

## SYLLABUS

**Course title:** MACHINE LEARNING IN MANAGEMENT RESEARCH

**Instructor:** Prof. Yash Raj Shrestha

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**Course website:** <https://moodle.unil.ch/course/view.php?id=30455> (Please follow the course website for announcements, updates on reading list and specific dates of classes)

**Semester:** Autumn 2024

**Timetable:** Selected Wednesdays 1000-1130 @ ANT 3077 (for specific dates please refer to the course website)

**Credits:** 3.0

**Prerequisites:** Interests in artificial intelligence (AI) related technologies and their interactions with organizations plus an open mind.

### Registration procedure:

Sign-up for the course by sending an e-mail to [benedicte.moreira@unil.ch](mailto:benedicte.moreira@unil.ch)

All open-minded PhD students interested in the study and use of machine learning in management research (e.g., information systems, strategy, OB, OT, entrepreneurship, marketing) are welcome to this course. Admission of interested students from neighboring disciplines (e.g. Economics, Finance) and external students will be discussed in case-by-case basis.

## GENERAL DESCRIPTION OF THE COURSE

This doctoral-level course offers an in-depth examination of the multifaceted impact of Artificial Intelligence (AI) within the realm of management research. The course will begin with general technical foundations of machine learning and related advanced technologies (such as deep learning and generative AI). Following this, the course is structured into three comprehensive modules: AI as a change agent, AI as an organizational agent, and AI as a research tool. Each module is designed to provide researchers with both theoretical insights and empirical applications, fostering a nuanced understanding of AI's transformative role. While the first two modules will focus on the AI as phenomenon of inquiry, third model will focus on AI as a research method in management.

**Module I: AI as a Change Agent** This module explores AI's profound influence on the external environment in which organizations operate. We will investigate how AI technologies are altering competitive landscapes, and consumer behaviors. This includes critical examination of contemporary empirical research and theoretical models that elucidate AI's role in driving

innovation and disruption across various industries. Students will engage with advanced literature to develop a comprehensive understanding of AI's macroeconomic and strategic implications.

**Module II: AI as an Organizational Agent** In this module, the focus shifts to the internal dynamics of organizations, examining how AI integrates with and transforms decision-making processes and problem-solving mechanisms. The module emphasizes the interplay between AI and human cognition, exploring ethical considerations necessary for responsible AI deployment. Through theoretical explorations, researchers will gain insights into the applications and challenges of AI within organizational contexts.

**Module III: AI as a Research Tool** The third module transitions from AI as a phenomenon to AI as a methodological tool for advancing management research. Students will be introduced to cutting-edge AI and machine learning techniques, including natural language processing, deep learning, and advanced data analytics as a research method. The curriculum is designed to equip researchers with the skills to design and execute AI-driven empirical studies, enhancing their ability to generate novel insights and contribute to the academic discourse.

## LEARNING OBJECTIVES

- To critically analyze the transformative impact of AI on organizations.
- To understand and evaluate the integration of AI within organizational decision-making and problem-solving processes.
- To develop understanding in utilizing AI and machine learning techniques for advanced management research.
- To foster a nuanced understanding of the ethical, theoretical, and empirical considerations surrounding AI in management research.

## COURSE INFORMATION PER SESSION

**Note:** This is tentative list, please follow the course website for updated list and exact dates of sessions. We are expecting updates in the reading list based on the final size of the class.

This course includes a kick-off session and cover an initial block of readings, and **x** additional sessions held over several weeks. The weeks in between sessions are meant for students to read, think, and apply techniques covered in class. Most of the sessions will feature inputs from the professor and discussion among all participants. Participants in the course are expected to carefully read and analyze the assigned research papers prior to coming to class. All the articles are provided on the online course website. On the last sessions of the course, students will present their own research projects and demonstrate how they apply new insights gained.

### Session 1: Kick-off & Introduction to ML

Please read ALL of the following as preparation:

1. Choudhury, P., Allen, R. T., & Endres, M. G. (2021). Machine learning for pattern discovery in management research. *Strategic Management Journal*, 42(1), 30-57.
2. Mullainathan S, Spiess J (2017) Machine learning: An applied econometric approach. *J. Econ. Perspect.* (American Economic Association), 87–106.

