Machine learning paradigms

How much a priori knowledge?

- Rote learning: storing data as it is. Example: database.

- Specifying parameters: all knowledge is already available in a parametric form. Example: a function in programming.

- Knowledge acquisition: only structure of knowledge is known (rules, frames etc.). Example: expert system.

- Concept Learning: given a set of examples (*training data*) create a description of this set in terms of a particular language. A priori knowledge:

  - Syntax of description language (*syntactical bias*)
  - Description of the domain from which the examples are drawn – *domain knowledge* or *semantic bias*.
  - Search algorithm to find hypotheses – *search bias*.

- Neural networks: no (or very little) a priori knowledge.

The role of the teacher

- Supervised learning: the system uses a teacher.

  - Concept Learning: teacher provides labeled data (pre-classified examples) to the system.
  - Reinforcement learning: teacher provides an estimate of the quality of system's response to the data (e.g. positive/negative or scaled).

- Unsupervised learning: no teacher is available to the system.

  - Clustering: partitioning or conceptual, flat or hierarchical.
  - Finding regularities in data: Data Mining, Knowledge discovery.

What does the system learn?

- Prediction: learning to predict values of unknown function.

  – Classification: binary function.

  – Regression: continuous-valued function.

- Concept learning: the systems acquires descriptions of concepts.

- Explanation-based learning: using traces (explanations) of correct (or incorrect) performances the system learns rules for more efficient performance of unseen tasks.

- Case-based (exemplar-based) learning: the system memorizes cases (exemplars) of correctly classified data or correct performances and learns how to use them (e.g. by making analogies) to process unseen data.