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Final learning diary

Expert Systems course gave me knowledge about general idea of expert systems and techniques which are used in them. These are things which I hadn’t known before course started and I know them now:

-what expert system is and what is not;
-where expert systems can be used and where can not;
-restrictions in using expert systems;
-main advantages and disadvantages of all model paradigms which we have considered;
-importance of data in expert systems;

I think that after this course I’m not ready to design very complex expert systems but I have knowledge which can be very good base to expand my expert systems skills.

Now I will try to explain how I understand model paradigms.

**Fuzzy Logic** - kind of logic where we consider continues range of true and false values rather than discrete 0 and 1. Advantage of fuzzy logic is that we can use this paradigm even if data is missing, imprecise or noisy. With this paradigm we can solve more difficult problems then with classic logic rules.

**Dempster-Shafer theory** – mathematical theory which is used to calculate probability of an event with separated pieces of information. Dempster-Shafer theory allows us to base degrees of belief for one question on probabilities for a related question.

**Decision trees** – allows us to represent problem as a graph which shows as decisions and their consequences. Model of this paradigm can be taught from given data. Decision trees are easy to implement and can be easily supervised by a human expert.

**Truth Maintenance Systems** - are used within Problem Solving Systems. The goals of TMS are: providing justifications for conclusions, supporting default reasoning, remembering derivations computed previously, supporting dependency driven backtracking.

**Bayesian network** - graph representing dependence relations among the variables. A Bayesian network is a representation of the joint distribution over all the variables represented by nodes in the graph.

**Naive Bayes** - is a simple probabilistic classifier that uses Bayes' theorem. Naive Bayes classification gets around problem by not requiring that we have lots of observations for each possible combination of the variables.

**Case-based reasoning** – model paradigm which solves given problem with solution of similar problem from the past. The main idea of this paradigm is finding similarities of known problems from the database and the problem that is given to solve.
**Genetic algorithms** – algorithms based on observance natural evolution process. In genetic algorithms population is improved by basic genetic operations – crossover and mutation. From the actual populations best candidates are taken to be parents for next population which will be better fitted. This process is continued until our solution is good enough.

**Hidden Markov Models** – mathematical probability theory which allows us to describe and analyze models in which probability of an event depends only on previous event. With HMM we can analyze models with hidden structure.

**Neural Networks** – paradigm which uses idea of biological neural network. Neural networks can be used for classification and regression. Now we have efficient methods for neural network learning. Neural networks need a lot of good quality data to work well.

**Support vector machines** – set of related methods used for classification and regression. Support vector machines are popular tool these days. This paradigm allows us to find best margins to separate different classes in given task. The main parts in support vector machines are kernel functions which are used to classify non-linear models.

The best thing in whole course for me was my project work. My topic was “Predicting course outcomes with Support Vector Machines”. Project allowed me to get deeper in SVMs and showed me that the support vector machines really work. During work on this project I have found few useful tools for designing and using neural networks and support vector machines. During this work I had also few interesting meeting and talks with my project partners.