## Session 2: Introduction to ML (continued): Shift from Discriminative to Generative AI

Please read ALL of the following as preparation:

1. Stefan Feuerriegel, Jochen Hartmann, Christian Janiesch, Patrick Zschech. Generative AI *Business & Information Systems Engineering* 66 (1), 111-126, 2024
2. Shrestha, Y. R., Krishna, V. and von Krogh, G., (2021) Augmenting Organizational Decision-Making with Deep Learning Algorithms: Principles, Promises, and Challenges. *Journal of Business Research*, 123, 588- 603
3. Csaszar, F. A., & Steinberger, T. (2022). Organizations as artificial intelligences: The use of artificial intelligence analogies in organization theory. *Academy of Management Annals*, 16(1), 1-37.

## Session 3: AI as Change Agent

Please read ALL of the following as preparation:

1. Berg, J., Raj, M., & Seamans, R. (2023). Capturing Value from Artificial Intelligence. *Academy of Management Discoveries*.
2. Dell'Acqua, F., McFowland, E., Mollick, E. R., Lifshitz-Assaf, H., Kellogg, K., Rajendran, S., ... & Lakhani, K. R. (2023). Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality. *Harvard Business School Technology & Operations Mgt. Unit Working Paper* (24-013). Available at <https://ssrn.com/abstract=4573321>

Then come prepared to present TWO of the following papers in maximum 5 slides:

1. Krakowski, S.; Luger, J.; Raisch, S. 2022. Artificial Intelligence and the Changing Sources of Competitive Advantage. *Strategic Management Journal*.
2. Brynjolfsson, E., Li, D., & Raymond, L. R. (2023). *Generative AI at work*. National Bureau of Economic Research Working Paper. Available at: [www.nber.org/papers/w31161](http://www.nber.org/papers/w31161)
3. Luo, X., Qin, M. S., Fang, Z., & Qu, Z. 2021. Artificial intelligence coaches for sales agents: Caveats and solutions. *Journal of Marketing*, 85(2): 14-32.

## Session 4: AI in Decision-Making

Please read the following as preparation:

Shrestha, Yash Raj, Shiko M. Ben-Menahem, and Georg Von Krogh. 2019. Organizational decision-making structures in the age of artificial intelligence. *California Management Review*, 61(4): 66-83.

Then come prepared to present TWO of the following papers in maximum 5 slides:

1. Herath Pathirannehelage, S., Shrestha, Y. R., von Krogh, G. (2024). **Design principles for artificial intelligence-augmented decision making: An action design research study.** *European Journal of Information Systems*
2. Choudhary, V., Marchetti, A., Shrestha, Y. R., & Puranam, P. (2023). Human-AI Ensembles: When Can They Work? *Journal of Management*, 01492063231194968.
3. Lebovitz, Sarah, Hila Lifshitz-Assaf, and Natalia Levina. 2022. To engage or not to engage with AI for critical judgments: How professionals deal with opacity when using AI for medical diagnosis. *Organization Science*, 33(1), 126-148.

### Session 5 : AI and Human Capital

Please read the following as preparation:

Kellogg, K., Valentine, M. & Christin, A. 2020. Algorithms at work: The new contested terrain of control. *Academy of Management Annals*, 14(1): 366-410.

Then come prepared to present ONE of the following papers in maximum 5 slides:

1. Choudhury, Prithwiraj, Evan Starr, and Rajshree Agarwal. 2020. Machine learning and human capital complementarities: Experimental evidence on bias mitigation. *Strategic Management Journal*, 41(8): 1381-1411.
2. Curchod, C., Patriotta, G., Cohen, L., & Neysen, N. 2020. Working for an algorithm: Power asymmetries and agency in online work settings. *Administrative Science Quarterly*, 65(3): 644-676.
3. Fumagalli, Elena, Sarah Rezaei, and Anna Salomons. 2022. OK computer: Worker perceptions of algorithmic recruitment. *Research Policy*, 51(2): 104420.

### Session 6: AI in Creativity and Problem-Solving

Please read ALL of the following as preparation:

1. Raisch, S. & Fomina, K. Combining Human and Artificial Intelligence: Hybrid Problem Solving in Organizations (2024) *Academy of Management Review*
2. He, V. F., Shrestha, Y. R., Puranam, P., Miron-Spektor, E. Searching together: A theory of human-AI co-creativity. Available at SSRN: <https://ssrn.com/abstract=4204889>

Then come prepared to present ONE of the following papers in maximum 5 slides:

1. Allen, R., & Choudhury, P. (2022). Algorithm-augmented work and domain experience: The countervailing forces of ability and aversion. *Organization Science*, 33(1), 149-169.
2. Jia, N., Luo, X., Fang, Z., & Liao, C. (2023). When and how artificial intelligence augments employee creativity. *Academy of Management Journal*.

