AutoLearn-SI Newsletter

Spring 2025 Edition

Leveraging Benchmarking Data for Automated Machine Learning and Optimization

Funded by
the European Union

AUTOLEARN-SI

Kick-Off Meeting Announcement

We are thrilled to announce the official kick-off meeting for AutoLearn-SI, a HorizonEU-funded project at Jozef Stefan Institute (JSI), Slovenia! This project establishes an ERA Chair research group to advance AutoML and AutoOPT, integrating cutting-edge automation into research and education.

Built on three vertical pillars:

- Experimental Databases
- Representation Learning
- Automated Algorithm Selection/Configuration

And two horizontal pillars:

- Single-objective Optimization (SOO)
- Multi-label Classification (MLC)

Led by a USA-based ERA Chair Holder (Eva Tuba) and SI-based Project Coordinator (Tome Eftimov), AutoLearn-SI fosters international collaboration with support from France, Germany, the Netherlands, and Belgium while strengthening knowledge transfer to North Macedonia.

Together, we aim to drive research excellence, boost EU funding potential, and position Slovenia as a top-tier research in automated machine learning and optimization.

Recent Academic Achievements

Distinguished Guest Lecture

We were honored to host Dr. Carola Doerr from Sorbonne Université, Paris - a valued associated partner of the AutoLearn-SI project–as part of our AI@JSI seminar series at the Jožef Stefan Institute (13.03.2025).

In her invited talk, "Generating Point Sets of Small Star Discrepancy", Dr. Doerr shared exciting insights into how solver-based optimization is revolutionizing the creation of low-discrepancy point sets, with far-reaching applications in experimental design, numerical integration, and machine learning.

A recipient of the CNRS Bronze Medal and an ERC Consolidator Grant, Dr. Doerr continues to shape the frontier of optimization research.

PhD Defense Success

We are proud to celebrate the successful PhD defense of Dr. Ana Kostovska (14.03.2025), whose outstanding research on "Representing and Exploiting Benchmarking Data for Optimisation and Learning" provides a crucial foundation for the AutoLearn-SI project.

Her dedication, insight, and collaborative spirit have greatly enriched our community. We thank her for her contributions and friendship throughout this journey and wish her continued success in all future endeavors!

Conference Acceptances: IEEE CEC 2025

We are excited to share that three of our research papers have been accepted for presentation at the 2025 IEEE Congress on Evolutionary Computation (CEC 2025), to be held in Hangzhou, China, in June 2025:

Tracing the Interactions of Modular CMA-ES Configurations Across Problem Landscapes

Authors: Ana Nikolikj, Mario Andrés Muñoz, Eva Tuba, and Tome Eftimov

Introduces the novel concept of algorithm footprints to analyze how different configurations of CMA-ES interact with the characteristics of optimization problems.

ClustOpt: A Clustering-based Approach for Representing and Visualizing the Search Dynamics of Numerical Optimization Algorithms

Authors: Gjorgjina Cenikj, Gašper Petelin, and Tome Eftimov

Presents a new method to visualize and represent algorithm behavior through clustering, enabling interpretable tracking of solution dynamics. Introduces two innovative metrics: algorithm stability and algorithm similarity.

A cross-benchmark examination of feature-based algorithm selector generalization in single-objective numerical optimization (Journal-to-Conference Track)

Authors: Gjorgjina Cenikj, Gašper Petelin, and Tome Eftimov

Conference Acceptances: GECCO 2025

Our team had four papers accepted at the Genetic and Evolutionary Computation Conference (GECCO 2025), taking place in Málaga, Spain, in July 2025:

Regular Papers:

Adaptive Estimation of the Number of Algorithm Runs in Stochastic Optimization

Authors: Tome Eftimov and Peter Korošec

Accepted in the Evolutionary Numerical Optimization (ENUM) track, this paper proposes an empirical method for estimating the number of algorithm runs needed for reliable performance assessment in stochastic optimization.

