Funded by the European Union NextGenerationEU | Ministero dell'Università e della Ricerca | Italiadomani | FAIR Future Artificial Intelligence Research

Università di Genova

UNIVERSITA' DEGLI STUDI DI GENOVA

AREA RICERCA, TRASFERIMENTO TECNOLOGICO E TERZA MISSIONE
SERVIZIO RICERCA
SETTORE RICERCA NAZIONALE

IL RETTORE

- Visto il Decreto Rettorale n. 6085 del 09/12/2024, con il quale è stato indetto il concorso, per titoli e colloquio, per il conferimento di 4 borse di ricerca post-laurea di tipo starting della durata di 9 mesi, eventualmente rinnovabili, dell'importo di € 12.186,00 (dodicimilacentoottantasei/00) cadauna, eventualmente rinnovabili, per lo svolgimento di una ricerca sul tema: "Metodi per lo sviluppo di architetture e modelli per la collaborazione tra uomo e robot", presso il DIBRIS dell'Università degli Studi di Genova;

- Visto il Decreto Rettorale n. 6366 del 27/12/2024 con il quale è stato prorogato il bando;

- Visto che, la copertura economica dei contratti di ricerca per borsisti, graverà sulle risorse di cui al Progetto di Ricerca e Innovazione FAIR "Future Artificial Intelligence Research" Codice PE0000013, CUP B53D22000980006– finanziato nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 Istruzione e ricerca - Componente 2 Dalla ricerca all'impresa – Investimento 1.3, finanziato dall'Unione europea – NextGenerationEU. - Determina di concessione a finanziamento Decreto Direttoriale n. 1555 del 11/10/2022, in particolare al progetto "LEveraging computer VIsion and Robotics for human-centered AI", acronimo LEVIR ammesso a finanziamento per l'obiettivo 9 "AI for human-centered vision and robotics" del BANDO A CASCATA dello SPOKE 10, CUP J33C2400043000;Visto il verbale della Commissione giudicatrice del concorso in parola, riunitasi in data 13/01/2025;

- Visto il verbale della Commissione giudicatrice del concorso in parola, riunitasi in data 13/01/2025;

- Constatata la regolarità della procedura seguita;

DECRETA

Art. 1

Sono approvati gli atti del concorso di cui in premessa e la seguente graduatoria di merito:

1. Dott. Vlad-Mihai Vasilescu punti: 98/100;
2. Dott.ssa Yi Gao punti: 95/100;
3. Dott. Mohamad Shaaban punti: 93/100,
4. Dott. Gianluca Galvagni punti: 75/100,
5. Dott. Rafi Zaid punti: 70/100.

Sotto condizione dell'accertamento dei requisiti di cui al bando, sono dichiarati vincitori del concorso in parola il Dott. Vlad-Mihai Vasilescu, la Dott.ssa Yi Gao, il Dott. Mohamad Shaaban, il Dott. Gianluca Galvagni.

Genova,

IL RETTORE
(firmato digitalmente)

Responsabile del procedimento: Paola Pelle
Area Ricerca, Trasferimento Tecnologico e Terza Missione
Servizio Ricerca
Settore Ricerca Nazionale

GIANLUCA GALVAGNI

Robotics engineering

PERSONAL STATEMENT

As a creative and meticulous Robotic and Industrial Engineer, I am motivated by the opportunity to incorporate advanced technologies into tangible and everyday uses.
I have a solid background in industrial engineering and continuous training in robotics. I am skilled in technical areas, with a propensity to proactively solving problems and a dedication to always learning, which helps me to handle new challenges and to be a valuable member of diverse teams.
I am excited to make use of my expertise and background in a lively setting that combines creativity with utility, and where my enthusiasm for robotics can drive significant progresses in various areas.

SKILLS

C, Python, ROS2, Linux, Matlab ○ ○ ○ ○ ○
ROS, C++, PDDL, English ○ ○ ○ ○ ○
Tensorflow, Pytorch, Keras ○ ○ ○ ○ ○

EDUCATION / COURSES

Master's degree in robotics engineering

Università degi studi di Genova

È£ September 2022 - October 2024

Immersive English Language Course

IELS Malta (Institute of English Language Studies)

È£ May 2022 - August 2022

Bachelor's degree in industrial automation engineering

Università degli studi di Brescia

È£ September 2018 – March 2022

Secondary School Diploma in Electrotechnical and Automation Technician

Giacomo Floriani Technical and Technological Institute

È£ September 2013 – June 2018

HONORS & AWARDS

- RoboCup Jr Italia, IX national final (2017) - Rescue Line
- RoboCup Junior Accademy, national final 2018 - Rescue Line
- Certificate in "Use and Programming" by Comau, with a consolidated score of advanced (2018).
- IELTS English B2 certification (2022).
- Won the Hackathon UniWeLab on 30-31 March 2023, by Webuild and UniGe.

