University of Gdańsk

Subject card

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|---|---|---|---|---|---|---|---|
| Subject name and code | Numerical Algorithms Used in Regression Models, PG_00208698 | | | | | | |
| Field of study | Mathematical Modeling and Data Analysis | | | | | | |
| Date of commencement of studies | October 2024 | | Academic year of realisation of subject | | 2026/2027 | | |
| Education level | Bachelor's studies | | Subject group | | Obligatory subject group in the field of study<br>Optional subject group | | |
| Mode of study | full-time studies | | Mode of delivery | | at the university | | |
| Year of study | 3 | | Language of instruction | | Polish | | |
| Semester of study | 5 | | ECTS credits | | 2.0 | | |
| Learning profile | academic | | Assessment form | | credit | | |
| Conducting unit | | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr Szymon Myga | | | | |
| | Teachers | | | | | | |
| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 0.0 | 0.0 | 0.0 | 0.0 | 30.0 | 30 |
| | E-learning hours included: 0.0 | | | | | | |
| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | | Participation in consultation hours | | Self-study | SUM |
| | Number of study hours | 30 | | 5.0 | | 15.0 | 50 |
| Subject objectives | The goal of the course is to understand how regression models are created using R language libraries. | | | | | | |

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [MMiADL3_K09] is ready to critically evaluate arguments, find gaps in reasoning, and constructively criticise other people's reasoning | Students engage in discussions regarding the proposed solutions. | [SK1] oral statement/conversation/ discussion<br>[SK2] presentation/project/paper/ report |
| [MMiADL3_U14] has the ability to prepare oral presentations in Polish and at least one foreign language about selected mathematical issues using various sources of knowledge | Students deliver presentations on selected topics during the seminar. | [SU2] presentation/project/paper/ report |
| [MMiADL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning | While preparing their presentation, students must be able to formulate relevant questions and respond to them satisfactorily. | [SK2] presentation/project/paper/ report |
| [MMiADL3_W12] has a basic knowledge and understanding of legal and ethical conditions related to scientific and didactic activities | Students make informed use of resources available under Open Access. | [SW1] oral statement/ conversation/discussion |
| [MMiADL3_K10] is ready to analyse data and communicate the conclusions of such analysis in an accessible form | The student knows and understands regression models and knows how to interpret them | [SK2] presentation/project/paper/ report |
| [MMiADL3_K04] is ready to understand and appreciate the importance of intellectual honesty in own and other people's actions; is ready to act ethically | The presented topics involve an honest acknowledgment of what can and cannot be computed. | [SK1] oral statement/conversation/ discussion |
| [MMiADL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education | The presented topics involve an honest acknowledgment of what can and cannot be computed. | [SK2] presentation/project/paper/ report |
| [MMiADL3_W13] knows and understands the basic concepts and principles of industrial property protection and copyright, is able to use patent information resources | Students make informed use of resources available under Open Access. | [SW1] oral statement/ conversation/discussion |
| [MMiADL3_K06] is ready to formulate opinions on basic mathematical issues | The student answers questions related to the mathematical aspects of their presentation. | [SK1] oral statement/conversation/ discussion |
| [MMiADL3_U15] can speak about mathematical problems in understandable colloquial language | Students present selected topics during the seminar and are expected to answer questions pertaining to their presentations. | [SU1] oral statement/conversation/ discussion<br>[SU2] presentation/project/paper/ report |

**Subject contents**

1. Regression models
2. Numerical methods of linear algebra used in regression.
3. Optimization algorithms.
4. Statistical diagnostics of regression modes.
5. Generalized models.
6. Regularized models.
7. Advanced diagnostics.
8. Optimizing performance.
9. Presenting the English nomenclature for the course.

**Prerequisites and co-requisites**

Linear Algebra, Probability

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Assessment of student's attitude | 51.0% | 0.0% |
| Presentation | 51.0% | 100.0% |

**Recommended reading**

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|---|---|
| Basic literature | 1. Chambers, J. M, Hastie, T. J., *Statistical Models in S,* Chapman and Hall/CRC, 1991.<br>2. James W. Demmel, *Applied Numerical Linear Algebra*, Society for Industrial and Applied Mathematics (SIAM), Philadelphia, PA, 1997<br>3. McCullagh, P, Nelder, J.A., *Generalized Linear Models*, Monogr. Statist. Appl. Probab. Chapman & Hall, London, 1989. |
| Supplementary literature | Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer Series in Statistics, Springer New York, NY, 2009. |
| eResources addresses | |

**Example issues/ example questions/ tasks being completed**

1. How are least squares computed using matrix decomposition?
2. How does Fisher scoring work?

**Work placement**

Not applicable

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