Martin Josifoski

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My long-term research focuses on the development of a highly capable collaborative multi-modal AI assistant that adapts to our evolving idiosyncratic needs, goals, and drives and can be trusted to act in line with our values and interests. Currently, I am working on enhancing collaboration and, since recently, memory in support of learning, adaptation, and inference.

EDUCATION

09.2020 – present **École Polytechnique Fédérale de Lausanne (EPFL)**
Ph.D. in Artificial Intelligence
Advisor: Robert West

09.2017 – 05.2020 **École Polytechnique Fédérale de Lausanne (EPFL)**
M.Sc. in Data Science (GPA 5.59/6.00)
Advisor: Robert West Thesis advisor (completed in ETH Zürich): Andreas Krause

09.2014 – 08.2017 **Ss. Cyril and Methodius University, Faculty of Computer and Engineering**
B.Sc. in Computer Science (GPA 9.93/10.00; top 1%)

WORK EXPERIENCE

06.2023 – 09.2023 **Research Internship, Office of the Chief Scientific Officer, Microsoft Research**
Worked on a more principled treatment of the function and implementation of memory in the context of language models and AI agents.
Supervised by Dr. Eric Horvitz

10.2019 – 05.2020 **MS thesis/Internship, Learning & Adaptive Systems Group, ETH Zürich**
Worked on a meta-learning formulation based on a PAC-Bayesian generalization bound that gives rise to a theoretically grounded class of meta-learning algorithms applicable to Neural Network (NN) models, which support expressive distribution models and are amenable to optimization by standard posterior inference methods.
Supervised by Prof. Dr. Andreas Krause

07.2019 – 10.2019 **Research Internship, Facebook AI Research**
Worked on developing a named entity linking model that scales to millions of candidates and relies solely on the context and candidate description, both of which improve performance in real-life scenarios.
Supervised by Dr. Fabio Petroni

09.2017 – 09.2019 **Research Assistantship, Data Science laboratory, EPFL**
I initially worked on reinforcement learning for representation learning on graphs. Then, I developed a statistical method for learning cross-lingual document embeddings from weakly aligned data, and finally, I worked on generalizing the latter for multitask representation learning in collaboration with Dr. Hristo Paskov.
Supervised by Prof. Dr. Robert West

11.2016 – 06.2017 **Software Engineering Internship, Asseco SEE**
Data warehouse design and implementation, business analysis.

SELECTED PUBLICATIONS

Click here for the complete list

Under review Flows: Building Blocks of Reasoning and Collaborating AI
*Authors: **Martin Josifoski,** Lars Klein, Maxime Peyrard, Yifei Li, Saibo Geng, Julian Paul Schnitzler, Yuxing Yao, Jiheng Wei, Debjit Paul, Robert West*
→ A precursor to the aiFlows library for building structured interactions involving tools, AI systems and humans, whose development I am leading.

JMLR Scalable PAC-Bayesian Meta-Learning via the PAC-Optimal Hyper-Posterior: From Theory to Practice
*Authors: Jonas Rothfuss, **Martin Josifoski**, Vincent Fortuin, Andreas Krause*

EMNLP '23 Exploiting Asymmetry for Synthetic Training Data Generation: SynthIE and the Case of Information Extraction
*Authors: **Martin Josifoski**, Marija Sakota, Maxime Peyrard, Robert West*

EMNLP '23 Grammar-Constrained Decoding for Structured NLP Tasks without Finetuning
*Authors: Saibo Geng, **Martin Josifoski**, Maxime Peyrard, Robert West*

EACL '23 **Language Model Decoding as Likelihood-Utility Alignment**

*Authors: **Martin Josifoski**, Maxime Peyrard, Frano Rajic, Jiheng Wei, Debjit Paul, Valentin Hartmann, Barun Patra, Vishrav Chaudhary, Emre Kıcıman, Boi Faltings, Robert West*

