

Dear Students,

Please find below the main rules of running the second part of the graduate course „Neural Networks”. **PLEASE READ THEM CAREFULLY SO AS TO AVOID ANY DISAPPOINTMENT LATER.**

Dates of lectures / project classes:

**21.04, 28.04, 05.05, 19.05, 26.05, 02.06, 09.06, 16.06**

## **LECTURES**

Following the means of lecturing proposed by prof. Macukow, each week I will place the lecture notes (pdf slides) on my webpage, either on Monday or Tuesday morning. The notes will be available at:

<http://www.mini.pw.edu.pl/~mandziuk> → teaching → neural networks

**login: student**

**password: nn2012**

Please do not distribute the login/password data.

There will be 7 lectures. On the last (8th) one (16.06) there will a „zero-term” exam, which is an additional chance to pass an exam (not counting to 2 official terms offered in June). If, due to COVID-19 situation, organization of a face-to-face written exam will not be possible we shall think of other options, most probably move the exam terms to later dates. The score is between 0 and 60 – you need 31 pts. or more to pass.

Regarding the slides: they should be self-explained, though if you have any questions feel free to contact me: [mandziuk@mini.pw.edu.pl](mailto:mandziuk@mini.pw.edu.pl)

## **PROJECTS**

There will be 3 tasks.

### **• FIRST TASK**

The first one will be paper-based. Please solve it and send the results to me in the form of a scan or a photo.

The goal is to built Hopfield Associative Memory (HAM) for the following 3 vectors and test stability of the vectors.

$$X_1=[1,0,0,1]^T$$

$$X_2=[1,1,0,1]^T$$

$$X_3=[1,1,0,0]^T$$

**Max 10 points** → proper for of a weight matrix – 4 pts; appropriate test of stability (**with appropriate conclusion!**) – 2 pts per vector.

This topic will be covered in the 1st lecture.

**Start – 21.04. End (submission deadline) 28.04 – 6 P.M.**

**STARTING EACH NEW WEEK OF DELAY → minus 5 PTS. (max 2 weeks delay)**

- **SECOND TASK**

Computer program which builds Hopfield Associative Memory and allows for calculating the output of ANY input vector (of appropriate size).

1) INPUT in the form of an external file or provided in an interactive way by the user. BOTH POSSIBILITIES (external txt file and by means of GUI) NEED TO BE PROGRAMMED (AVAILABLE).

2) Calculation of the Hopfield Associative Memory

3) Iterative testing of any input vector: the user provides a test vector and the system outputs the HAM vector; next the user may input another vector – receive the output, etc.

This topic will be covered in the 1st and 2nd lectures.

**Max 20 points** → possibility of reading the input vectors from external file – 5 pts; possibility of providing input vectors via GUI (interactively) – 5 pts. Proper calculation of the HAM outputs – 5pts; quality of documentation – 5 pts.

In the documentation you should describe the idea of HAM and the user interface of the program, and present the results of your own test made PRIOR to sending the program to me for an assessment. Documentation has to be submitted together with the executive code (program).

**Start – 28.04. End (submission deadline) 19.05 – 6 P.M.**

**STARTING EACH NEW WEEK OF DELAY → minus 5 PTS. (max 2 weeks delay)**

- **THIRD TASK**

Classification with Multilayer Perceptron network. **Details will be available on May 19th.**

**Start – 19.05. End (submission deadline) 16.06 – 6 P.M.**

**Max 30 points**

**STARTING EACH NEW WEEK OF DELAY → minus 5 PTS. (max 2 weeks delay)**