PROJECTS

RoboCup Robot - 2017 - 2018

- Project and implementation of a homemade robot starting from the CAD, then realization using the 3D printer and other techniques.
- Use of Arduino Mega and Arduino Nano in an I2C connection to allow the robot control.

Supervisors: Luigi Venditti, Walter Dalbon

High School Graduation Project - 2018

- Development, implementation and testing of an "Automatic Chicken Coop" that transported eggs via conveyor belts. Cleaning and drying of the eggsh troughout the transportation, before packing them in suitable boxes.
- Use of a PLC in conjunction with an Arduino to regulate the motor control through the PLC and the sensor feedback through the Arduino.

Supervisors: Luigi Venditti, Graziano Malfer

Thesis project: Motion of an Anthropomorphic KUKA Robot Arm - 2022

- Planning of the motion of the robot on a seventh auxiliary axis.
- Grip and placement of tools by the robot for a boring and milling machine.

Master's University Projects

- PDDL programs for Artificial Intelligence. Highlight: "coffee shop with robots as waiters and baristas".
- MATLAB programs for Machine Learning, Modeling and Control of Manipulators, and Biomedical for Robotics.
- C programs for Embedded Systems. Programming of a buggy for precise tasks.
- ROS and ROS2 systems. Programs for motion and control of robots in simulation environments.

All the Master's University Projects can be found on the individual GitHub page at the address *github.com/giangalv*.

Thesis project: Software Development for Mobile Robots - 2024

- Development of a system using SLAM techniques and a custom navigation controller.
- Testing of the solution in "TheEngineRoom" laboratory using the Unitree Go2 EDU robot.

THESIS

Progetto di un'Isola Robotizzata Tramite l'Utilizzo di ABB RobotStudio

The thesis project addresses a Pama client's requirement for an automated, multifunctional machining center featuring ample tool storage. A KUKA KR QUANTEC 210 R2700 robot acts as the slave to a SPEEDMAT HP7 machine (master), overseeing automatic tool changes and handling rack-mounted tools by loading and unloading them according to operator commands.
Supervisors: Riccardo Adamini, Silvano Pizzini.

Software Development for Mobile Robots in Construction Site Monitoring: A Case Study with the Unitree Go2 Robot

The thesis explores the potential of the Unitree Go2 mobile robot to improve safety and data gathering at construction sites. It encompasses a review of literature regarding sensor difficulties and SLAM methods. The research assesses different robotic systems and utilizes sophisticated algorithms, such as A* for navigation. Laboratory examinations validate efficient SLAM functioning, while indicating enhancements in rear-view detection. It suggests a software framework for customized robotic applications in construction management.
Supervisors: Fulvio Mastrogiovanni, Alessandro Carfì.

INDUSTRIAL AUTOMATION ENGINEERING

MAT/03 Algebra and Geometry

The basic contents of Linear Algebra are presented: theory of vector spaces, linear systems, diagonalization of matrices, bilinear and quadratic forms. A second part is dedicated to Analytic Geometry in affine and Euclidean spaces of dimensions 2 and 3: lines, circles, conics, planes, spheres, surfaces of revolution, and quadrics.

MAT/05 Mathematical Analysis I

The topics in differential calculus for single-variable functions, foundational logic, and the properties of real and complex numbers. Topics include sequences, limits, continuity, and derivatives, with a focus on function behavior such as concavity and convexity. Key theorems, like Rolle's, Cauchy's, and Lagrange's, introduce derivative applications, while Taylor series and asymptotic forms aid in approximation. Integration, Riemann integrals, improper integrals, and differential equations round out the focus on calculus applications.

ING-IND/15 Industrial Technical Drawing

Standards and examples of Industrial Technical Drawing.

CHIM/07 Elements of Chemistry

Core principles of chemistry with applications in industrial settings.

FIS/01 Experimental Physics (Mechanics, Electromagnetism)

Exploration of physical laws governing mechanical, electromagnetic, and wave phenomena.

ING-INF/05 Elements of Computer Science and Program- ming

Introduction to programming and computational thinking.

LIST OF EXAMS

FIS/01 Experimental Physics (Optics, Waves)

Oscillatory phenomena and the formalism of the propagation phenomena of mechanical, acoustic, and electromagnetic waves. Geometric and wave optics: interference, diffraction, and polarization.

ING-IND/10 Technical Phisycs

Applications of thermodynamics and fluid mechanics in engineering.

ING-IND/04 Fundamental of Automation

Basics of control systems, focusing on automation processes.

ING-IND/01 Fundamentals of Electronics and Instrumentation

Electronic devices and instrumentation techniques in engineering.

MAT/07 Rational Mechanics

This content covers vector calculus basics, the kinematics of material systems, and principles of relative motion. It introduces fundamental dynamic principles and equations, alongside mass geometry and kinetic quantities. Core mechanical equations for rigid and articulated systems are included, with a brief overview of analytical mechanics.

ING-INF/05 Programming Fundamentals
Introduction to programming and computational thinking, in principal the C and Python language.