Customized Exploration of Landscape Features Driving Multi-Objective Combinatorial Optimization Performance

Authors: Ana Nikolikj, Gabriela Ochoa, and Tome Eftimov

Accepted in the Evolutionary Multiobjective Optimization (EMO) track, this work explores feature-based performance modeling for multi-objective combinatorial problems.

Short Papers (Posters) - ENUM Track:

Comparing Optimization Algorithms Through the Lens of Search Behavior Analysis

Authors: Gjorgjina Cenikj, Gašper Petelin, and Tome Eftimov

Geometric Learning in Black-Box Optimization: A GNN Framework for Algorithm Performance Prediction

Authors: Ana Kostovska, Carola Doerr, Sašo Džeroski, Panče Panov, and Tome Eftimov

Recent Publications

New Journal Article Published

We are pleased to announce the publication of our latest paper, "A Learning Search Algorithm for the Restricted Longest Common Subsequence Problem", in Expert Systems with Applications. This work delivers significant advances in both search performance and explainability for the RLCS–a critical extension of LCS widely used in bioinformatics for discovering motifs in DNA, RNA, and protein sequences.

Key Innovations:

- Versatile Search Framework: Building on a general search framework for RLCS
- Two Learning-Driven Heuristics:
  - Probabilistic Evaluator
  - Neural-Guided Beam Search
- Explainability at the Forefront: Rigorous empirical analysis pinpoints feature combinations driving success

Collaborating Institutions:

- Faculty of Natural Sciences and Mathematics, University of Banja Luka (Bosnia & Herzegovina)
- Faculty of Mathematics, University of Belgrade (Serbia)
- Jožef Stefan Institute (Slovenia)
- Artificial Intelligence Research Institute, UAB Campus (Spain)

Read the full article:
https://doi.org/10.1016/j.eswa.2025.127731

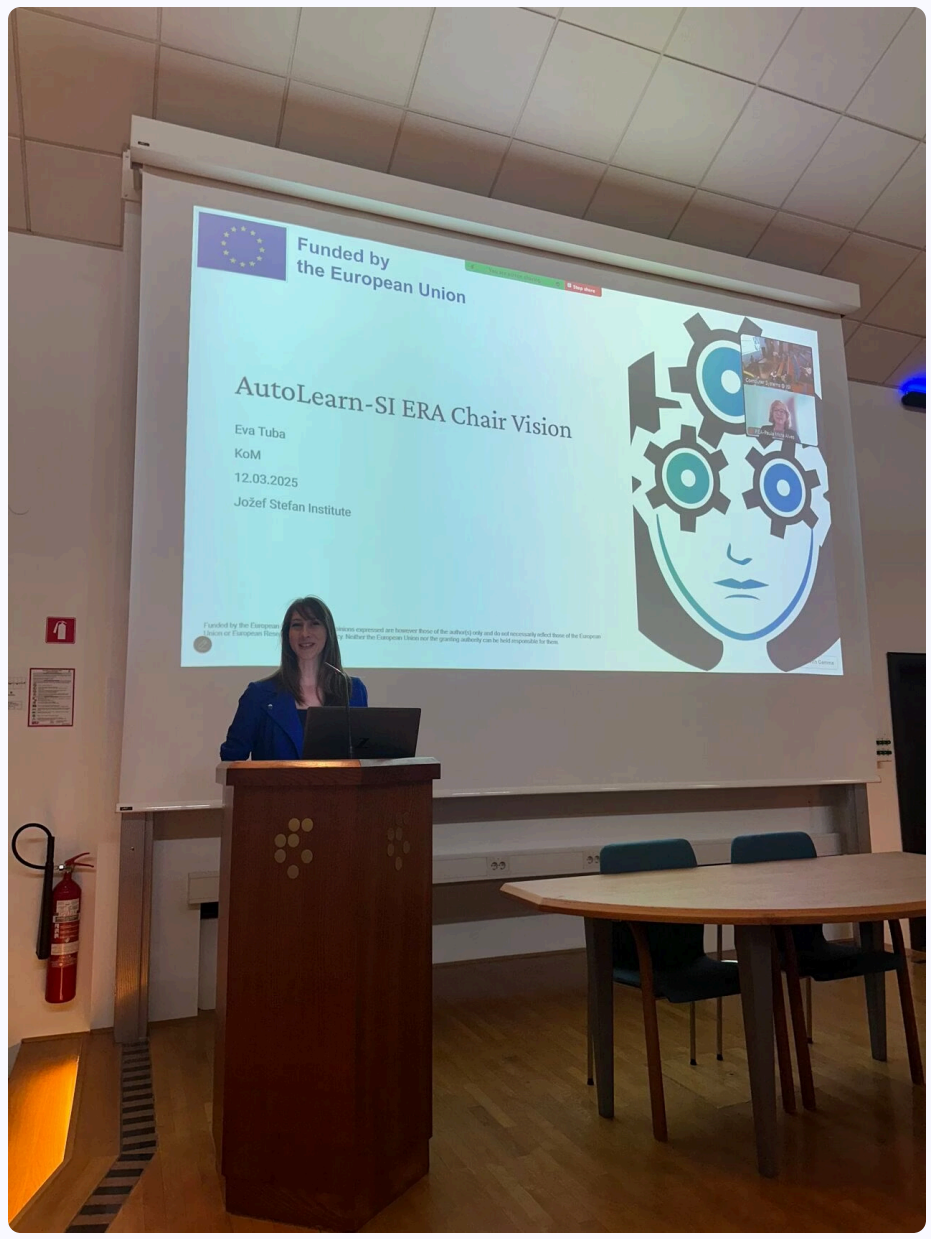
Outreach Activities: JSI Open Days & ERA Chair Keynote