EMNLP '22 **Invariant Language Modeling**

*Authors: Maxime Peyrard, Sarvjeet Singh Ghotra, **Martin Josifoski**, Vidhan Agarwal, Barun Patra, Dean Carignan, Emre Kiciman, Robert West*

NAACL '22 **GenIE: Generative Information Extraction**

*Authors: **Martin Josifoski**, Nicola De Cao, Maxime Peyrard, Fabio Petroni, Robert West*

ICML '21 **PACOH: Bayes-Optimal Meta-Learning with PAC-Guarantees**

*Authors: Jonas Rothfuss, Vincent Fortuin, **Martin Josifoski**, Andreas Krause*

EMNLP '20 **Zero-shot Entity Linking with Dense Entity Retrieval**

*Authors: Ledell Wu, Fabio Petroni, **Martin Josifoski**, Sebastian Riedel, Luke Zettlemoyer*
→ The project's repository, open sourced at the end of my internship, has +1,000 stars.

WSDM '19 **Crosslingual Document Embedding as Reduced-Rank Ridge Regression**

*Authors: **Martin Josifoski**, Ivan Paskov, Hristo Paskov, Martin Jaggi, Robert West*

FELLOWSHIPS & ACHIEVEMENTS

2023 – 2028 ***SNSF Starting Grant*** with Robert West (CHF1,800,000 + CHF800,000 compute)
Title: "Self-Supervised NLP: From Text to Knowledge and Back"
My contributions include: (i) the initial ideas; (ii) initial work on the ideas; (iii) refinement of the ideas in collaboration with Maxime Peyrard and Robert West; (iv) feedback on framing and exposition for the application and interview

2022 – present ***PhD Fellowship*** from the Swiss Data Science Center (max 3 years; CHF175,000)
Title: "Better Decoding Algorithms for Large Language Models"

2022 – 2023 ***Google's Research Collab Grant*** (collaboration + US$100,000)
Title: "Plan-Before-You-Implement: A Higher-Level Reasoning Paradigm for LMs of Code"
Google collaborators: Rishabh Singh and Michele Catasta

2020 – present ***Microsoft Turing Academic Program*** (collaboration + compute)
Microsoft collaborators: Emre Kıcıman, Jason Eisner and members from the MS-Turing team (Vishrav Chaudhary, Vidhan Agarwal, Barun Patra et al.)

2020 – 2021 ***PhD Fellowship*** from EPFL for the first year of the PhD (CHF55,000)

2017 – 2019 ***M.Sc. Research Scholarship*** at EPFL (CHF38,000)

2015 – 2017 National ***Scholarship*** for university students with outstanding academic achievements (EUR3,000)

2010 – 2014 National ***Scholarship*** for high school students with outstanding academic achievements (EUR1,500)

2010 – 2014 High-School Tuition ***Scholarship*** based on entrance exam results (EUR10,000)

HONORS & AWARDS

2015 ACM ICPC Southeastern Europe Regional contest

2014 Bronze at National Informatics Olympiad

2013 International Mathematical Olympiad participation

2013 Balkan Mathematical Olympiad participation

2013 Gold Medal at National Mathematical Olympiad

2011 Bronze medal at Junior Balkan Mathematical Olympiad

PROGRAMMING SKILLS

Python, PyTorch, TensorFlow, Spark, Java, SQL, C++. HTML, JavaScript

TALKS

2023 Flows: Building Blocks of Reasoning and Collaborating AI, *Google'Research*

2023 Symbolic Intermediate Representations for Reasoning and Collaborating AI, *Swiss' Data 'Science'Center*

2022 GenIE: Generative Information Extraction

- *NEC'Lab*
- *Wikimedia'Research*

2022 Exploiting Asymmetry for Synthetic Training Data Generation: SynthIE and the Case of Information Extraction, *EPFL'Open'House*

2019 Crosslingual Document Embedding as Reduced-Rank Ridge Regression

- *Wikimedia'Research*
- *Wikimania'/Wikipedia'annual'conference_*