University of Gdańsk

Subject card

Subject name and code	Generalized Linear Models, PG_00177503						
Field of study	Informatics and Econometrics						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2026/2027			
Education level	Master's studies		Subject group	Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study			
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	5.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Department of Statistics -> Faculty of Management -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Beata Jackowska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	45.0	0.0	0.0	60
	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	60		4.0	61.0	125	
Subject objectives	Gaining knowledge about the construction and verification of generalized linear models, in particular logistic models. Acquiring skills in estimating and verifying models based on empirical data and interpreting the obtained results. Learning about the possibilities of the applications these models to build credit scoring. Learning about the stages of building scoring models.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[IiEMU2_W05] Possesses advanced knowledge and understanding of informatics, statistics, and econometrics techniques and tools used to acquire, process, or visualise data to aid in decision-making and verify research hypotheses	The student knows and understands the methods of estimation and verification of generalized linear models and scoring models.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[IiEMU2_W02] Comprehends advanced theoretical and practical concepts in econometrics, informatics, or statistics, which are essential for a deeper understanding of economic and social phenomena	The student knows and understands the essence of generalized linear models and scoring models, describes the stages of their development, and identifies possible applications of these models, including their use in building scoring models.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[IiEMU2_U01] Can creatively and profoundly analyze complex social and economic processes using structured knowledge, econometrics, informatics, or statistics tools	The student is able to identify a research problem, formulate research hypotheses, select and apply appropriate modeling methods to solve the researched problem.	[SU2] presentation/project/paper/ report
[IiEMU2_U03] Is able to obtain and verify data from properly selected sources and to collect, process, and visualize it using modern econometrics, informatics or statistics tools	The student is able to use generalized linear models to identify cause-and-effect relationships and search for regularities occurring in the analyzed data set. On the basis of empirical data, the student is able to estimate and verify the models and interpret the obtained results.	[SU2] presentation/project/paper/ report

Subject contents

Generalized linear models

1. Model form: random component, systematic component, a link function connecting random and systematic components. Distribution of the response variable and link function. Canonical link functions for selected distributions.
2. Essence and application possibilities of generalized linear models for response variables: numerical, nominal, ordinal, dichotomous (binary).
3. Method of estimation model parameters.
4. Stages of model construction: preparation of variables, choice of model form, estimation of model parameters, model verification.
5. Logistic model as a generalized linear model for a qualitative response variable (dichotomous or with more than two categories).
6. The concept of odds and odds ratio. Interpretation of the resulting model.
7. Statistical inference in logistic regression. Evaluation of the logistic model: assessment of model fit, assessment of classification performance.

Scoring models

1. Introduction to scoring
2. Data preparation data quality assessment, predictor selection, variable discretization, measure of predictive ability for variables and their attributes
3. Development of a logistic regression model using quasi-continuous variables
4. Scorecard development
5. Scoring-model evaluation
6. Comparison of scoring models
7. Optimal segmentation of a set of individuals into homogeneous risk groups (cut-off point management)
8. Comparison of two datasets (population stability analysis)
9. Incorporation of rejected-application data (analysis of rejected applications)
10. Scoring-model monitoring

Prerequisites and co-requisites

Knowledge of the subject program "Quantitative and qualitative research techniques" (1st semester of studies):

1. basics of correlation analysis and regression analysis
2. basics of point and interval estimation and hypothesis testing

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Final project – realization of a final project in teams in the form of a written study of data analysis results using the logistic model</td><td>51.0%</td><td>33.0%</td></tr>
<tr><td>Final project – realization of a final project in teams in the form of a written study of data analysis results using the scoring model</td><td>51.0%</td><td>33.0%</td></tr>
<tr><td>Written colloquium</td><td>51.0%</td><td>34.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Gruszczyński M. (red.), Mikroekonometria. Modele i metody analizy danych indywidualnych, Oficyna Wolter Kluwer business, Warszawa 2010
2. Jackowska B., Efekty interakcji między zmiennymi objaśniającymi w modelu logitowym w analizie zróżnicowania ryzyka zgonu, "Przegląd Statystyczny", nr 1-2/2011, str. 24-41
3. Stanisz A., Przystępny kurs statystyki z zastosowaniem STATISTICA.PL na przykładach z medycyny. Tom 2. Modele liniowe i nieliniowe, StatSoft, Kraków 2007 (rozdz. 6, 21)
4. Przanowski K., Zając S. (red), Modelowanie dla biznesu. Metody machine learning, modele portfela consumer finance, modele rekurencyjne analizy przeżycia, modele scoringowe, Oficyna wydawnicza SGH 2020
5. Matuszyk A., Credit Scoring, CeDeWu, 2018
6. Wycinka E., Uniwersalność zastosowań modeli skoringowych, StatSoft Polska 2013</td></tr>
<tr><td>Supplementary literature</td><td>1. Agresti A., Categorical Data Analysis, John Wiley & Sons, New Jersey 2002 (rozdz. 4-7)
2. Harrell F.E., Regression Modeling Strategies with Applications to Linear Models, Logistic and Ordinal Regression, and Survival Analysis, Second Edition, Springer 2015
3. Jong P., Heller G., Generalized Linear Models for Insurance Data, Cambridge University Press, Cambridge 2008
4. Kleinbaum D.G., Logistic Regression. A Self-Learning Text, Springer-Verlag, New York 1996
5. McCullagh P., Nelder J. A., Generalized Linear Models, Chapman & Hall, London 1989
6. Stanisz A., Modele regresji logistycznej. Zastosowania w medycynie, naukach przyrodniczych i społecznych, StatSoft, Kraków 2016
7. Siddiqi N., Intelligent Credit Scoring: Building and Implementing Better Credit Risk Scorecards, Wiley 2016
8. Thomas L., Crook J., Edelman D., Credit Scoring and Its Applications, SIAM, 2017
9. Jackowska B., Wycinka E., Zastosowanie scoringu do oceny ryzyka ubezpieczeniowego, Zeszyty Naukowe, Uniwersytet Ekonomiczny w Poznaniu, 2011, str.225-235</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2"></td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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