

# Machine Learning - Practical Project

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## General Instructions

The practical project about the Artificial Neural Network contains following two parts :

### Part I

The first part of the presentation mainly concerns with the *domain of the problem*, you observe with the practical project. The general overview of the associated neural network is expected. The following points should be clarified:

- What is the *theoretical background* of this problem?
- In which type of problem, this neural network model is usable? Support your opinion with example(s).
- What are the pros. and cons. of this model?
- What is your own opinion about the type of neural network, you concerned with?
- What are the scope of possible improvements in this area?

### Part II

The second part is then about present one of the programming project (see **Projects**) from Encog workbench, with the following guidelines:

- Give details description about the problem.
- Description about the neural network with its *Layers* and *Synapses*. May be pictorial demonstration of the input, intermediate and output variables could be interesting.
- Explain the general *algorithm*, used for the concern problem.
- Which *Encog* java classes/packages are used to design this model? Why these are useful in this context?
- Clear understanding about the variables, used in the program. What are the scope of parameters and functions, used in the program?

- Your own observation, remarks and possible improvement of this neural network model.
- What is your own opinion about the similar problem(s), may be solved by this neural network framework?
- Your own java code, contains either additional improvement of the existing model or able to handle similar problem (optional).

## Projects

Here we introduce the basic description about the projects. Students are encouraged to understand and explore each area with more references.

### Project I

*Traveling Sale-Person (TSP) problem:* Here the goal is to find the shortest path with passing all the city only one time for a Sales-Person. Here a Boltzmann machine type of Hopfield neural network model is used.

*Encog source:* Package - *boltzmann*, Class - *BoltzTSP.java*

### Project II

*Lunar Lander problem:* The objective of this problem is to safely land a spaceship on a planet, firing the ship's rocket in order to reach the surface with minimum velocity and running out of fuel.

*Encog source:* Package - *lunar*, Classes - *LanderSimulator.java*, *LunarLander.java*, *NeuralPilot.java*, *PilotScore.java*

### Project III

*Color matching Self Organizing Maps (SOM) problem:* Here the task is to visualize how the Self Organizing Maps is used for Color matching problem. Here the *MapPanel* class is used to display the weight matrix to the screen and the class *SomColors* extends the *JPanel* class and adds the *MapPanel* to itself.

*Encog source:* Package - *som*, Classes - *MapPanel.java*, *SomColors.java*

### Project IV

*Optical Character Recognition (OCR) problem:* The goal of the project is to recognize an optical characters.

*Encog source:* Package - *ocr*, Class - *Entry.java*, *OCR.java*, *Sample.java*, *SampleData.java*

### Project V

*Sunspots prediction problem:* This project concerns with the use of Encog to predict sunspots. Sunspots are normally periodic and predictable. Here by the use of *predictive neural network* we learn the pattern and predict the number of sunspots with reasonable accuracy.

*Encog source:* Package - *sunspot*, Class - *PredictSunspot.java*