English Language Proficiency Test
Certification in English, assessing reading, writing, listen- ing, and speaking skills. B1 level.

MAT/05 Mathematical Analysis II
Differential calculus for functions of multiple variables. Ordinary differential equations.

ING-IND/31 Electrical Engineering
The course introduces electrical circuit theory and electromechanical applications. It starts with core circuit analysis concepts, covering Kirchhoff's laws, resistor configurations, and Thévenin/Norton theorems. It also delves into RC, RL, and RLC circuits, sinusoidal analysis, and three-phase power systems. In the second section, the focus shifts to low-frequency electromagnetic fields, magnetic materials, transformers, and electromechanical trans- duction. Key principles of DC, synchronous, and asyn- chronous rotating machines are explored, including opera- tional cycles, equivalent circuits, and slip in asynchronous machines.

ING-IND/16 Mechanical Technologies and Machining Machines
This material covers general manufacturing processes, including casting, plastic deformation of metals, and material removal (machining). It also introduces unconventional methods like laser and electrical discharge machining, alongside additive manufacturing (3D printing), emphasizing modern production techniques and material manipulation.

ING-IND/14 Machine Desing
Principles and techniques for designing industrial machines.

ING-IND/13 CAD Laboratory
Practical CAD modeling for engineering design.

ING-IND/13 Mechanics of Drives
Introduction to electric drives, electric machines, thermal issues of electric machines, static converters of electrical energy, motor-load coupling, electric drives. Introduction to pneumatic technology, pneumatic components, pneumatic circuit techniques, management of compressed air. Introduction to hydraulic technology, hydraulic components, fluids used in hydraulic systems, basic hydraulic circuits.

ING-IND/13 Mechanics of Machines and Machinery
The primary objective of the course is to enable students to tackle the first part of a mechanical engineering project by understanding the role of the machines used in the sys- tem, including operating and hydraulic driving machines.

ING-IND/12 Mechanical and Thermal Measurements
Techniques for measuring mechanical and thermal properties in systems.

ING-INF/07 Vision Systems
The instrumentation for image acquisition; the processing, communication, and control software; the sizing of simple vision systems for solving typical control and measurement problems in the industrial sector. The study of the most commonly used image processing procedures in the industrial field. Main contents: camera technology; optical systems; lenses for imaging applications; sizing parameters for 2D vision systems; analysis and processing algorithms. Histogram, contrast and spatial enhancement operations; filtering operations; image calibration; edge detection; morphological operations.

ING-INF/04 Digital Control
Theory and application of digital control in automated systems.

ING-INF/07 Distributed Systems and PLC
Introduction to distributed systems and PLCs for industrial control.

ROBOTICS ENGINEERING

ING-INF/05 Artificial Intelligence for Robotics I - Grade: 26
The course introduces to the main themes of deductive-based Artificial Intelligence.

ING-IND/13 Mechanics of Mechanisms and Machines– Grade: 29
The course introduces students to modern mathematical methods of modelling rigid-body motion as applied to the study, design, and control of robotic mechanisms. The focus is on the geometry, kinematics, and statics of artic- ulated multi-body systems, with targeted applications in mechanism analysis and synthesis, as well as robot dynamics, flexibility, and control.

INF/01 Machine Learning for Robotics I – Grade: 27
The MLR course provides the basics of machine learning and pattern recognition theory and exposes the machine learning methods, workflows, and best practices, with emphasis on applications in Robotics and a focus on artificial neural networks as well as several other techniques.

ING-INF/04 Modeling and Control of Manipulators– Grade: 20
The course presents the fundamentals of the modeling and control techniques for serial manipulators. Main top- ics are geometric and kinematic modeling, kinematic based control in the operational space and its functional and algortitmic architetures (KCL: Kinematic Control Layer). The dynamic modelling and the relevant joint-space control techniques, and their functional and algorithmic architecture will instead be only introduced in general terms (since developed in details on another course) as the lower con- tol layer (DCL: Dynamic Control Layer) nested inside the outer Kinematic based control loop (KCL: Kinematic Con- trol Layer), which constitutes the main objective of the course .

Research Track 1 – Grade: 27
The objective of the Research Track I course is to provide students with the basic concepts for developing software in the field of robotics. Lectures and in-class exercises will help students learn and analyze the most relevant software tools for robotic programming (Linux, Git, C++, Python, Docker) and the ROS robotic framework.

ING-INF/05 Advanced and Robot Programming– Grade: 24
Robots are programmed machines based on multi-task, distributed and concurrent programming. The ARP course expands the so called system programming level. The student will learn how to use the operating system's services to design such concurrent sitributed applications. In ad- dition, robotic programs must be reliable and portable through differenet kernels, different versions and different architectures/electronics. ARP covers mostly the mid topics of the list above. ARP, RTOS and SOFAR cooperate in addressing all topics. State-of-the-art languages are used, in particular C, C++ and Rust, together with ISO/IEC 9945 POSIX framework.

