List of Courses

Department of Cybernetics

Study Field: Cybernetics

Adaptive Systems

Adaptivní systémy

Doc. Ing. Ondřej Straka, Ph.D.

The course deals with adaptive control systems and adaptive signal processing systems based on running system identification. These systems are applied in decision-making, control and signal processing under uncertainty. Main topics: self-tuning controllers and reference-model control, dual control, intelligent adaptive control, adaptive systems with implicit and explicit identification, adaptive prediction and filtering.

Artificial Intelligence

Umělá inteligence

Doc. Dr. Ing. Vlasta Radová


Computer Speech Synthesis

Počítačová syntéza řeči

Doc. Ing. Jindřich Matoušek, Ph.D.

Computer Vision

Počítačové vidění

Doc. Ing. Miloš Železný, Ph.D.

Contactless measurement based on processing of visual information. Overview of hardware for image acquisition. Image data formats, transmission and compression. Definition of computer vision, aims, terminology. Digital image processing. Description of objects, phenomena, scene. Recognition, motion analysis, three-dimensional vision. Applications of computer vision in the domain of human-computer interaction, technical diagnostics, medical vision, remote sensing.

Control of Linear Multivariable Systems

Řízení vícezměrových lineárních systémů

Prof. Ing. Miloš Schlegel, CSc.


Diagnostics and Decision-making

Diagnostika a rozhodování

Doc. Ing. Luděk Müller Ph.D.

Statistical decision problems, statistical modelling and classification. Artificial intelligence methods appropriate for diagnostics – informative features extraction and selection, pattern recognition, decoding. Engineering approach to the implementation of technical and medical diagnostic systems, feasibility studies, implementation of diagnostic systems in industry. Examples of technical and medical diagnostic systems.

Fault Detection

Detekce chyb

Doc. Ing. Ondřej Straka, Ph.D.

Fault detection is based on fast and correct identification of such behaviour of the monitored system that is considered inadmissible for the required system functioning. Main topics: specification of fault detection or change detection of monitored or controlled systems, detection quality requirements, approaches based on signal processing, approaches based on models, passive and active detection, optimal input signal, information processing strategy.

Knowledge Based Systems

Znalostní systémy

Doc. Ing. Luděk Müller, Ph.D.


Model Based Predictive Control
**Prediktivní řízení**

Prof. Ing. Miloš Schlegel, CSc.

The model predictive control (MPC) strategy enables optimisation of the performance index with respect to some future control sequence, using predictions of the output signal based on a process model. The course presents an overview of the most important predictive control strategies, the theoretical aspects as well as the practical implications. Hands-on experience is gained through Matlab/Simulink simulation exercises.

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**Multiagent Systems**

*Multiagentní systémy*

Doc.Ing. Pavel Ircing, Ph.D.


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**Natural Language Processing**

*Zpracování přirozeného jazyka*

Doc. Ing. Pavel Ircing, Ph.D.

The course deals with the basic methods of natural language processing, especially in connection with automatic speech recognition. Attention is paid mainly to text normalisation, statistical language modelling, clustering of words into classes and morphological tagging. Fundamentals of the information retrieval methods are also introduced, again with emphasis on speech retrieval.

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**Neural Networks**

*Neuronové sítě*

Doc. Dr. Ing. Vlasta Radová


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**Nonlinear Filtering**

*Nelineární filtrace*

Doc. Ing. Ondřej Straka, Ph.D.

The course deals with the state estimation problem of linear and especially nonlinear stochastic systems. The estimation methods are applied in e.g. automatic control, tracking, navigation, fault detection, signal processing. Main topics: Bayesian approach, Kalman filtering, derivative-free filters, Gaussian sum method, sequential Monte Carlo method, point mass method, Cramér-Rao bound, continuous systems with discrete measurements.

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**Optimal Stochastic Control**
Optimální stochastické řízení

Doc. Ing. Ondřej Straka, PhD.


Pattern Recognition

Rozpoznávání obrazů

Prof. Ing. Josef Psutka, CSc.


Robust Control of Linear Systems

Robustní řízení lineárních systémů

Prof. Ing. Miloš Schlegel, CSc.

Robust control is a control which fulfills design specifications not only for a nominal system but also for a whole, exactly defined, family of controlled systems. Model uncertainty and robustness have been central topics in the development of automatic control. First, an elementary explanation of these notions is given. Further, some basic methods (robust regions, robust pole placement, H-infinity) for the design of robust controllers are presented.

Signal Processing

Zpracování signálů

Prof. Ing. Josef Psutka, CSc.


Spoken Language Processing

Počítačové zpracování mluveného jazyka

Doc. Ing. Luděk Müller, Ph.D.


Stochastic Models of Utility Networks
**Stochastic models of energetic networks**

**Doc. Ing. Eduard Janeček, CSc.**


**System Identification**

**Identifikace systémů**

**Doc. Ing. Ondřej Straka, Ph.D.**

The aim of system identification is to find a mathematical model using experimental data. Identification is an alternative to mathematical modelling, which is based on physical laws. Main topics: system, model structure, experimental conditions, identification methods, parametric models, stochastic model of uncertainty, linear and nonlinear parameter estimation, unbiased estimation.

**Time-frequency Signal Processing for Diagnostics**

**Časofrekvenční zpracování signálu pro diagnostiku**

**Doc. Ing. Eduard Janeček, CSc.**