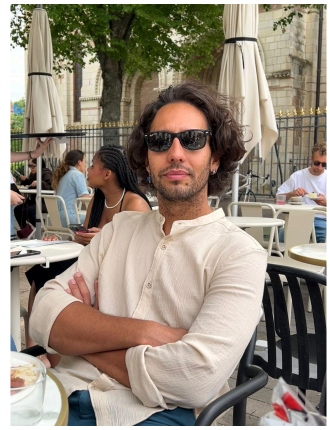
CV of the advisors



Pr. Yuri Cossich Lavinas (former species awardee - 2020)

Website: https://yurilavinas.github.io/

Research profile: https://scholar.google.com/citations?user=-hdeQYcAAAAJ

Current Position

2024 – Associate Professor

Yuri Cossich Lavinas got my PhD degree from the University of Tsukuba, Japan.
He's from Brazil, where he did his undergraduate course, at the University of Brasilia. His research interests are related to Computational Intelligence, such as Evolutionary Computation and Artificial Life, with a greater focus on multi-objective optimization, fitness landscape and Genetic Programming. Overall, he's interested in programs that can adapt themselves, in applications of Evolutionary Computation (black box optimization, multi-agent systems, games), as well as more speculative use of these Computational Intelligence for Artificial Life (such as the evolution of virtual creatures and the worlds where the live).

Pr. Sylvain Cussat-Blanc

Website: http://www.irit.fr/~Sylvain.Cussat-Blanc

Research profile: https://scholar.google.fr/citations?user=16NYbuwAAAAJ

Current Positions

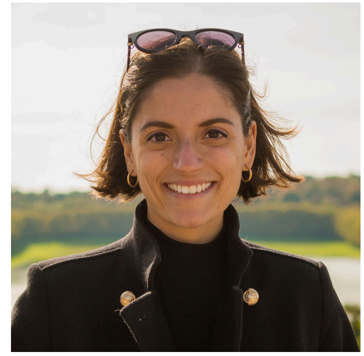
2024 – 2029 Junior Fundamental Chair at the Institut Universitaire de France

Genetic programming for biomedical image analysis

2022 - University Professor

Sylvain Cussat-Blanc defended his thesis in 2009 at Toulouse Capitole
University, where he developed evo-devo algorithms for growing virtual organisms optimized by genetic algorithms. As a post-doc at Brandeis University, he applied these concepts to modular robotics. Lecturer in 2012 and University Professor in 2022, he collaborates with biologists and physicians to apply evolutionary algorithms to biomedical data, notably via genetic programming for biomedical image analysis, offering results comparable to neural networks while being more interpretable and less data-intensive to learn.

Dr. Giorgia Nadizar (former species awardee - 2022)



Website: https://giorgia-nadizar.github.io/

Research profile: https://scholar.google.fr/citations?user=TWbaiVMAAAAJ

Current Position

2025 – 2027 - Postdoctoral Research Fellow

Giorgia Nadizar got her PhD degree from the University of Trieste, Italy. She is currently a Postdoctoral Research Fellow, working on the OPTICCS project (OPTimization of Interpretable Control policies for Clinical Support), funded by TIRIS (Toulouse Initiative for Research's Impact on Society). Her research interests are related to embodied AI and explainable/interpretable AI, with a greater focus on Genetic Programming and the development of human-intelligible robotic controllers. Overall, she is interested in designing adaptive and interpretable control systems for real-world applications (such as medical devices like mechanical ventilators), as well as more general applications of Evolutionary Computation in embodied systems and Artificial Intelligence.

REVATeam

The REVAteam, based at the Institut de Recherche en Informatique de Toulouse (IRIT) and affiliated with Université Toulouse Capitole (UTC), conducts research in bio-inspired artificial intelligence and artificial life. The group focuses on computational models inspired by living systems, aiming to replicate properties such as adaptability, self-organization, and resource efficiency.

A key area of expertise is genetic programming, with a strong emphasis on Cartesian Genetic Programming (CGP), used to develop innovative and robust solutions in evolutionary computation and complex adaptive tasks, ranging from biomedical image processing to the control of robots.

Situated in Toulouse, a major academic and technological hub in France, the team benefits from a stimulating interdisciplinary environment. The close connection between IRIT, UT1, and the broader Toulouse ecosystem, e.g.,health, aerospace, AI, and robotics, making it a fertile ground for cutting-edge research and collaboration.

The team brings together 3 permanent researchers, 2 postdoctoral fellows, and around 10 PhD and master students, from at least 5 different nationalities, working on projects spanning evolutionary computation, artificial life, and bio-inspired AI. In April this year, the team served as local organisers for EvoStar 2026 in Toulouse, meaning new students could dive straight into the heart of the international research community from day one.

Spatial computing of Cartesian Genetic Programming and its evolution

This project investigates new spatial and parallel formulations of Evolutionary Computation based on Cartesian Genetic Programming (CGP). The main objective is to design, implement, and evaluate distributed and spatially-structured CGP models capable of exploiting locality, coevolution, and parallel computation in order to improve scalability, diversity maintenance, robustness, and evolvability. The main objective is to develop a generalized framework in which CGP can evolve and execute over spatial grids, enabling both the evolution of populations distributed on cells (like in classical cellular Genetic Algorithms) and the distributed execution of individual CGP programs.

The proposed idea is to explore two complementary perspectives of spatial CGP. In the first, evolutionary processes occur over a structured grid, where multiple CGP individuals evolve through local interactions, neighborhood-based variation, and decentralized selection mechanisms. In the second, a single CGP individual is spatially distributed across a computational substrate, allowing computation itself to emerge through local interactions between processing elements. Together, these perspectives aim to investigate how spatial organization affects evolvability, robustness, modularity, diversity maintenance, and emergent behavior in evolutionary systems.

CGP is particularly well suited for this project because of its compact graph-based representation, high computational efficiency, and strong capacity for modular and reusable computation, given that CGP represents programs as directed acyclic graphs. Its graph structure also maps naturally onto spatial and distributed substrates, making CGP an ideal candidate for investigating decentralized execution, cellular computation, and coevolutionary dynamics on grids and parallel architectures.

The student will design and implement scalable computational models capable of supporting spatial execution, parallel evolution, and coevolutionary dynamics. The project will include the study of asynchronous and distributed evolutionary operators, local communication strategies, migration and neighborhood policies, and parallel execution techniques suitable for GPUs and large-scale distributed environments.

Experimental evaluation will be performed on benchmark problems in symbolic regression, classification, and dynamical systems, comparing canonical CGP with the proposed spatial formulations. Particular attention will be given to understanding how spatial constraints and decentralized interactions influence search dynamics and the emergence of complex computational structures.

The project combines concepts from genetic programming, cellular systems, graph computation, and distributed evolutionary algorithms. The student is expected to implement the proposed methods in a modular research framework (e.g., Python/C++), perform experiments on benchmark symbolic regression and classification problems, and analyze emergent properties of spatial evolution such as self-organization, robustness, and specialization.