

RecSys - Past, Present, and Future (Challenges) Course

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ESSAI Summer School 2026

July 2026

Course Website:

<https://aisocietylab.github.io/recsys-ppf-course/>



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QR Code to reach course website:



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About the Lecturers

Dr. Markus Reiter-Haas:

- PostDoc studying Neurosymbolic and Agentic Recommender Systems
- Vita: RecSys in Industry → PhD in CS → PostDoc Duke → TU Graz
- Interests: NLP, Transformers, IR, RecSys, User Behavior, NeSy AI
- Contact: reiter-haas@tugraz.at

About the Lecturers

Prof. Dr. Elisabeth Lex:

- Professor for HCI and Inclusive Technologies
- Head of AI for Society Lab at TU Graz, Institute of Human-Centred Computing
- Key researcher in FWF CoE Bilateral AI
- Vita: PostDocs at UNSL & RWTH Aachen → Habil in Applied CS
- Interests: ML, RecSys, IR, User Modeling, HCI, Inclusive Technologies
- Contact: elisabeth.lex@tugraz.at

Motivation: Last Decades of RecSys

2026 is special for RecSys:

- Netflix Prize began 20 years ago (in 2006)
- 20th RecSys conference in fall

"The most important application of the last 15 years is called RecSys, Recommender Systems" - Jensen Huang (2025)

Course Description

Recommender systems represent one of the most impactful **applications of AI** in the modern era, shaping everything from global commerce to information consumption. This course offers a **comprehensive look into their evolution**, navigating the path from *classical matrix factorization* to *current deep learning* and the *emerging frontiers of neuro-symbolic and agentic* approaches. Moving beyond simple accuracy, the curriculum adopts an *interdisciplinary lens* to tackle systemic challenges, including *fairness, transparency, inclusion*, and the growing divergence between offline metrics and real-world impact. In light of the EU AI Act, we will critically examine how to build trustworthy systems that align with societal values. Participants will move beyond algorithmic implementation to develop a sophisticated research mindset, equipping them with the **conceptual toolbox** necessary to navigate and shape the *next generation of recommendation technologies*.

Learning Outcomes

At the end of the course, you should be able to:

- Understand the gist of established recommendation algorithms
- Outline the evolution of recommendation approaches
- Identify practical challenges and potential remedies in the recommendation process
- Implement and optimize a two-tower model with a basic evaluation procedure
- Know about how current trends in AI might shape future recommender systems

Prerequisites: basic linear algebra and neural network knowledge

Course Calendar

Monday July 6: Introduction to Recommender Systems + History (Past)

Tuesday July 7: Matching Users and Items with Deep NN (Present)

Wednesday July 8: Beyond Optimizing Predictions (Challenges)

Thursday July 9: No RecSys class

Friday July 10: Towards Agentic LLMs and NeSy AI for RecSys (Future)

Expectations

In-person attendance and active participation!

While introductory, the course will still be information-dense (overview)

→ ask clarifying questions and

→ request a slowdown if necessary

Have fun learning about the diverse landscape of recommender systems.

Course Materials

Shared Materials:

- Two Tower Model Jupyter Notebook (<https://www.kaggle.com/code/markusreiterhaas/essai26-recsys>)
- Naive Quick RecSys Gem: example <https://gemini.google.com/share/633179f9112f> and gem <https://gemini.google.com/gem/1Uu0uQ4COG0vwSSUhtNTyJ0c63bAqBrHn?usp=sharing>

Recommended Reading:

- Recommender Systems Handbook [13]
- Blog Post on Two Tower Model:
<https://www.shaped.ai/blog/the-two-tower-model-for-recommendation-systems-a-deep-dive>
- Semantic IDs - potential backbone for future systems: Rajput, S., Mehta, N., Singh, A., Hulikal Keshavan, R., Vu, T., Heldt, L., ... & Sathiamoorthy, M. (2023). Recommender systems with generative retrieval. Advances in Neural Information Processing Systems, 36, 10299-10315.
- Good Use Case Example of novel directions: Spillo, G., Musto, C., De Gemmis, M., Lops, P., & Semeraro, G. (2022, September). Knowledge-aware recommendations based on neuro-symbolic graph embeddings and first-order logical rules. In Proceedings of the 16th ACM conference on recommender systems (pp. 616-621).