LIST OF EXAMS

ING-INF/05 Software Architectures for Robotics– Grade: 25
Software Architectures for Robotics (SOFAR) is a novel and highly experimental field involving research and development activities aimed at providing scholars and professionals with conceptual tools and practical knowledge about how to design and implement complex software architectures for real-world robots. The course covers a few basics in high-end software development and focuses on real-world scenarios, e.g., companion robots for in-home assistance, or collaborative robots in factories.

Research Track 2 – Grade: 27
The goal of the Research Track II course is to provide students with advanced tools to develop software in the field of robotics, to carry out scientific research, and to present the results of their work. Lectures and class exercises will help students learn and analyze the most relevant tools in this context, such as data visualization libraries, software documentation tools, robotics notebooks, and statistical tools. Additionally, students will work on a specific line of research, potentially laying the groundwork for their future thesis work. In this regard, part of the course will be dedicated to certain aspects related to research methodology.

ING-INF/04 Mobile Robots– Grade: 19
The class first develops the kinematic modeling and motorization of mobile robots, illustrated by the full study of the differen- tial drive robot. Then localization based on the Extended Kalman Filter is addressed, is illustrated by a lab which uses real data and presents a tuning methodology. Observability issues are also addressed, with practical examples. Planning methods applicable to mobile robots are studied, in particular potential field methods and the Rapidly exploring Random Tree. Control then focuses on direct applications to mobile robots: static and dynamic feedback control and Lyapunov based control, illustrated on the case of the differential drive robot.

ING-INF/05 Artificial Intelligence for Robotics II – Grade: 30
Artificial Intelligence for Robotics II (AIRO2) describes advanced concepts. methods and techniques at the intersection between Artificial Intelligence (AI) and Robotics practice. The aim of the course is to provide future schol- ars and professionals with conceptual tools and practical knowledge about how to integrated cutting-edge AI techniques in robot software architectures, and to guide future engineers about how to do so. The course on real-world, advanced scenarios, e.g., autonomous vehicles, collaborative robots, assistive robots.

ING-INF/05 Real-Time Operating Systems – Grade: 18
A real-time system has a predictable behavior regarding execution times. Its main characteristic is not so much the speed of execution, but ensuring compliance with timing constraints: in particular, ensuring a maximum time within which each processing process will end. The course aims to present the principles, methodologies, and fundamental tools for understanding real-time operating systems and real-time software design.

ING-INF/04 Robot Dynamics and Control – Grade: 24
The course introduces the dynamic modelling of robot manipulators and the fundamentals of dynamic control of robots. These aspects are the key elements for the design of robot controllers and for the implementation of robot controlled operations involving interaction of the robot with objects (e.g. for their manipulation), the envi- ronoment (e.g. force control), humans (e.g. human robot collaborative tasks).

ING-INF/06 Biomedical Robotics – Grade: 29
The purpose of this lesson is to provide a perspective on applied (and inspired) robotic technologies in the fields of biomedical research and practice. Robotics is a multidisciplinary technology, with elements of computer science, electrical and mechanical engineering, and a growing spectrum of biomedical applications. These include (but are not limited to) basic biomedical research, advanced surgical and diagnostic techniques, robots for rehabili- tation and assistance, biomimetic robotics, and human- machine interfaces. In addition to learning the content of the lesson, students are required to engage in activities, including software development and scientific discussion in class, both individually and in groups.

FIS/02 Introduction to Quantum Information and Computation for Robotics – Grade: 27
The course aims to bring the students updated with the recent and fast-developing field of quantum technologies, quantum information, and computation. The students will learn the fundamental ideas of quantum mechanics which form the basis for the applications of quantum technologies and information. The most important innovations and applications to informatics (such as quantum teleportation and cryptography) and computation (database search algorithm) will be presented. Some of the more recently proposed applications to Robotics engineering will be discussed. The students will also learn the most used quantum programming languages (such as IBM-Qiskit) and apply the knowledge to solve prototypical simple problems.

ING-INF/05 Trustworthy Artificial Intelligence for Robotics – Grade: 30
Today machine-learning algorithms and AI-based systems are used for many real-world applications, including image recognition, spam filtering, malware detection, biometric recognition. In these applications, the learning algorithm may have to face intelligent and adaptive attackers who can carefully manipulate data to purposely subvert both the learning and the operational phases. Part 1 of the course aims to introduce the fundamentals of the security of machine learning and the related field of adversarial machine learning. Part 2 introduces the international regulations behind the so called “trustworthy AI. The course uses applica- tion examples including object recognition in images, biometric recognition, robotics.

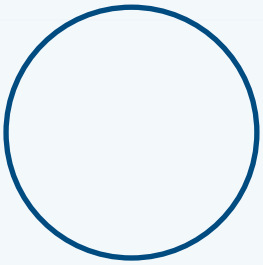
ING-INF/04 Embedded Systems – Grade: 30
An embedded system is an electronic circuit equipped with a computer, designed to perform a specific function, and integrated (embedded) in a platform which controls it while respecting various design constraints such as production cost, size, and energy consumption. The course will provide the necessary skills for the design of these systems, showing how the same technologies can be employed for the implementation of modern electronic devices.

