FRANCESCO ZITO

EXPERIENCE

ADJUNCT PROFESSOR 11/2024 – Present
University of Catania, Catania, Italy
Department of Biomedical and Biotechnology Sciences
Course of Principles of Computer Science and Mathematics applied to Biotechnology

VISITING PHD STUDENT 04/2024 – 05/2024
INRIA, University of Lille, Lille, France
Institut national de recherche en sciences et technologies du numérique INRIA (National Institute for Research in Digital Science and Technology)
- Collaborated with international colleagues and professors on joint publications.
- Conducted research on the field of Global Optimization Problem, Hyperparameters Optimization on Machine Learning Models and High-Performance Computing.
- Supervisor: Prof. El-Ghazali Talbi

PHD FELLOW IN COMPUTER SCIENCE 11/2021 – 10/2024
University of Catania, Catania, Italy
Department of Mathematics and Computer Science
- Conducted extensive research over a three-year period as part of my PhD program, focusing on artificial intelligence and the design of algorithms for data-driven learning, pattern extraction, and real-world system replication to facilitate decision-making. Developed various methodologies, algorithms, and frameworks tailored to diverse contexts, including:
  - **Real-time Optimization**: Adapted metaheuristic techniques for addressing real-time optimization challenges.
  - **Machine Learning Principles to Drive Metaheuristics**: Integrated machine learning principles within metaheuristics to enhance efficiency in search space exploration.
  - **Modelling Complex Systems**: Created a framework to capture nonlinear relationships between variables in complex systems, enabling effective modelling and simulation.
  - **Automated Machine Learning**: Analysed the application of metaheuristics in automated machine learning, proposing an algorithm to construct neural networks from scratch using only provided data.
  - **Forecasting for Decision-Making**: Developed a methodology employing forecasting techniques to improve decision-making processes and explored the use of automated machine learning in designing effective forecasting models.
- Supervisor: Prof. Mario Pavone

TEACHING ASSISTANT 11/2022 – 10/2024
University of Catania, Catania, Italy
- Course of Mathematic in Chemistry (A.Y. 2023/2024), *Department of Chemical Sciences.*
- Course of Operating Systems in Computer Science (A.Y. 2023/2024), *Department of Mathematics and Computer Science.*
- Courses of Foundations of Programming (A.Y. 2022/2023 and 2023/2024), *Department of Electrical Electronic and Computer Engineering*
- Courses of Software Engineering in Computer Engineering (A.Y. 2022/2023), *Department of Electrical Electronic and Computer Engineering*.

SOFTWARE ENGINEER 11/2019 – 11/2021
Etna Digital Growth, Tremestieri Etneo, Catania, Italy
- ➢ Developed and maintained applications using .NET and .NET Core frameworks.
- ➢ Utilized SQL databases such as Oracle and SQL Server to store and retrieve data.
- ➢ Implemented best practices for code quality, testing, and documentation.
- ➢ Collaborated with other engineers and stakeholders to deliver solutions that met user needs and specifications

RESEARCH SCHOLAR 12/2019 – 05/2020
University of Catania, Catania, Italy
TALIsMAn Project, Department of Electrical Electronic and Computer Engineering

- ➢ Participated in a research project on personalized assistance technologies for improving the quality of life of vulnerable individuals and social and health service providers
- ➢ Conducted research on how virtual networking and virtualization techniques can protect personal data in a social-health context
- ➢ Developed and evaluated methods for data protection

RESEARCH & DEVELOPMENT 06/2018 – 07/2019
ICS Group, Siracusa, Italy
- ➢ Designed and developed a Geographic Information System (GIS) software to manage multiple and synchronized data for photovoltaic system projects.
- ➢ Analyzed the ground data to determine the optimal locations for photovoltaic modules.
- ➢ Used .NET Framework to implement the software.
- ➢ Tested and debugged the software to ensure its functionality and reliability.
- ➢ Documented and presented the software to clients

SOFTWARE DEVELOPER 01/2015 – 11/2019
Self-Employment, Italy
- ➢ Full Stack Developer: WPF, ASP.NET, Node.js, SQL Server
- ➢ Web Developer: Bootstrap, jQuery, Express.js, WordPress
- ➢ Designing applications (desktop and mobile) published on the Windows Store

