ThinkBS Tomography (Advanced)

Offered in University of Debrecen

by: Ábris Nagy

Course Description:

The principal objective of this course is to give a short introduction to different technologies widely used in the world of mathematics and engineering to solve, visualize and communicate results.

This course is divided into four parts to analyze four different kinds of software for mathematics: R, for basic data analysis and visualization; Matlab/Octave, to develop simple programs to solve algebraic or numerical problems; Python, for visualizing time series and perform Furier analysis; LaTex, to be able to produce documents with LaTex in a mathematical context.

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| Computed Tomography | Discrete Tomography | Geometric Tomography |
| * Transformations in the Euclidean space. Projections.
* Basic concepts of computed tomography and reconstruction algorithms
* Series expansion method.
 | * An overview of discrete tomography.
* Constructing binary matrices with given line sums.
* Network flow algorithms
 | * Convexity.
* Uniqueness of the solution and stability.
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Bibliography:

1. G. T. Herman - Fundamentals of Computerized Tomography, Springer-Verlag London, 2009
2. G. T. Herman, A. Kuba - Advances in Discrete Tomography and Its Applications, , Birkhäuser Basel, 2007
3. G. T. Herman, A. Kuba - Discrete Tomography: Foundations, Algorithms, and Applications, Birkhäuser Basel, 1999
4. R. J. Gardner - Geometric Tomography (2nd edition), Cambridge University Press, 2006.

Mode of Delivery : (in class / online / blended) Blended

Prerequisites by topic: None.

Language of Instruction: English

Course Objectives: To give a basic understanding of the mathematical foundation of computed tomography and discrete tomographic methods.

Course Contents:

Basic concepts of computed tomography and reconstruction algorithms. Algebraic reconstruction techniques and backprojection. Series expansion method. Basic concepts of discrete tomography, reconstruction of binary matrices. Geometric tomography. Convexity. Uniqueness of the solution and stability.

Learning Outcomes of the Course Unit:

1. To solve mathematical problems related to tomography.

2. To develop mathematical models for tomographic problems.

3. To understand mathematical concepts related to the study of tomographic problem such as projections, convexity, affine transformations, and network flows.