

Angelo Quarta

AI Research Assistant

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Research Summary

Researcher in robustness related to Artificial Intelligence applied to combinatorial problems with special dedication to Decision-Focused approaches, Reinforcement Learning, real-world applications, performance optimisation and scalability.

Technical Skills

Programming: Python, C, C++, C#, SQL, MiniZinc

ML/DL: PyTorch, TensorFlow, SK-learn

Computer Vision: OpenCV

Optimization: Gurobi, Z3

Tools: Git, Docker, LaTeX

Research Interests

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|------------------------------|---|
| • Decision Focused Learning | • Physics-Driven AI |
| • Reinforcement Learning | • Neural Network Properties Enforcement |
| • Combinatorial Optimisation | • Knowledge Injection |
| • Mixed Integer Programming | • Process Optimisation |
| • Missing Data Imputation | • Digital Twins |

Academic Experience

Research Assistant

Nov 2024–Present

University of Bologna

- Participation In the Horizon Europe TUPLES Project on AI trustworthiness co-operating with OPTIT, consulting company specialised in logistics, optimisation algorithms, and AI, that provided data, computational facilities as well as domain support.
- Development of a Benchmark for Decision-Focused Learning approaches applied to Unit-Commitment problems in gas production and distribution environment. Such approach consists of taking the cost of the plant configuration into account to compute the loss function instead of relying just on the volatile inputs prediction.
- Development of a digital twin meant to simulate the human interaction necessary for adjusting the plant configuration once the realisations of the volatile inputs are available.

- Development of Reinforcement Learning based Decision-Focused Learning approaches.
- Testing of the building blocks composing the Benchmark.
- Enhancement of existing Property Enforcement methods to make them suitable for real-word applications.

Teaching Tutor
University of Bologna

Sep 2022–Present

- **Computer Science Fundamentals:**

Laboratory tutoring about C programming language, algorithmic problem solving and software architecture principles.

- **Software Engineering:**

Assessment of major issues in students' projects regarding UML and Object-Oriented design, design patterns, .NET framework and C# and requirements analysis.

- **Deep Learning:**

Frontal lessons about Tensorflow framework and examples of training and testing processes models for tasks as: Classification, Transfer Learning, Semantic Segmentation, Small Language Models; focusing on useful techniques and best practices.

- **Combinatorial Decision Making and Optimisation:**

Frontal lessons about Minizinc and Z3 usage for combinatorial optimisation, illustrating complex study-cases and solutions; alongside the assessment of projects' main issues related to problem modelling and solution design.

Research Internship
CNR-ISASI

Nov 2018–Apr 2018

- Development of a erosion monitoring system based on vision technologies.
- Development of segmentation algorithm based on graph-cut.
- Development of distance estimation based on out-of-plane transformation employing RANSAC.
- Co-operation with Marine Protected Area of Porto Cesareo that supported the project with their meteo-cameras and domain knowledge for validating the final result.

Research Internship
Tallinn University of Technology

May 2017–Oct 2017

- Development of a kinect-API-based software for saving 3D models faces.
- Creation of a dataset of 3D models faces paired with the identity of the person.
- Development of a face identification algorithm based on Random Forest, trained on 3D models data.

Education

M.Sc. Artificial Intelligence

2022–2025

University of Bologna, IT

- Final Mark: 94/110
- Thesis: "Artificial Intelligence for robust Black-box Decision Support Systems: a Case Study on Unit Commitment"
Implementation of SFGE algorithm to robustly solve a Unit Commitment problem related to gas generation and distribution, developing a pipeline consisting of a planner, a recourse action and an uncertainty injection model.
- Supervisor: Prof. Michele Lombardi
- Courses: AI in Industry, Combinatorial Decision Making and Optimisation, Machine Learning for Computer Vision, Natural Language Processing.

