

Subject card

Subject name and code	Applications of Bayesian Inference in Artificial Intelligence , PG_00179341						
Field of study	Mathematical Modeling and Data Analysis						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2025/2026		
Education level	Master's studies		Subject group				
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Marta Frankowska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	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		10.0		80.0	150
Subject objectives	To familiarise students with Byesian methods in artificial intelligence.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[MMiADMU2_U03] can understand mathematical texts from selected areas of mathematics	Students are able to apply knowledge drawn from mathematical texts to the construction of a model.	[SU2] presentation/project/paper/report
	[MMiADMU2_U04] can, at an advanced level and including modern mathematics, apply and present in speech and in writing the methods of at least one selected branch of mathematics	The student is able to apply Bayesian probabilistic methods to infer reality and the design of the model that describes it.	[SU2] presentation/project/paper/report
	[MMiADMU2_K04] is ready to understand and appreciate the importance of intellectual honesty in the actions of himself and others; is ready to act ethically	Students are prepared to understand and appreciate the importance of intellectual honesty in their own and others' actions and to act in accordance with ethical principles in scientific work and applications of artificial intelligence, including in the context of the use of Bayesian inference methods.	[SK8] observation of student's independent or team work
	[MMiADMU2_K02] is ready to precisely formulate questions to deepen his own understanding of a given topic or to find missing elements of reasoning	The student is prepared to formulate precise questions aimed at deepening their own understanding of Bayesian inference issues and identifying and filling in missing elements of reasoning.	[SK8] observation of student's independent or team work
	[MMiADMU2_K01] is ready to recognize the limitations of his own knowledge and is ready to continue his education	The student is willing to acknowledge the limitations of his/her own knowledge in the field of Bayesian inference and its applications in artificial intelligence, and demonstrates a readiness for further independent learning and competence development in this area.	[SK8] observation of student's independent or team work
	[MMiADMU2_U06] is able to apply methods and examples from a selected field of mathematics in related fields	The student is able to apply Bayesian probabilistic methods to infer reality and the design of the model that describes it.	[SU2] presentation/project/paper/report
	[MMiADMU2_W01] knows and understands in-depth the theory of selected areas of mathematics	The student knows the basic models used in Bayesian methods, what a Bayesian network is and what inference from a Bayesian network is.	[SW4] test/exam - oral or written
	[MMiADMU2_W02] knows and understands well the role and importance of the construction of mathematical reasoning	The student knows and understands what Bayesian inference is, what conditional, a priori and a posteriori probability is.	[SW2] presentation/project/paper/report
	[MMiADMU2_K05] is ready to independently search for information in literature, also in foreign languages	The student is ready to independently search and critically analyse information from the literature, including in foreign languages, in order to further his/her knowledge of Bayesian inference and its applications in artificial intelligence.	[SK8] observation of student's independent or team work
	[MMiADMU2_K06] is ready to form an opinion on basic mathematical issues	The student is ready to form an opinion on basic mathematical issues related to Bayesian inference used in artificial intelligence, and recognises the importance of applying probabilistic methods accurately and responsibly in data analysis and decision-making.	[SK8] observation of student's independent or team work
	[MMiADMU2_U01] can construct mathematical reasoning: prove theorems and disprove hypotheses by constructions and selecting counterexamples	The student applies Bayesian methods to inference about reality.	[SU2] presentation/project/paper/report
	[MMiADMU2_U07] is able to define his interests and develop them; in particular, is able to establish contact with specialists in their field, e.g. understand their lectures intended for young mathematicians	The student is able to apply the knowledge of Bayesian inference learnt in the lecture to solve practical problems by constructing a model for the given problem and inferring from the model.	[SU2] presentation/project/paper/report

Subject contents	1 The concept of Bayesian networks. 2. inference in Bayesian networks. 3. application of Bayesian networks vs decision making. 4. Bayesian causality discovery - network learning.		
Prerequisites and co-requisites	Knowledge of probability calculus and a programming language used in statistics.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	project	51.0%	60.0%
	observation of the student's attitude	100.0%	0.0%
	written exam	51.0%	40.0%
Recommended reading	Basic literature	1. Kevin B. Korb, Bayesian artificial intelligence, second edition, CRC Press, 2011. 2. Alicia A. Johnson, Miles Q. Ott, Mine Dogucu, Bayes Rules! An Introduction to Applied Bayesian Modeling, Taylor & Francis, 2022.	
	Supplementary literature	Dimitris Margaritis, Learning bayesian network model structure from data, Ph.D. Thesis, 200	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. description of the selected/indicated model used in Bayesian inference. 2. definition and description of the design/operation of a Bayesian network. 3. description of the Bayesian method applied to the issue/prob		
Work placement	Not applicable		

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