ING-INF/05 Experimental Robotics Laboratory – Grade: 29
The experimental aspect is fundamental in a discipline like robotics, in which various theoretical skills (automatic controls, computer vision, software architectures, real-time programming, ...) come together in concrete systems and mechatronic platforms. The course aims to provide students with a methodology to make this transition and bridge the gap between theory and practical implementation, through lectures, exercises, and projects. Specifically, the course will provide the basic elements to implement robotic simulations, including aspects related to software architectures, computer vision, autonomous localization, and motion planning.

ING-INF/05 Machine Learning for Robotics II – Grade: 30
In this course the student does a specific use case of Machine Learning and Data Analysis related to robotics.

ING.IND/13 Soft Robotics– Grade: 19
"Soft robotics" is a new field of robotics that explores how the compliance in the robot's body can provide new solutions for application contexts where high adaptability to the environment and safety during interaction are neces- sary. The goal of the course is to provide students with the fundamental concepts of soft robotics. In particular, the following topics will be addressed: methods for the design, modeling, analysis, and fabrication of soft robots; technologies for soft actuators and sensors and control methods; application contexts for soft robotics and successful examples.

ING-IND/13 Research Methodology – Grade: 28
This course is intended to provide the student with the necessary skills and tools to carry out and present a research topic. It presents the profession of university staff, researchers in research institutions, and in RD departments in enterprises and how to apply for them. This course includes also the beginning of the bibliographical study and collect information part for the MSc thesis topic.



Mohamad Shaaban

Robotics Engineer

CONTACT

Languages:

Arabic (Native)
English (B2)
Italian (A2)

ABOUT ME

Experienced robotics and systems engineer with a solid background in digital twins, hardware design, and mixed reality. Capable of designing scalable systems that bridge the gap between physical and virtual environments to enhance predictability and enable real- time interaction. Expertise includes embedded systems, cloud integration, and mixed- reality solutions for robotics, complemented by hands-on experience with ROS2 and FastDDS for building efficient distributed architectures.

WORK EXPERIENCE

01/01/2022 – 31/12/2024 Italy

Industrial PhD - Robotics University of Genova

- Develop miniaturized hardware for wearables
- Develop digital twins for robotics applications
- Develop frameworks for distributed simulations

01/08/2020 – 31/03/2022 Beirut, Lebanon

Cloud Systems Engineer - AWS Mobile Arts ME

- Designing horizontally scalable cloud systems

01/06/2018 – 02/2019 Beirut, Lebanon

Embedded Engineer Maxwell Innovation Lab LLC

- Hardware prototyping
- Develop interactive UI for embedded systems(LVGL/QT)
- Low level libraries for different hardware (SPI/CAN/I2C...)

EDUCATION AND TRAINING

01/01/2022 – 31/12/2024 Genova, Italy

Industrial PhD in Robotics and Autonomous systems University of Genoa

Website https://dibris.unige.it/ | **Level in EQF** EQF level 8

01/03/2016 – 31/12/2020 Beirut, Lebanon

Masters of Science in Electronics Engineering Lebanese international university

Website https://liu.edu.lb/NewLIU2022/academic/engineering.php | **Level in EQF** EQF level 7

PROJECTS

01/01/2024 – 30/06/2024

Novel Sensor Design for Robotics Applications (HRC) -PhD

- Design, fabricate and test one of the smallest ever IOT connected sensor board (10 DOF 13x17mm 4 layers mixed circuit design) .
- Develop a power optimized firmware with FreeRTOS (including power stages).

Link https://sha3sha3.github.io/Portfolio/Sensor.html

Modular Digital Twin for Human Robot Collaboration - C++ -PhD

•Develop Kafka/Redpanda client for Unreal Engine
•Develop modular Digital Twin based on the client
Links https://sha3sha3.github.io/Portfolio/RICO.html | https://sha3sha3.github.io/Portfolio/Digital-Twin.html | https://github.com/sha3sha3/UE-EasyKafka

Servers Meshing - C++

•Develop a server instantiation middleware
•Develop server meshing for distributed load in Digital Twins & Games
Links https://youtu.be/6xAtZihYs10?si=RU0a_72MrcJ0WpEK | https://github.com/sha3sha3/UE-DSSPlugin

DIGITAL SKILLS

ROS | ROS2 | Gazebo | Digital Twins | FastDDS | Mixed Reality | Unreal Engine | Moveit | SLAM | OpenCV | C++ | Python | Linux | Tensorflow | Embedded C | RTOS | Altium Designer | Control Systems | MQTT | IOT | Git

PERSONAL INFORMATION

Yi Gao

EDUCATION

09.2020 - now **School of Cyber Science and Engineering, Southeast University**
Cyber Science and Engineering, PhD Supervisor: Prof. Min-Ling Zhang

09.2017 - 07.2020 **School of Information Science and Technology, Northwest University**
Computer Application Technology, MSc Supervisor: Prof. Xia Sun

09.2013 - 07.2017 **School of Information Science and Technology, Northwest University**
The Internet of Things, BSc

RESEARCH INTERESTS

Machine learning, data mining, weakly supervised learning, complementary label learning

EXPERIENCE

Research on Complementary Label Learning Algorithms (PhD):

Complementary label learning is a subset of weakly supervised learning. In this task, training instances are only associated with complementary labels (i.e., the classes to which the instance **does not belong**).

