Tárgy neve: Advanced Machine Learning

Tárgyfelelős neve: Buza Krisztián Antal

Tárgyfelelős tudományos fokozata: PhD, egyetemi docens

Tárgyfelelős MAB szerinti akkreditációs státusza: AT

Az oktatás célja angolul:
a) **knowledge**
  - In order to be able to perform their work in an innovative way and do research (when necessary) in their own IT specialization, they have comprehensive and up-to-date knowledge of general mathematical and computing principles, rules and relationships, particularly – depending on their chosen specialization – in the following areas: algebraic, linear algebraic and number theory methods and applications, special fields of mathematical analysis, numerical methods and their applications; discrete mathematics, graph theory, logic and their applications; theoretical basics and applications of stochastic modelling and statistics; first-order and second-order statistical analysis, operation research; algorithmic methods in mathematics, formal models and tools in computing science, complexity and efficiency theory of algorithms, and special algorithms of application fields.
  - They have comprehensive and up-to-date knowledge of the principles, methods, and procedures for designing, developing, operating, and controlling IT processes, particularly – depending on their chosen specialization – in the areas of program design methods; design, construction and management of complex software systems and databases in modern database management systems; service-oriented program design; the design, construction and management of information systems; the design and development of tools and services for the internet; the design, development and management of database systems; the design, construction and management of distributed systems, cryptography, data security and data protection.
  - They have comprehensive and up-to-date knowledge of specific IT tools, particularly – depending on their chosen specialization – in the areas of numerical computing systems, model analysis, scientific computing methods, digital signal and image processing, artificial intelligence methods, software methods of operation research and optimization, modern programming languages and paradigms, the usage of modern programming languages; theoretical foundations and applications of information systems; distributed and parallel systems, expert systems; information technology and application security, geoinformatics; the construction and organization of health information systems; new methods of information management and organization, corporate (enterprise & business) information systems, services of information systems implementing corporate (enterprise & business) processes; digital signal and image processing, computer graphics; web and multimedia applications, and media informatics.
  - They have a high level of fluency in the language of IT – including its professional vocabulary and its characteristic features of expression and composition – both in their mother tongue and in English, at least.

b) **skills and abilities**
  - They are able to formalize complex IT tasks, to identify and study their theoretical and practical background and then to solve them.
  - They are able to initiate collaboration and work in a team as well as on projects with IT or other professionals
  - They are familiar with IT professional vocabulary, which enables them to express themselves at a high level, both orally and in writing, in their mother tongue and (at least) in English; i.e. they are able to participate in discussions and debates, to write reports, to work with, understand and utilize scientific and technical literature (e.g. professional books, chapters, articles etc.).

- They are able to professionally use scientific and technical information sources to obtain knowledge necessary for solving a problem, and to critically interpret and evaluate it.
- Under professional guidance, they are able to carry out scientific research on their own, and to prepare for further studies at postgraduate level.

c) attitude
- They follow professional and technological developments in their IT field.
- They are committed to critical feedback and evaluation based on self-examination.
- They are committed to lifelong learning and they are open to acquiring new IT competencies.
- They share their knowledge and consider it important to disseminate professional IT results.
- They are open to proactive collaboration with IT and other professionals.

d) autonomy and responsibility
- They take responsibility for their professional decisions made in their IT-related activities.
- They undertake to meet deadlines and to have deadlines met.
- They bear responsibility for their own work as well as for the work of their colleagues they work together with in a project.

Az oktatás tartalma angolul:

We shall deal with practical problems in this course via deep learning approaches. Network architectures, image processing, speech processing, motion and control, anomaly detection make the core of the course. The course enables the student for researching and tracking the literature, helps to deepen her/his knowledge in diverse ways that includes the deepening of the mathematics, physics and control related knowledge among others.

A számonkérés és értékelés rendszere angolul:

continuous assessment, examination

Idegen nyelven történő indítás esetén az adott idegen nyelvű irodalom:

Text book, compulsory:
- Ian Goodfellow and Yoshua Bengio and Aaron Courville: Deep Learning. MIT Press, 2016. Hardcover: ISBN: 9780262035613, eBook: ISBN: 9780262337434

Proposed further reading:
- Aurélien Geron: Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems O'Reilly Media, Inc. 2017. ISBN: 1491962291
- Josh Patterson and Adam Gibson: Deep Learning: A Practitioner's Approach. O'Reilly Media, Inc. 2017. ISBN: 1491914254
- Sayan Pathak, Roland Fernandez, and Jonathan Sanito, Deep Learning Explained, MOOC edX, https://www.edx.org/course/deep-learning-explained-microsoft-dat236x