



**UNIVERSITY of MISKOLC**  
**Faculty of Materials Science and Engineering**  
**Antal Kerpely Doctoral School of Materials**  
**Science & Technology**



# Non conventional computation in image analysis

Dr. Péter Barkóczy

**COURSE DESCRIPTION**

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## Lecturer

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## Recommendation

The lecture is proposed for all students of the Kerpely doctoral school, especially in the field of physical metallurgy, heat treatment and casting.

## Language

Hungarian or English.

## Scope

The aim of the course is to present non-conventional methods applicable in the field of image analysis (neural network, cell automation, genetic algorithms...).

## Methodology

For larger student numbers, the course is held in contact lectures. The time of contact courses is based on agreements with the students. In case of 1-2 students, keywords are given of the corresponding block.

## Topics

### **1. Topic**

Basic tasks of image analysis. The classification. Model-based image analysis.

### **2. Topic**

Classical tools for classification. Bayesian classifier, group analysis, fuzzy group analysis. Application of neural networks in classification.

### **3. Topic**

Cell automaton in image analysis. Deterministic and stochastic automata. Advanced image analysis procedures based on cell automation.

### **4. Topic**

Analyze large amounts of images. Development of automatic image analysis procedures.

## References

1. Leszek Woynar: Image Analysis, Applications in Materials Engineering, CRC Press, 1999
2. Frank Y Shih: Image Processing and Mathematical Morphology, CRC press, 1999
3. Richard Jensen – Quiang Shen: Computational Intelligence and Feature Selection, Wiley and Sons, 2008
4. Paul Rosin – Andrew Adamatzky – Xianfang Sun: Cellular Automata in Image Processing and Geometry, Springer 2014

## Exam

Oral exam if basic questions are answered correctly.

## Complex exam questions

1. Basic tasks of image analysis. Classic solution options. Use of unconventional calculation procedures.
2. Group analysis and algorithms. Application in digital image analysis.
3. Methods of conduction and flow simulations. Their field of application.
4. Development and application of multiple scale simulations.
5. Scaling, validation and accuracy of simulations.