- **For single-label classification:** The goal is to learn a classifier from the training instances with complementary labels, which can predict the true labels of unseen instances.
- **For multi-label classification:** The goal is to learn a multi-labeled classifier from training data that only contains complementary labels, which can predict a set of relevant labels for unseen instances.

PUBLICATION

* presents corresponding author

Accepted Paper:

[1] **Y. Gao**, M. Xu, M.-L. Zhang. Complementary to multiple labels: A correlation-aware correction approach. **IEEE Transactions on Pattern Analysis and Machine Intelligence**, 2024, 46(12): 9179-9191.

[2] **Y. Gao**, M. Xu, M.-L. Zhang. Unbiased risk estimator to multi-labeled complementary label learning. In **Proceedings of the 32nd International Joint Conference on Artificial Intelligence** (IJCAI'23), Macau, China, 2023, 3732-3740.

[3] **Y. Gao**, M.-L. Zhang. Discriminative complementary-label learning with weighted loss. In **Proceedings of the 38th International Conference on Machine Learning** (ICML'21), Virtual Conference, 2021, 3587-3597.

[4] **Y. Gao**, X. Sun, X. Wang, J. Feng, S.-X. Guo. A parallel neural network structure for sentiment classification of MOOCs discussion forums. **Journal of Intelligent & Fuzzy Systems**, 2020, 38(4): 4915-4927.

[5] Y. Tang, **Y. Gao***, Y.-G. Luo, J.-C. Yang, M. Xu, M.-L. Zhang. Unlearning from weakly supervised learning. In **Proceedings of the 33rd International Joint Conference on Artificial Intelligence** (IJCAI'24), Jeju, South Korea, 2024, 5000-5008.

[6] X. Sun, **Y. Gao**, R. Sutcliffe, S.-X. Guo, X. Wang, J. Feng. Word representation learning based on bidirectional GRUs with drop loss for sentiment classification. **IEEE Transactions on Systems, Man, and Cybernetics: Systems**, 2021, 51(7): 4532-4542.

Submitted Paper:

[7] **Y. Gao**, Y.-Y. Meng, M. Xu, M.-L. Zhang. Data augmentation with consistency regularization for multi-labeled complementary label learning. (submitted to **IEEE TPAMI**)

[8] **Y. Gao**, J.-Y. Zhu, M. Xu, M.-L. Zhang. Multi-label learning with multiple complementary labels. (submitted to **IEEE TPAMI**)

[9] **Y. Gao**, M. Xu, M.-L. Zhang. MulCo: Representation learning for multiple complementary labels. (submitted to **IEEE TNNLS**)

AWARDS

2023/2021 Excellent Graduate Student of Southeast University

2020 Outstanding Master's Thesis of Northwest University

ACTIVITIES

Reviewer ICML'25, IJCAI'25, ICLR'25, IJCAI'24, NeurIPS'24, Neural Networks, Machine Intelligence Research

Invited Talk The 2024 Academic Conference on Artificial Intelligence of Jiangsu Province, Nov. 2024, Suqian, China. Title: "Complementary to Multiple Labels: A Correlation-Aware Correction Approach"

Vlad-Mihai Vasilescu

WORK EXPERIENCE

01/11/2024 – CURRENT Bucharest, Romania
RESEARCH ASSISTANT UNIVERSITY POLITEHNICA OF BUCHAREST

Website http://campus.pub.ro/

26/02/2024 – CURRENT Bucharest, Romania
UNIVERSITY TEACHING ASSISTANT UNIVERSITY POLITEHNICA OF BUCHAREST

Lab Applications Design & Teaching for 2 Master Graduate Courses:

- *Artificial Intelligence II, Deep Learning Methods.* repo: https://github.com/Vladimirescu/BIOSINF_IA2
- *Artificial Intelligence III, Advanced Methods. repo:* https://github.com/Vladimirescu/BIOSINF_IA3

01/10/2021 – 01/11/2024
ENGINEER LEVEL II UNIVERSITY POLITEHNICA OF BUCHAREST

Faculty of Electronics, Telecommunications and Information Technology

01/01/2023 – 31/12/2023 Bucharest, Romania
MACHINE LEARNING RESEARCH RESEARCH CENTER FOR SPATIAL INFORMATION- CEOSPACETECH

Project: Explainable Deep Learning for Earth Observation (xAI), under the supervision of Prof. Mihai Datcu

Introduced a GPR-based super-resolution method for Sentinel-2 super-resolution:

https://ieeexplore.ieee.org/abstract/document/10185047

01/10/2021 – 01/06/2023
MACHINE LEARNING RESEARCH RESEARCH CENTER FOR SPATIAL INFORMATION- CEOSPACETECH

H2020-CENTURION Project: AI for Earth Observation applications. Deep Learning for Satellite Image Analysis and Enhancement. Multispectral image super-resolution.

