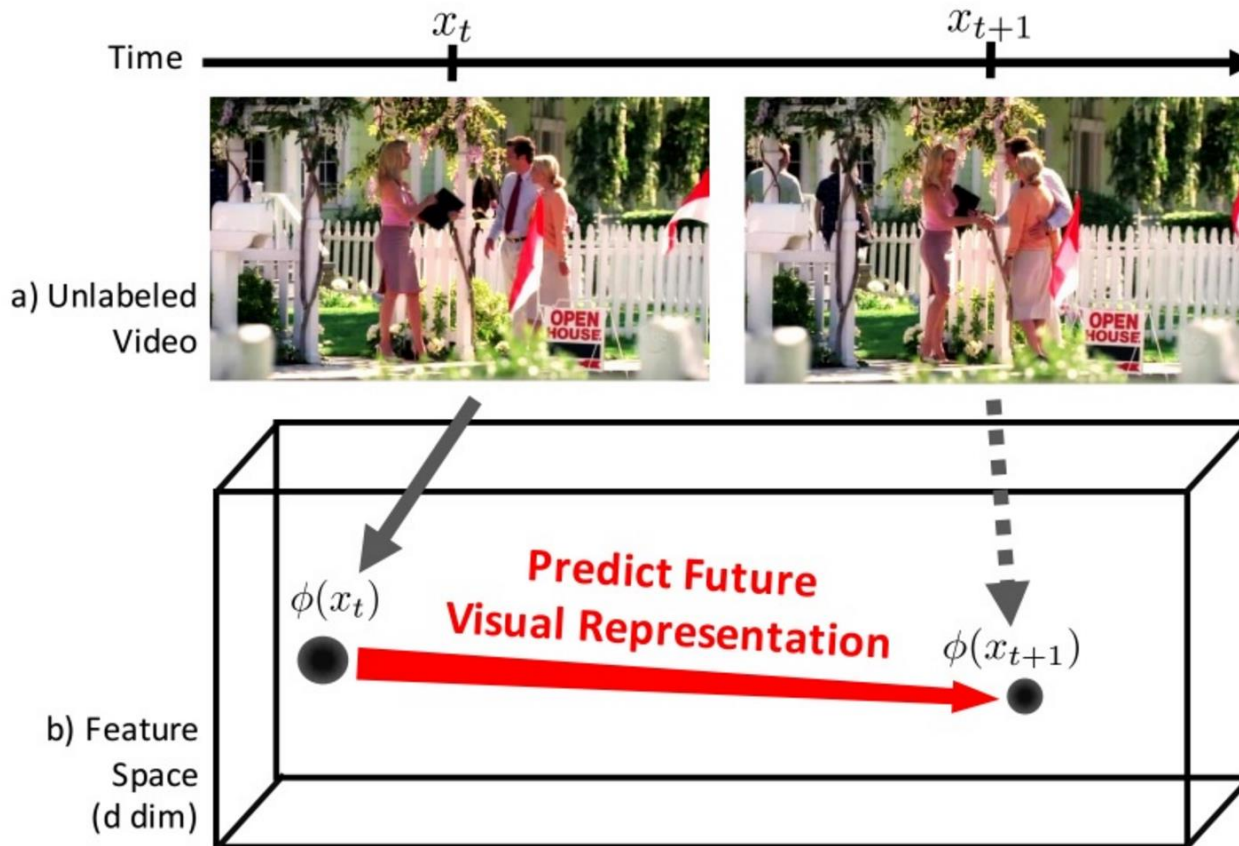
The mighty hammer – Support Vector Machines
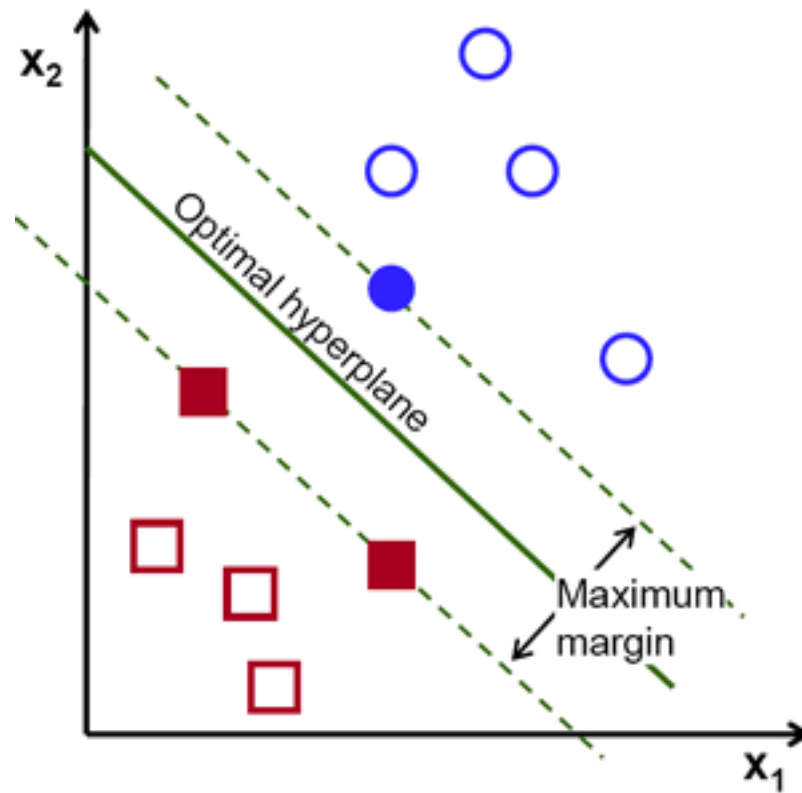
- Support Vector Machines are the best off-the-shelf ML technique.
    - Is relatively straight forward to use.
    - Has few parameters to optimize
    - Works amazingly well, regardless the size of the data.
    - Is fast, compared with other ML techniques.

