Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	AI Methods for Decision Making
Code der Lehrveranstaltung	27529
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	ECON-06/A
Sprache	Englisch
Studiengang	Master in Data Analytics for Economics and Management
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Prof. Dr. Paul Michael Pronobis, Paul.Pronobis@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/49449
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
Studienjahr/e	1
KP	6
Vorlesungsstunden	- 24 hours of in-person lectures - 12 hours of video lectures (counted as 24 hours to account for re-watching)
Laboratoriumsstunden	-
Stunden für individuelles Studium	-
Vorgesehene Sprechzeiten	18, including 6 hours offered as virtual classroom sessions
Inhaltsangabe	This course explores how modern AI systems, including large language models and autonomous agents, can be designed and deployed to support decision-making in business and finance. Students learn to build, evaluate, and orchestrate AI-powered tools for real-world applications such as information retrieval, data

	analysis, and process automation, with emphasis on practical implementation, prompt engineering, and responsible deployment.
Themen der Lehrveranstaltung	1. Foundations of Modern AI for Decision-Making – How large language models and generative AI differ from traditional software; capabilities, limitations, and the role of AI as a decision-support tool; ethical and regulatory context (e.g., the EU AI Act) and responsible deployment. 2. Prompt Engineering & Building Blocks of AI Applications – Core components of an LLM application: models, prompts, structured outputs/output parsers; designing reliable prompts; managing conversation context and state. 3. AI Agents, Tools & Automated Workflows – Chaining individual AI tasks into automated process pipelines; designing autonomous agents that use tools; common agentic patterns for information retrieval, data analysis, and process automation. 4. Knowledge Retrieval with RAG Systems – Retrieval-Augmented Generation as a remedy for hallucinations; RAG architecture from query to response; semantic vs. keyword search, metadata filtering, embeddings and vector databases; building grounded assistants over proprietary data. 5. Evaluation, Quality & Orchestration – Metrics and strategies to systematically assess and improve AI systems; reliability, reproducibility, and monitoring of multi-component / agentic pipelines. 6. Deployment & Practical Implementation – From notebook to product: building applications in Python, working with cloud AI services, data pipelines, and considerations for cost control, performance, and responsible production deployment. 7. Applications in Business & Finance – Case studies and use cases such as financial information retrieval, automated reporting, data analysis, and decision-support assistants.
Stichwörter	Large Language Models (LLMs); Generative AI; Prompt Engineering; AI Agents; Agentic Workflows; Tool Use / Function Calling; Retrieval-Augmented Generation (RAG); Vector Databases & Embeddings; Information Retrieval; Semantic Search; Data Analysis; Process Automation; Orchestration; AI Evaluation; Responsible AI; Decision Support; Python; Business & Finance Applications.
Empfohlene	

Voraussetzungen	
Propädeutische Lehrveranstaltungen	
Unterrichtsform	Recorded lectures, in-person teaching, exercises. The course adopts a blended, student-centred approach that emphasises problem-based learning and active engagement. A portion of the lecture content is made available online in advance, allowing students to explore key concepts independently and at their own pace before attending class. This preparatory work enables inperson sessions to focus on the application of knowledge through real-world problems, collaborative activities, and guided discussions — fostering critical thinking and deeper learning. The course is fully aligned with the principles of the Italian Universities Digital Hub (EDUNEXT) initiative (https://edunext.eu), which promotes the integration of digital resources and active learning strategies within university teaching.
Anwesenheitspflicht	Attendance is recommended, but not mandatory.
Spezifische Bildungsziele und erwartete Lernergebnisse	Intended Learning Outcomes (ILO) ILO 1 Knowledge and understanding: ILO 1.1 Students will develop specialised knowledge within the economic and business domains, tailored to their areas of interest and essential for addressing decision-making and managerial challenges in both public and private organisations. This learning outcome emphasises an interdisciplinary approach to problem-solving and organisational analysis. ILO 1.2 Students will acquire knowledge of tools and methodologies essential for analysing and interpreting corporate and organisational data. This includes understanding business performance measurement, business models and their evolution, decision-support techniques, and performance measurement systems aligned with digitalisation and sustainability processes. Furthermore, students will develop competencies in managing marketing processes, with particular emphasis on digital and interactive marketing, and assessing the impact of digitalisation on marketing activities.

	ILO 2 Applying knowledge and understanding: ILO 2.1 Students will develop the ability to analyse business-related issues that underpin data-driven decision support by applying statistical models and computational modelling techniques. This outcome focuses on integrating quantitative methods to evaluate and optimise organisational decision-making processes. ILO 2.2 Students will develop the ability to utilise and apply models designed for market analysis and for the formulation of economic policies. This outcome emphasises the integration of theoretical and empirical approaches to support evidence-based policy development and strategic decision-making. ILO 3 Making judgements: ILO 3.1 The student acquires the ability to apply acquired knowledge to interpret data in order to make directional and operational decisions in a business context. ILO 3.2 The student acquires the ability to apply acquired knowledge to support processes related to production, management and risk promotion activities and investment choices through the organisation, analysis and interpretation of complex databases. ILO4 Communication skills: ILO 4.1 The student acquires the ability to communicate effectively in oral and written form the specialised content of the individual disciplines, using different registers, depending on the recipients and the communicative and didactic purposes, and to evaluate the formative effects of his/her communication. ILO 5 Learning skills: ILO 5.1 The student acquires knowledge of scientific research tools. He/she will also be able to make autonomous use of information technology to carry out bibliographic research and investigations

	both for his/her own training and for further education. Furthermore, through the curricular teaching and the activities related to the preparation of the final thesis, she will be able to acquire the ability - to identify thematic connections and to establish relationships between methods of analysis and application contexts; - to frame a new problem in a systematic manner and to implement appropriate analysis solutions; - to formulate general statistical-econometric models from the phenomena studied.
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	In both modules the exam modalities are the same for both attending and non-attending students. The assessment consists of two components: Project work (50% of the final grade) – assesses students' ability to apply knowledge and tools (ILO 2.1, ILO 2.2), to make independent judgements and derive insights from data and AI systems (ILO 3.1, ILO 3.2), to communicate results clearly (ILO 4.1), and to work autonomously with modern AI tools and frameworks (ILO 5.1). Written exam (50% of the final grade) – assesses students' knowledge and understanding of the foundations, capabilities, and limitations of modern AI methods for business decision-making (ILO 1.1, ILO 1.2), as well as their ability to select appropriate approaches for a given problem (ILO 2.1, ILO 3.1).
Bewertungskriterien	Relevant for project work: clarity of presentation, ability to gain useful and novel insights from data and AI systems, creativity, critical thinking, ability to adhere to reproducible research best practices. Ability to design, build, and evaluate AI-powered tools — to properly use Python and modern AI libraries/frameworks, to choose the appropriate approach (e.g., prompting, agents, or RAG) for a given problem, and to apply responsible deployment

	practices. Ability to use Python and large language models to employ (understand, recall and use) AI methods in practical settings — including prompt engineering, retrieval-augmented generation, agent orchestration, and the evaluation of AI system outputs for decision-making.
Pflichtliteratur	• Huyen, C. (2024). *AI engineering: Building applications with foundation models*. " O'Reilly Media, Inc.". • Kim, G., & Yegge, S. (2025). *Vibe Coding: Building Production-Grade Software With GenAI, Chat, Agents, and Beyond*. Simon and Schuster.
Weiterführende Literatur	
Weitere Informationen	
Ziele für nachhaltige Entwicklung (SDGs)	Industrie, Innovation und Infrastruktur, Menschenwürdige Arbeit und Wirtschaftswachstum