M.Eng. Computer Engineering

2015–2018

University of Salento, IT

- Final Mark: 110/110
- Thesis: "Visual Monitoring System for Coastal Erosion"
Development of an Erosion Monitoring System based on visual technologies consisting of a graph-cut segmentation algorithm and distance estimation achieved through out-of plane transformations and RANSAC algorithm.
- Supervisor: Prof. Cosimo Distante
- Courses: Decision Support Systems, Advanced Control Techniques, Parallel Algorithms, Robotics, Network Technologies.

Erasmus+ Programme

2016–2017

University of Huelva, ES

- Courses: Machine Learning, Artificial Intelligence for Robotics.

B.Eng. Information Technologies Engineering

2010–2014

University of Salento

- Final Mark: 91/110
- Thesis: "Design and implementation of an NFC-based software architecture for treatment plan management"
Development of a NFC-based software architecture designed for elders to manage their treatment plan and recognise the correct medicinal thanks to a NFC tags applied on the box; presenting the final results at "Le applicazioni ICT nella Sanità" held on March 26th 2015 in Lecce at "Polo Didattico ASL".
- Supervisor: Prof. Luigi Patrono
- Courses: Control Theory, Electronics, Electromagnetic Fields, Telecommunication, Computer Science

Work Experience

R&D Software Engineer

Jan 2019–Dec 2021

3DConnexion

- Development and maintenance of the 3D viewer produced by 3DConnexion.
- Integration of 3DConnexion driver's interface in CAD Software.
- Testing of third party integrations.
- Projects Management.

Network Administrator

Aug 2018–Jan 2019

Freelance

NLP Software Engineer

Jan 2018–Jul 2018

ZeroDD

- Back-end interactions.
- Similarity text estimation algorithm.
- APIs development for front-end usage.

Network Administrator

Apr 2016–Sep 2016

Apicella Sistemi

Academic Projects

Leader-Follower Control-law for Quad-rotors

- Design of a control-law and implementation of a leader-follower schema employing physical Quad-rotors and physical simulation techniques using ROS as operating system and C++ ROS nodes for implementing the control-law, Python ROS nodes for controlling the physical quad-rotor drone.

Fuzzy Controller for a Mobile Robot

- The goal of the group project was that the mobile robot has to follow a specific face while avoiding obstacles placed in the middle of the path between the robot and the followed person. The main task of my contribution was the CNN based face identification system and its integration with the several modules developed for the robot motion.

Reinforcement Learning based algorithm for Super Mario

- In the context of the Mario-AI Competition, a table Q-learning algorithm has been employed to learn how to play the game achieving the longest distance possible from the starting point in an infinite generated level.

Reinforcement Learning Tablut BOT

- The unbalanced Finnish board game has been tackled using the classical implementation of the Monte-Carlo approach called UCT.

Vehicle Routing Problem

- As a combinatorial problem based on graphs, the vehicle routing problem is suitable to be described with different approaches: among the most successful ones Constraint programming and Mixed Integer Programming.

Vanishing Points Detection

- Leveraging the Huough transform, this project aimed to find the vanishing points in selected use-cases using classical image processing techniques.

Legal Case Retrieval

- Legal document retrieval task based on finding target documents cited in the input document. Such goal has been achieved by a learning-to-ranking approach as well as neural networks and ensemble models.

Fairness Techniques applied to CatBoost

- Comparison of several well-known decision-tree-based methods and Cat-Boost model in terms of fairness capabilities under the constraint of the *unprocessing* technique.

PUBG Cheater Detection

- In order to detect cheaters in an off-line fashion in a tabular dataset in the famous competitive game PUBG, Bayesian Networks' architecture has been designed aided by the mutual information between couples of features.

Languages

Italian

- level: Native

English

- level: C1
- certification: IELTS
- date: Dec 2025

Spanish

- level: B2
- certification: University of Huelva certification

- date: Oct 2017

French

- level: B1
- certification: University of Bologna (CLA) certification
- date: Nov 2022

German

- level: A2
- certification: Eszett online School
- date: Jan 2021

Portuguese

- level: A2