LEADERSHIP EXPERIENCE
- ➢ Member of the Technical Program Committee of 5th International Conference On Computational Intelligence 2024 (Link).
- ➢ Chair of the Session in Data-driven approaches, The15th Metaheuristics International Conference (MIC 2024), 4-7 June 2024, Lorient, France
- ➢ Co-organizer, Special issue on Mathematics. Modeling Real-World Problems Using Complex Networks (Link).
- ➢ Co-organizer, Special session on "Advanced methods for anomalies forecasting and detection", International Conference on Optimization and Learning, 3-5 May 2023, Malaga - Spain (OLA 2023) and 13-15 May, Dubrovnik - Croatia (OLA 2024).
  - Planned and coordinated a special session
  - Publicized the special session on channels such as social media, groups to attract and inform the audience.

- ➢ Member of the local organizing committee for the Metaheuristics Summer School - MESS 2024 – "Automated Deep Learning meets High-Performance Computing", 15-18 July 2024, Department of Economics and Business, University of Catania, Italy.
- ➢ Local Organizer, 14th Metaheuristics International Conference, 11-14 July 2022, Siracusa (Italy)
  - Assisted the conference organizers with the local arrangements and logistics of the conference
  - Handled the registration, reception, and guidance of the attendees and speakers
  - Solved any issues or problems that arose during the conference.
- ➢ Thesis co-supervisor:
  -Evolutionary algorithm with metaheuristic approaches for finding optimal solutions to the Feedback Vertex Set Problem (Master of Science in Computer Science)
  -Development of a population-based algorithm to infer the parameters of a Gene Regulatory Network in the S-system model: a first approach (Bachelor of Science in Computer Science)
  -An overview of Automated Machine Learning (Bachelor of Science in Computer Science)

EDUCATION

University of Catania, Catania, Italy
Doctor of Philosophy: Computer Science
2021 – 2024

- ➢ Thesis Title: **In What Ways Do Data-Driven AI Algorithms Impact Complex Real-World Systems and Decision-Making?**
- ➢ Short Abstract: This doctoral thesis advances artificial intelligence (AI) algorithms for processing large datasets across various domains, emphasizing the critical role of data in decision-making. Focusing on metaheuristic algorithms, the research introduces a novel methodology for adapting these algorithms to real-time optimization challenges and integrates machine learning principles to enhance their search capabilities, leading to faster convergence and improved performance. A key application is a reverse engineering framework for gene regulation, designed to replicate gene behavior from temporal observations and deepen our understanding of gene interactions. The thesis also explores advancements in automated machine learning, proposing a new algorithm for autonomously constructing deep neural networks from scratch tailored to specific tasks. Additionally, it examines multivariate time series forecasting, presenting a framework that enhances decision-making by combining Automated Machine Learning with Metaheuristics.

University of Catania, Catania, Italy
Professional Engineer License
2021

University of Catania, Catania, Italy
Master of Science, Computer Engineering
2018-2020

- ➢ Graduated with honor, full marks with laude
- ➢ Thesis title: **Design and Validation of Virtual Gateway**

University of Catania, Catania, Italy
Bachelor of Science, Computer Engineering
2015-2018
- ➢ Thesis title: **Innovative techniques for optimizing cache access in web applications**

ADVANCED COURSES

3rd International Metaheuristic Summer School, Catania, Italy
15-18 July 2024
The third edition focuses on "*Automated Deep Learning Meets High-Performance Computing*", that is how these research areas may interact and affect each other to develop reliable and robust solving methodologies for Big Data analysis, and data-driven problems.

2nd Doctoral Summer School on Multi-Functional Materials and Sustainability, Catania, Italy
1-5 July 2024
The 2nd edition of this workshop focuses on the study, synthesis, and application of materials in different strategical fields for sustainable development.

1st REUNICE Doctoral Summer School in Italy, Catania, Italy
10-14 July 2023
The REUNICE Doctoral Summer School focuses on the different aspects of Sustainable Science starting from the fundamental definition and continuing with the crosslink with Artificial Intelligence and transversal skills, thus ending with practical examples of sustainable science in the Environment, ICT and social innovation.

International School on Deep Learning, Bari, Italy
3-7 April 2023
Deep Learning 2023 Spring School is a research training event with a global scope aiming at updating participants on the most recent advances in the critical and fast developing area of deep learning.