Designed a method for super-resolving multispectral data using multi-objective training for balancing the trade-off between information enhancement and spectral consistency:
https://ieeexplore.ieee.org/abstract/document/10026840
Worked under the supervision of Prof. Mihai Datcu and Prof. Daniela Faur.

Website https://www.centurion-project.eu/

31/05/2021 – 30/09/2021 France
MACHINE LEARNING RESEARCH INTERN CENTRE DE VISION NUMERIQUE, CENTRALE SUPELEC

Implemented adversarial robust convolution neural networks for image classification tasks, evaluated their robustness on state-of- the art white-box attacks and implemented new methods for controlling the robustness of such models.
Acquired skills:

- Advanced Tensorflow practices, including custom layer building, custom constraints and callbacks for controlling the desired behaviour
- Adversarial white-box attacks
- Mathematical understanding of adversarial attacks and robustness guarantees

31/05/2020 – 30/09/2020 Bucharest, Romania
RESEARCH INTERN SPEED LABORATORY, UNIVERSITY POLITEHNICA OF BUCHAREST

Developed Deep Learning algorithms for the task of lesion segmentation from lung chest CT scans.
Acquired skills:

- Deep Learning algorithms for image segmentation

- Scientific Python programming
- Mathematical understanding of optimization and image processing

Business or Sector Professional, scientific and technical activities | **Website** https://speed.pub.ro/

EDUCATION AND TRAINING

04/06/2024 – 12/06/2024 Bologna, Italy
INTERNATIONAL PHD SUMMER SCHOOL OF MATHEMATICS AND MACHINE LEARNING FOR IMAGE ANALYSIS Alma Mater Studiorum Universita di Bologna

Website https://site.unibo.it/mathematical-ml-imaging/en

01/10/2023 – CURRENT
PHD University POLITEHNICA of Bucharest, Faculty of Electronics Telecomm. and Information Technology

Working at SpeeD: Speech and Dialogue Laboratory, under the supervision of Prof. Corneliu Burileanu.

Website https://www.sdettib.pub.ro/en/index.html | **Thesis** Stability and Robustness Techniques for Neural Networks

01/10/2021 – 01/07/2023 Bucharest, Romania
MASTER OF SCIENCE University POLITEHNICA of Bucharest, Faculty of Electronics Telecomm. and Information Technology

Master thesis: https://www.researchgate.net/publication/373372634_Robust_training_techniques_against_adversarial_attacks_on_image_classification

Website https://etti.upb.ro/en/ | **Final grade** Final Grade: 10 / 10 | Class ranking: 1st |

Thesis Robust training techniques for neural networks againsta adversarial attacks

30/09/2017 – 04/07/2021 Bucharest, Romania
BACHELOR OF SCIENCE University POLITEHNICA of Bucharest, Faculty of Electronics Telecomm. and Information Technology

- Digital Integrated Circuits
- Probability and Statistics
- Image Processing & Analysis
- Signal Processing
- C/C++/Python Programming
- Data Structures and Algorithms
- Machine Learning, Deep Learning

Bachelor thesis: https://speed.pub.ro/speed3/wp-content/uploads/2022/09/VASILESCU_Vlad_2021.pdf

Website https://etti.upb.ro/en/ | **Field of study** Mathematics and statistics not further defined , Electronics and automation |

Final grade Final grade: 9.53 / 10 | Class ranking: 1 / 120 |

Thesis Automatic lung lesion segmentation using deep learning techniques | Grade: 9.7 / 10

LANGUAGE SKILLS

Mother tongue(s): **ROMANIAN**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	B2	B2	B2	B2	B2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DIGITAL SKILLS

Python | C++ | SQL | C | Deep Learning | Machine Learning | Keras | Tensorflow | LaTeX | Scikit-Learn | Numpy | Data Science | OpenCV | Matplotlib | Artificial Intelligence | Computer Vision | Deep Reinforcement Learning | Optimization Methods

PUBLICATIONS

2024
Are almost non-negative neural networks universal approximators?

2024 IEEE International Workshop on Machine Learning for Signal Processing (MLSP)

2024

ABBA Neural Networks: Coping with Positivity, Expressivity, and Robustness

We introduce ABBA networks, a novel class of (almost) non-negative neural networks, which are shown to possess a series of appealing properties. In particular, we demonstrate that these networks are universal approximators while enjoying the advantages of non-negative weighted networks. We derive tight Lipschitz bounds both in the fully connected and convolutional cases. We propose a strategy for designing ABBA nets that are robust against adversarial attacks, by finely controlling the Lipschitz constant of the network during the training phase. We show that our method outperforms other state-of-the-art defenses against adversarial white-box attackers. Experiments are performed on image classification tasks on four benchmark datasets.

