

PhD intensive course

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# NEURAL NETWORKS AND NEUROCOMPUTING

Prof. Dr. A. Verikas, Department of Electric Power Systems

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10 – 17 May 2019

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## About the course:

The course aims at providing deep knowledge of modern machine learning algorithms for classification, regression and self-organization. The course consists of lectures, project work and seminars. It starts with three intensive days of lectures and discussions, followed by project work and seminars. The course ends with a one-day workshop to present and discuss project results, to discuss promising application areas of learning systems and hot topics of research in the area. Eight days is the planned duration of the course.

## Aim of the course:

The aim of the course is to let you develop advanced skills in the field of machine learning. The objective of the course is to provide deep knowledge of machine learning systems for classification, regression, and self-organization, to study main learning algorithms in detail.

## Course format, ECTS credits:

Instruction consists of lectures (40%), two projects (40%), and seminars (20%). You will do projects in groups of two students. Each group shall do two projects (take-home assignments requiring about 2 weeks of work to accomplish), one regression and one classification project. In the projects students solve a practical problem using machine learning methods. The projects will be performed in MATLAB. Results are to be presented in a report and orally. Each student has to give a seminar (20 min). In seminars, scientific literature/articles are addressed and presented by the student. Material is provided by the course responsible. To pass the course you have to write, present and defend the project report and actively participate in the seminars. The evaluation is on a pass/fail basis.

Study load: 6 ECTS credits.

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## Neural Networks and Neurocomputing

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### Target group:

Prerequisites: Master of Science degree (or equivalent) in an engineering subject or in computer science. Courses in mathematics of at least 30 credits or courses including calculus, linear algebra and transform methods.

### Main topics of the course:

Introduction to the learning systems area, learning in linear systems, learning in nonlinear systems, multilayer perceptron (MLP), main gradient-based learning algorithms, stochastic learning algorithms and genetic search, support vector machines (SVM), relevance vector machines (RVM), committees, decision trees, random forests, fuzzy rules-based systems, deep neural networks, generalization issues in learning systems, self-organization in learning systems, self-organizing maps, partition maps, t-distributed stochastic neighbour embedding (t-SNE), applications of learning systems.

### References:

1. E. Alpaydin, Introduction to Machine Learning, 2nd Edition, The MIT Press, Cambridge, Massachusetts, 2010.
2. T. Hastie, R. Tibshirani, J. H. Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction (Springer Series in Statistics), 2nd Edition, Springer-Verlag, New York, 2009.

### Course schedule:

Start date: 10 May 2019 at 9 a.m.

End date: 17 May 2019 at 4 p.m.

### Course fee:

8-day 6 ECTS course fee is 540 EUR . Travel, insurance, accommodation, and other personal expenses *are not* included in course fee.

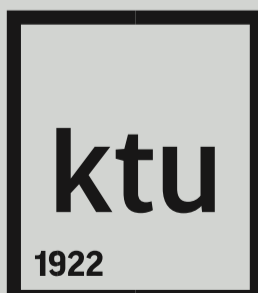
Course is free of charge for students who come to study under the Erasmus+ program.

### Registration to the course:

Send inquiry to [phd@ktu.lt](mailto:phd@ktu.lt)

Registration deadline: 19 April 2019

**Contacts:** Doctoral School, Kaunas University of Technology  
Phone: +370 626 22701, e-mail: [phd@ktu.lt](mailto:phd@ktu.lt)



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