Bertinoro International Spring School, Centro Universitario di Bertinoro
7-11 March 2022
Italian Computer Science PhD organized an annual school offering three graduate-level courses: Towards Developmental Machine Learning, Opinions and conflict in social networks: models, computational problems, and algorithms, From Cloud to Serverless through microelements.

2nd International Metaheuristic Summer School, Catania, Italy
15-18 June 2021
MESS2020+1 focuses on Learning and Optimization from Big Data

Advanced Business Analytics, Coursera
26 March 2021 (Link)

| **VOLUNTEERING** | **University of Catania**, 06/2023 – 10/2024 |
| | **Representative at EUNICE Student Board** |

University of Catania, 06/2023 – 10/2024
Representative at EUNICE Student Board
EUNICE, the European University for Customized Education, is a university alliance involving ten European countries (https://eunice-university.eu/). I have been a member of the EUNICE Student Board at the University of Catania since its establishment in 2023, where I served as one of the coordinators until July 2024.

LANGUAGES

Italian: First Language

English: B2

TALKS

During my academic career, I delivered the following talks at international conferences and presentations:

- **Enhancing Multivariate Time-Series Forecasting Accuracy through Automated Machine Learning.** 3rd International Metaheuristic Summer School. Catania (Italy), 15-18 July 2024
- **Enhancing Energy Consumption Forecasting Accuracy through Automated Machine Learning.** 2nd REUNICE Workshop on Multi-Functional Materials and Sustainability. Catania (Italy), 3-5 July 2024
- **A General-Purpose Neural Architecture Search Algorithm for building Deep Neural Network**. In 15th Metaheuristics International Conference (MIC 2024), Lorient (France), 4-7 June 2024
- **Deep Learning and Metaheuristic for Multivariate Time-Series Forecasting**, 18th International Conference on Soft Computing Models in Industrial and Environmental Applications (SOCO), Salamanca (Spain), Sep 5-7, 2023
- **Integrating Machine Learning into a Genetic Algorithm to Improve the Performance**, International Conference on Optimization and Learning (OLA), Malaga (Spain), May 3-5, 2023.
- **A Fast Methodology to Find Decisively Strong Association Rules (DSR) by Mining Datasets of Security Records**, International Conference on Optimization and Learning (OLA), Malaga (Spain), May 3-5, 2023.
- **A Novel Reverse Engineering Approach for Gene Regulatory Networks**, The 11th International Conference on Complex Network and Their Applications (CNA), Palermo (Italy) Nov 7-10, 2022.
- **A Machine Learning Model for Inferring Gene Regulatory Networks**, The 1st Italian Conference on Big Data and Data Science (ITADATA), Milan (Italy), Sep 20-21, 2022.
- **Optimizing Multi-variable Time Series Forecasting Using Metaheuristics**, The 14th Metaheuristics International Conference (MIC), Siracusa (Italy), July 11-14, 2022.

REVIEWER

I am currently an invited reviewer for several prestigious journals and international conferences.

Scientific Journals
- Scientific Report, Nature
- Applied Soft Computing (ASOC)
- Knowledge-Based System (KNOSYS)
- Swarm and Evolutionary Computation (SWEVO)
- Neural Computing and Applications (NCAA)
- Multimedia Tools and Applications (MTAP)

International Conferences
- BIOMA 2022: International Conference on Bioinspired Optimization Methods and Their Applications.
- MIC 2022: Metaheuristics International Conference
- IJCNN 2022: International Joint Conference on Neural Networks
- OLA 2023: International Conference in Optimization and Learning
- IAAI 2023: Conference on Innovative Applications of Artificial Intelligence
- IJCNN 2024: International Joint Conference on Neural Networks

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SCIENTIFIC PUBLICATIONS

Following my contributions to academic literature, showcasing my research and expertise in Artificial Intelligence and in developing advanced optimization algorithms employed in real applications.

Conference Paper
V. Cutello, A. Mezzina, M. Pavone and F. Zito, A Real-Time Adaptive Tabu Search for Handling Zoom In/Out in Map Labelling Problem. In: Learning and Intelligent Optimization Conference (LION 2024), 9-13 June 2024, Ischia, Italy. Lecture Notes in Computer Science, Springer Nature Switzerland (in press).

