

Project - Learning multilayer perceptrons by the Runge-Kutta 4 method

Problem 1. State the program 2016fit_tanh_M in the course website.

- A. Describe the target function.
- B. Describe how to prepare paired data by sampling the target function.
- C. Describe the network function for approximating the target function underlying paired training data.
- D. State the mean square error of approximating desired targets by the network outputs.
- E. Describe how to apply symbolic differentiation for determining the gradients of the mean square error with respect to network parameters.
- F. Give the formula of updating network parameters by the gradient descent method.
- G. Draw a flow chart to illustrate learning multilayer perceptrons by the gradient descent method.

Problem 2. Give the formula of Runge-Kutta 4 method for solving the initial value problem

- A. State the initial value problem of tracking differential equations
- B. List the formula of Runge-Kutta 4 method.

Problem 3. Try to express the gradient descent method by differential equations and prove convergence of the differential equations.

Problem 4. Please revise the program of 2016fit_tanh_M for learning multilayer perceptrons by the Runge-Kutta 4 method.

Problem 5. Give examples to verify the revised program by numerical simulations.

Problem 6. Conclude your works.