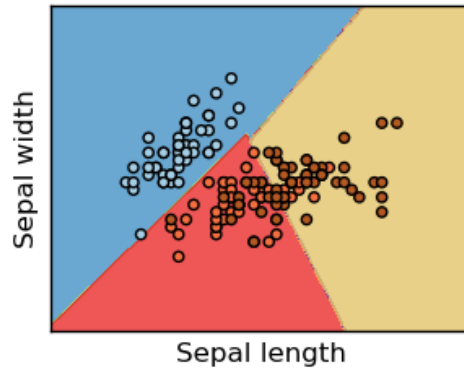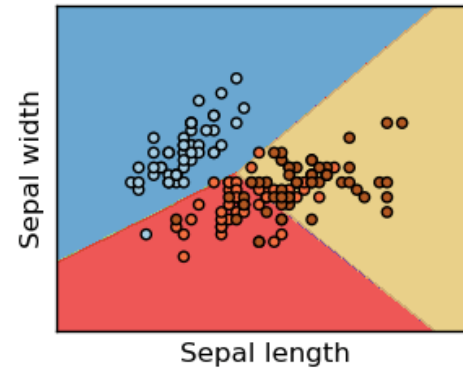# Support Vector Machines (SVMs)

SVM Introduction

Kernels

- Like in linear regression, using only lines is impractical to solve classification problems.

- We use the concept of Kernel (distance).
  - Different definitions of Kernels allow for different spaces
  - Most common ones:
    - Linear (logistic regression)
    - Polynomial (expanded powers) (power of polynomial)
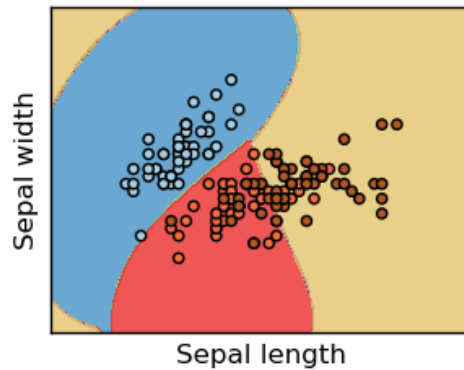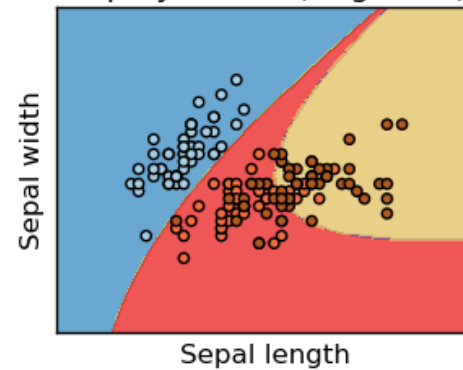   - RBF (Gaussian Kernel) ("variance")

Kernels

Support Vector Machines (SVMs)

- Form part of a family known as Kernel Methods

- Kernel methods are incredibly versatile
  - Lots of research on what is a good Kernel
  - Is a great can of worms
  - The panacea is to have self-defining kernels