Conference Paper
F. Zito, V. Cutello, and M. Pavone, A General-Purpose Neural Architecture Search Algorithm for Building Deep Neural Networks. In: Metaheuristics International Conference (MIC 2024), 4-7 June 2024, Lorient, France. Lecture Notes in Computer Science. Springer Nature Switzerland, vol 14754, pp. 126-141, 2024. https://doi.org/10.1007/978-3-031-62922-8_9

Article
V. Cutello, M. Pavone, and F. Zito, Improving an immune-inspired algorithm by linear regression: A case study on network reliability, Knowledge-Based Systems, vol. 299. Elsevier BV, p. 112034, Sep. 2024. https://doi.org/10.1016/j.knosys.2024.112034

Conference Paper
C. Cavallaro, V. Cutello, M. Pavone, and F. Zito, A Tabu Search Algorithm for the Map Labelling Problem. In: Italian Workshop on Artificial Life and Evolutionary Computation (WIVACE 2023), 6-8 September 2023, Venice, Italy. Communications in Computer and Information Science. Springer Nature Switzerland, vol 1977, pp. 16-28, 2024. https://doi.org/10.1007/978-3-031-57430-6_2

Chapter
V. Cutello, M. Pavone, and F. Zito, Inferring a Gene Regulatory Network from Gene Expression Data. An Overview of Best Methods and a Reverse Engineering Approach, Lecture Notes in Computer Science. Springer Nature Switzerland, vol 14070, pp. 172-185, 2024. http://doi.org/10.1007/978-3-031-55248-9_9

Article
C. Cavallaro, V. Cutello, M. Pavone, and F. Zito, Machine Learning and Genetic Algorithms: A case study on image reconstruction, Knowledge-Based Systems, vol. 284. Elsevier BV, p. 111194, Jan. 2024. https://doi.org/10.1016/j.knosys.2023.111194

Article	C. Cavallaro, C. Crespi, V. Cutello, M. Pavone, and F. Zito, Group Dynamics in Memory-Enhanced Ant Colonies: The Influence of Colony Division on a Maze Navigation Problem, Algorithms, vol. 17, no. 2. MDPI AG, p. 63, Feb. 01, 2024. https://doi.org/10.3390/a17020063.
Conference Paper	F. Zito, V. Cutello, and M. Pavone, Deep Learning and Metaheuristic for Multivariate Time-Series Forecasting. In: International Conference on Soft Computing Models in Industrial and Environmental Applications (SOCO 2023), 5-7 September 2023, Salamanca, Spain. Lecture Notes in Networks and Systems. Springer Nature Switzerland, vol 749, pp. 249-258, 2023. https://doi.org/10.1007/978-3-031-42529-5_24
Article	Cavallaro, C., Cutello, V., Pavone, M., & Zito, F. (2023). Discovering anomalies in big data: a review focused on the application of metaheuristics and machine learning techniques. In Frontiers in Big Data (Vol. 6). Frontiers Media SA. https://doi.org/10.3389/fdata.2023.1179625
Article	F. Zito, V. Cutello, and M. Pavone, A Machine Learning Approach to Simulate Gene Expression and Infer Gene Regulatory Networks, Entropy, vol. 25, no. 8. MDPI AG, p. 1214, Aug. 15, 2023. https://doi.org/10.3390/e25081214
Conference Paper	C. Cavallaro, V. Cutello, M. Pavone, and F. Zito, A Fast Methodology to Find Decisively Strong Association Rules (DSR) by Mining Datasets of Security Records. In: International Conference on Optimization and Learning (OLA 2023), 3-5 May 2023. Malaga, Spain. Communications in Computer and Information Science. Springer Nature Switzerland, vol 1824, pp. 315-326, 2023. https://doi.org/10.1007/978-3-031-34020-8_24
Conference Paper	F. Zito, V. Cutello, and M. Pavone, A Novel Reverse Engineering Approach for Gene Regulatory Networks. In: International Conference on Complex Networks and Their Applications (CNA 2022), 8-10 November 2022, Palermo, Italy. Studies in Computational Intelligence. Springer International Publishing, vol 1077, pp. 310-321, 2023. https://doi.org/10.1007/978-3-031-21127-0_26
Conference Paper	F. Zito, V. Cutello, and M. Pavone, Optimizing Multi-variable Time Series Forecasting Using Metaheuristics. In: Metaheuristics International Conference (MIC 2022), 11-14 July 2022, Syracuse, Italy. Lecture Notes in Computer Science. Springer International Publishing, vol 13838, pp. 103-117, 2023. https://doi.org/10.1007/978-3-031-26504-4_8

Catania 18/11/2024