JSI Open Days 2025

As part of the JSI Open Days 2025 (25.03.2025), our ERA Chair project coordinator, Asst. Prof. Dr. Tome Eftimov, presented the vision and objectives of the AutoLearn-SI project. His talk, delivered during the session on high-impact international initiatives at the Jožef Stefan Institute, highlighted how AutoLearn-SI is advancing data-driven research and fostering international collaboration.

ERA Chair Holder Keynote

Our ERA Chair Holder, Asst. Prof. Dr. Eva Tuba, delivered a keynote talk titled "AI for Automated Optimization" at the 6th Doctoral Symposium on Computational Intelligence. The symposium was jointly organized by the Institute of Engineering and Technology Lucknow, Campus of Open Learning (University of Delhi), Shaheed Rajguru College of Applied Sciences for Women (University of Delhi), and the University of Calabria, Italy.



Outreach Activities: Industry & HR Engagement

loveHR 2025 Summit

Our project coordinator, Asst. Prof. Dr. Tome Eftimov delivered a thought-provoking presentation on the role of automated learning techniques in addressing real-world workforce challenges at the #loveHR2025 Summit - Slovenia's leading HR congress.

Dnevi Slovenske Informatike 2025

The AutoLearn-SI project was prominently featured at Dnevi slovenske informatike 2025, Slovenia's national informatics conference. Our project coordinator contributed valuable insights on the evolving role of AI and data-driven technologies in society during the final panel session.

Outreach Activities: International Conferences

CIIT2025 Conference

We hosted a dedicated session on Automated Learning Techniques at the International Conference on Informatics and Information Technologies (#CIIT2025) on April 25, 2025, in Strumica, North Macedonia. The session featured presentations on "Leveraging Benchmarking Data for Automated Optimization" and "Robust and Interpretable Large Language Model Ranking Based on User Preferences."

COSEAL 2025 Presentations

- Gjorgjina Cenikj presented research on "Landscape Features in Single-Objective Continuous Optimization: Have We Hit a Wall in Algorithm Selection Generalization?" at COSEAL 2025 in Porto, Portugal.
- Ana Nikolikj presented a comprehensive study of how individual modules within the modular CMA-ES framework interact across diverse optimization problem instances.

