

University of Trieste

Species Scholarship 2026 host candidate

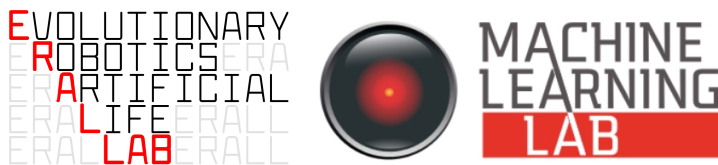
Short CV of the advisor

Eric Medvet (<https://medvet.inginf.units.it/>) is an Associate Professor in Computer Engineering at the Department of Engineering and Architecture of University of Trieste, Italy, where he is the founder and head of the Evolutionary Robotics and Artificial Life lab (ERALLab) and has been the co-founder of the Machine Learning Lab. His research activities include evolutionary computation (with a focus on genetic programming and grammar-guided genetic programming), artificial life, and the application of machine learning techniques to engineering, including robotics. He served as reviewer for many international journals and as a program committee member for many important conferences closely related to his research interests. He covered chairing roles for Evostar, GECCO, and PPSN. He authored more than 190 peer-reviewed articles on international journals or conferences, with more than 60 coauthors. He was a recipient of the Google Faculty Research Award 2020.

Research group

The research group is based on three highly interacting labs:

- Evolutionary Robotics and Artificial Life lab (ERALLab, <https://erallab.inginf.units.it/>)
- Machine Learning lab (MaLeLab, <https://machinelearning.inginf.units.it/>)



Jointly, the computer engineering group is currently composed of faculty:

- Eric Medvet (associate professor, head of ERALLab, **main proponent**)
- Sylvio Barbon Junior (associate professor, head of MaLeLab)
- Alberto Bartoli (full professor)
- Andrea De Lorenzo (associate professor)
- Laura Nenzi (associate professor)
- Alessandro Renda (assistant professor)
- Martino Trevisan (assistant professor)

PhD students (only ERALLab listed):

- Michel El Saliby

- Francesco Rusin
- Berfin Sakallioglu

The ERALLab group also hosts master students from University of Trieste and visiting students from other universities as, e.g.:

- Jessica Megane (from Portugal)
- Kenneth Ege de Bruin (from Norway)
- Gabin Calmet (from France)
- Ninel Dogaru (from France)
- Davide Farinati (from Portugal)

Many other international researchers visited the larger group including MaLeLab.

At ERALLab, students and staff interact **daily**, with the goal of mutual enrichment resulting eventually, when possible, in research output.

Work to be carried out by the student

We propose a research topic related to **program synthesis**.

In [1], we developed a theoretical framework for the expression, in a transparent way, of **programs in the form of graphs** which process information in the form of flowing typed tokens. We called this kind of program **Typed Token Processing Networks (TTPNs)**. TTPNs are promising, as they are expressive and provide not only **static transparency** (how the program is structured), but also **dynamic transparency** (how, where, and for how long the information flows in the program). Unfortunately, we also discovered that it is quite hard to optimize, through evolutionary computation, over the space of TTPNs, as the fitness landscape is likely very rugged. On the other hand, recent research by Moraglio [2] proposed a kind of universal generative representation (**Program Trace Optimization, PTO**) that might fit the case of TTPNs, i.e., support their expressiveness and transparency and improve their evolvability.

In this proposed research project, we aim at **improving the effectiveness of evolutionary program synthesis** for the case of TTPNs by employing PTO. We will formalize the application of the PTO representation for expressing phenotypes which are TTPNs. We will develop the corresponding composed, indirect representation, building on our quite solid experience on representation properties and using our consolidated toolbox, including JGEA [3]. We will evaluate the output (i.e., the PTO-based representation for TTPNs) experimentally on a set of benchmark problems and compare it against the direct representation that we used in [1].

The hosted student will get in touch with “hot” topics, program synthesis and transparency (an enabling factor for interpretability, i.e., **XAI**), will tackle it with theoretically grounded methods, and will play a primary role in the full pipeline for producing the research output.

References

1. Sakalliglu, Berfin, et al. "Evolving Typed Token Processing Networks." Proceedings of the Genetic and Evolutionary Computation Conference Companion. 2025.
2. Moraglio, Alberto, and James McDermott. "Program trace optimization." International Conference on Parallel Problem Solving from Nature. Cham: Springer International Publishing, 2018.
3. Medvet, Eric, Giorgia Nadizar, and Luca Manzoni. "JGEA: a modular java framework for experimenting with evolutionary computation." Proceedings of the genetic and evolutionary computation conference companion. 2022.

Other relevant information

City of Trieste

Trieste is a mid-sized Italian city placed on the northernmost part of the Mediterranean sea. It is known for its high quality of life (6th in Italy according to Sole 24 Ore ranking) and its lively multiculturalism, deriving from its being a border town. Trieste has for decades been a

research and science city: it hosts 2 universities (University of Trieste and SISSA) and many world-level research institutions. It has been the City of Science 2020 and hosted the Euroscience Open Forum (ESOF2020) in early July 2020

(<https://www.esof.eu/en/home.html>)

Trieste is a researcher-friendly city: with its 37 researchers on 1000 inhabitants it is one of the most science-dense regions of the world. As a result, Trieste offers many facilities and accommodations for researchers and students (e.g., Welcome Office:

<http://www.welcomeoffice.fvg.it/>).

University of Trieste hosted Evostar in 2025, with a significant contribution from our group (students and faculty) in the organization.

Accommodation

University of Trieste offers many student services, including accommodation and use of the canteen, to its students: see

<http://www.welcomeoffice.fvg.it/practical-info/accommodation/students-and-researchers-hall/>.

Depending on the status of the visiting student, these services may be accessed at a discounted rate.