## Session 7: Algorithm Supported Induction

Please read ALL of the following as preparation

1. Gelman, A. & Loken, E. (2014). The statistical crisis in science. *American Scientist*, 102, 460.
2. Shrestha, Y. R., He, V. F., Puranam, P., & von Krogh, G. (2021). Algorithm supported induction for building theory: How can we use prediction models to theorize? *Organization Science*, 32(3), 856-880.

Then come prepared to present ALL of the following papers in maximum 5 slides (focus on methods):

1. Sen, P., & Puranam, P. (2022). Do Alliance portfolios encourage or impede new business practice adoption? Theory and evidence from the private equity industry. *Strategic Management Journal*, 43(11), 2279-2312.
2. He, V. F., Puranam, P., Shrestha, Y. R., & von Krogh, G. (2020). Resolving governance disputes in communities: A study of software license decisions. *Strategic Management Journal*, 41(10), 1837-1868.

## Session 8: Machine Learning for measurement

Please read ALL of the following as preparation

1. Shin, D., He, S., Lee, G. M., Whinston, A. B., Cetintas, S., & Lee, K. C. (2020). Enhancing social media analysis with visual data analytics: A deep learning approach (pp. 1459-1492). *Management Information Systems Quarterly*.
2. Shrestha Y. R. & He, V. F. (2022) Integrating multimodal data and machine learning for entrepreneurship research, Available at SSRN: <https://ssrn.com/abstract=4204889>

Then come prepared to present TWO of the following papers in maximum 5 slides (focus on methods):

1. Park, S., Piezunka, H., & Dahlander, L. (2023). Coevolutionary lock-in in external search. *Academy of Management Journal*.
2. Miric, M., Jia, N., & Huang, K. G. (2023). Using supervised machine learning for large-scale classification in management research: The case for identifying artificial intelligence patents. *Strategic Management Journal*, 44(2), 491-519.
3. Corritore, M., Goldberg, A., & Srivastava, S. B. (2020). Duality in diversity: How intrapersonal and interpersonal cultural heterogeneity relate to firm performance. *Administrative Science Quarterly*, 65(2), 359-394.

## Sessions 9 & 10: Student Presentations & Discussion

Please read ALL of the following as preparation

1. Wang, H., Fu, T., Du, Y., Gao, W., Huang, K., Liu, Z., ... & Zitnik, M. (2023). Scientific discovery in the age of artificial intelligence. *Nature*, 620(7972), 47-60.
2. Stokel-Walker, C., & Van Noorden, R. (2023). What ChatGPT and generative AI mean for science. *Nature*, 614(7947), 214-216.

## ASSESSMENTS AND GRADING POLICY

Weekly readings and homework are a prerequisite to passing the course. This course has three grading components as follows:

Grading	Component	Weight
<i>Individual</i>	Class contribution	20%
	Article Presentation	40%
<i>Team</i>	Research project presentation	40%

### 1. *Class contribution* (evaluated throughout the course)

Since you are all intelligent and ambitious people, a significant part of the learning in this course comes from your individual in-class contributions to our discussions. To maximize the value of our time in class, you should read the assigned articles prior to class. You will benefit from actively contributing to the discussion of the dilemmas and questions that emerge from the recent development of AI and share your perspectives (and solutions, if any) with the rest of the class. A high participation score requires on-time and full attendance, good preparation, as evidenced in sharing an in-depth understanding of readings, as well as critical thinking, as evidenced in asking questions, providing examples, and sharing your perspectives, in the context that is **RELEVANT** to the topic being discussed.

In that sense, each session provides opportunities to argue your position, share your view, and learn from others by appreciating their comments and criticisms. The keyword here is “contribution” rather than “participation”.

### 2. *Presentation of research articles* (evaluated throughout the course)

In weekly sessions, randomly picked (subset) of students will present research article selected from the pre-defined list. This presentation should include the main insights of the article and their understanding or critique of the article.

### 3. *Presentation of a (component of a) research project* (evaluated on the final sessions)

Students will be assigned into self-selected teams of 2 people. In this assignment, you will apply what you learn in this class in a current research project of yours. The goal is to experiment with using AI to enhance one of the components in the research process.

## RETAKE ASSESSMENT

Re-examination procedure: Students can redo failed assessments. The resits will be during the official resit examination period. The group class-room assignments can be redone individually, which will be evaluated with an oral presentation. The grade after resits will be calculated on the assessments that are redone along with the assessments that are not redone as per weighting scheme of the original syllabus.