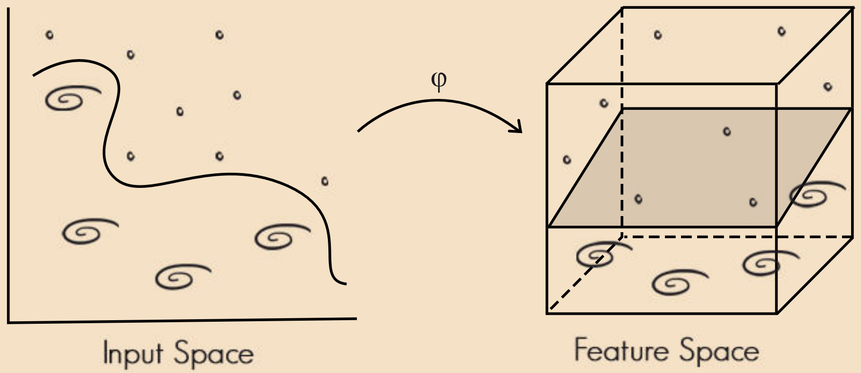
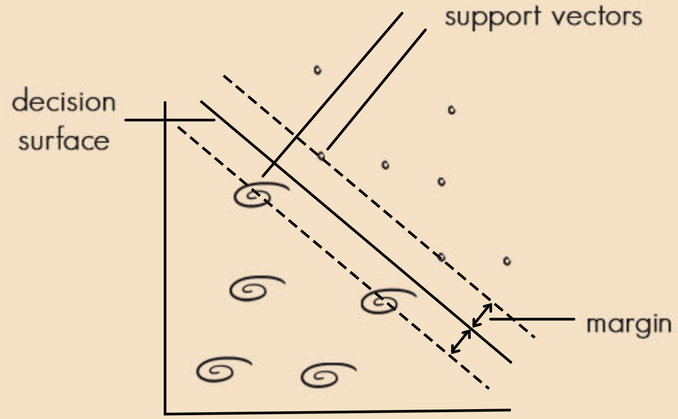
Fuzzy logic SVM based classification for large astronomical data sets

Artem Poliszczuk, Aleksandra Solarz, Agnieszka Pollo

- **Support Vector Machine (SVM) Algorithm**

Main idea: mapping data from its normal parameter space (input space) to the high dimensional feature space, where it becomes possible to construct a separating hyperplane. Mapping done by the kernel functions.





Training - searching for the combination of the kernel parameters that maximize the efficiency (grid search)

No measurement uncertainties in classical SVM!

- **Fuzzy SVM (FSVM)**
  - Objects have fuzzy memberships.
  - Two types of FSVM: error-based, distance-based.

Fuzzy logic SVM based classification for large astronomical data sets

Artem Poliszczuk, Aleksandra Solarz, Agnieszka Pollo

Results

- Accuracy of the classification of all SVM versions stands at around 97%-99%.
- Grid search process: error-based FSVM shows a better performance in the grid search process where it minimizes more effectively the number of support vectors (high generalization ability and smaller probability of the overfitting).
- Distance histograms: both error-based and distance-based FSVM show better results (wide range of the distances). Clustering of the objects even at the big distances can lead to overfitting.