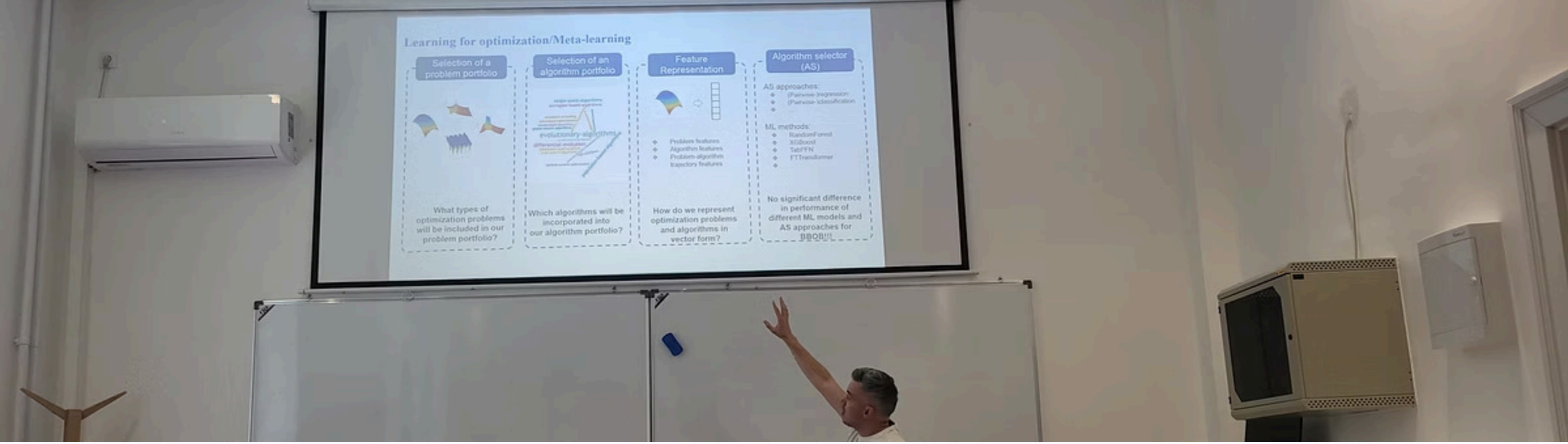
Outreach Activities: Community Engagement

DATA FAIR Showcase

Ana Kostovska represented Autolearn SI at the Slovenian Data Science community's DATA FAIR event in Ljubljana, demonstrating how graph structures can be harnessed to predict which algorithm will deliver the best performance for any given learning task.

CASSINI Hackathon Mentorship

Our Project Coordinator participated in the Big Ideas Campaign at the CASSINI Hackathon, delivering an engaging session on how artificial intelligence is transforming the food and health sectors.



International Knowledge Transfer

Our project coordinator presented the team's work in leveraging benchmarking data for automated optimization during the AI Workshop at the Faculty of Natural Sciences and Mathematics, University of Banja Luka.

Data Collection

Gathering benchmarking data across diverse optimization problems

Feature Extraction

Identifying key characteristics that influence algorithm performance

Model Training

Developing predictive models for algorithm selection

Automated Optimization

Deploying intelligent systems that select optimal algorithms

This knowledge transfer initiative strengthens our collaboration with research institutions in the Western Balkans, supporting the development of AI expertise throughout the region.

Contact Information

AutoLearn-SI is a HorizonEU-funded project establishing an ERA Chair research group at Jozef Stefan Institute (JSI), Slovenia. For more information about our activities and research, please visit our website **https://autolearnsi.eu/**.

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info-autolearnsi@ijs.si

Location

Jozef Stefan Institute, Ljubljana, Slovenia

Project

HorizonEU-funded ERA Chair research group

Team

Led by Eva Tuba (ERA Chair) and Tome Eftimov (Coordinator)