SIAM Journal on Mathematics of Data Science

2024

Enhanced Agricultural Parcel Segmentation Through Multi-Modal Satellite Image Time Series Prediction

Poster presented during the DRAGON 5 Symposium, as part of my work on fusing Sentinel-1 (radar) and Sentinel-2 (optical) time- series for parcel segmentation.

2023

A CNN-Based Sentinel-2 Image Super-Resolution Method Using Multiobjective Training

This journal paper aims to provide a super-resolution mechanism based on fully convolutional neural networks (CNNs) for up- sampling the low-resolution spectral bands of Sentinel-2 up to 10m spatial resolution. Our approach is centered on attaining good performance with respect to two main properties: consistency and synthesis.

This work was supported by project CENTURION - Copernicus Datacube and AI Services for Society, Industry and New Market Generation.

IEEE Transactions on Geoscience and Remote Sensing (Volume: 61)

2023

Sentinel-2 60-m Band Super-Resolution Using Hybrid CNN-GPR Model

This research aims to provide a method for super-resolving the 60-m bands provided by Sentinel-2 up to 10-m spatial resolution, using Gaussian process regression (GPR).

IEEE Geoscience and Remote Sensing Letters (Volume: 20)

2023

A Latent Analysis of A Super-Resolved Sentinel-2 Data Cube For Green Urban Infrastructure Health Monitoring

The methodology presented in this paper leverages one of the most common satellite missions for vegetation assessment, the Sentinel-2 mission, applies super-resolutions techniques to increase the image spatial resolution and quantifies the spectral radiation reflected by the ground in order to map the Earth's biophysical properties. The resulting temporal signature of each topic, for a use case centered in Bucharest city in Romania, is further correlated with the evidence of environmental indicators to
underline the vegetation vulnerability and specificity of the species.

IGARSS 2023 - 2023 IEEE International Geoscience and Remote Sensing Symposium

2021

A deep learning approach for improved segmentation of lesions related to COVID-19 chest CT scans

The current coronavirus pandemic (COVID-19) became a world-wide threat, infecting more than 42 million people since its outbreak in early 2020. Recent studies show that analyzing chest CT scans plays an essential role in assessing disease progression and facilitates early diagnosis. Automatic lesion segmentation constitutes a useful tool to complement more traditional healthcare system strategies to address the COVID-19 crisis. We introduce MASC-Net, a novel deep neural network that automatically detects COVID-19 related infected lung regions from chest CT scans. The proposed architecture consists of a multi-input encoder-decoder that aggregates high-level features extracted with variable-size receptive fields.

PROJECTS

2022

IEEE DataPort Dataset: Sentinel 2 super-resolved data cubes - 92 scenes over 2 regions in Switzerland spanning 5 years

This Sentinel-2 L2A dataset contains two regions of interest, each of them containing 92 scenes across Switzerland within tile T32TLT, between 2018 and 2022. All bands have been super-resolved to 10-m spatial resolution These areas of interest show a diverse landscape, including regions covered by forests that have undergone changes, agriculture parcels and urban areas.

Super-resolution was performed using the algorithm proposed in:

V. Vasilescu, M. Datcu and D. Faur, "A CNN-Based Sentinel-2 Image Super-Resolution Method Using Multiobjective Training," in IEEE Transactions on Geoscience and Remote Sensing, vol. 61, pp. 1-14, 2023

Link https://ieee-dataport.org/documents/sentinel-2-super-resolved-data-cubes-92-scenes-over-2-regions-switzerland-spanning-5-years

04/2020 – 06/2020

Reinforcement Learning on stock prices

Simple Linear Agent that tries to estimate the Q-value of a state composed of the stock prices for different companies, in order to maximize it's final profit by buying and selling based on these values.

Link https://github.com/Vladimirescu/RL_stocks

Modified Particle Swarm Optimization algorithm

MPSO algorithm implamentation in Python and C++ and a project report.

Link https://github.com/Vladimirescu/MPSO

Spiking Neural Networks (SNNs) for EEG signal classification

Implemented from scratch common SNN architectures for EEG signal classification of brain disease.

CONFERENCES AND SEMINARS

Scientific Communication Session

2nd place -- Automatic Lung Lesion Segmentation using Generative Adversarial Networks

VOLUNTEERING

CURRENT

IEEE Reviewer

Volunteer for Journal Reviwer at IEEE Access.

Link https://orcid.org/0000-0003-3743-4235

HONOURS AND AWARDS

01/06/2021

Top-of-class graduate for Bachelor Studies – University POLITEHNICA of Bucharest

Graduated 1st out of 120 students in the *Computers and Information Technology* specialization.

01/06/2023

Top-of-class graduate for MSc Studies – University POLITEHNICA of Bucharest

Graduated 1st out of 30 students in the *Information Engineering and Computing Systems* master programme.