ANDREA CORSINI

Born: Correggio (RE), Italy ⋄ 30-May-1995
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CURRENT EMPLOYMENT

University of Modena and Reggio Emilia   Nov 2023 → Present
Researcher

My primary research activities focus on designing new methods to tackle optimization problems like scheduling and routing ones with Artificial Intelligence. I am also involved in applications of Deep Learning to network security and in the design of algorithms for complex industrial problems.

▷ Covered subjects: Operations Research, Artificial Intelligence, Mathematical Optimization.

EDUCATION

University of Modena and Reggio Emilia   *Nov 2020 → Nov 2023*
PhD in Industrial Innovation Engineering.

Thesis: Solving Variants of Scheduling Problems with Deep Learning Methodologies.
Advisor: Prof. Mauro Dell'Amico.
Co-Advisor: Prof. Simone Calderara.
Covered subjects: Operations Research, Artificial Intelligence, and Mathematical Optimization.

Rochester Institute of Technology   *May 2020 → Aug 2020*
Visiting Research Student.

Advisor: Prof. Shanchieh J. Yang.
Covered subjects: Cyber-Security, Sequential Machine Learning, and Network Traffic analysis.

University of Modena and Reggio Emilia   *2018 → 2020*
Master's Degree in Computer Engineering (Artificial Intelligence curriculum).

Graduation Mark: 110/110 cum laude
Thesis: Scatter Search for Neural Networks Hyper-Parameters Optimization.
Advisor: Prof. Mauro Dell'Amico.
Covered subjects: Machine and Deep learning, Big Data, and Cyber-Security.

University of Modena and Reggio Emilia   *2014 → 2017*
Bachelor's Degree in Computer Engineering.

Graduation Mark: 110/110 cum laude
Thesis: Zcluster: a simple yet scalable failover and monitoring system developed on FreeBSD.
Advisor: Nicola Bicocchi.
Covered subjects: Software Development, Mathematics & Statistics, Database and OS Architecture.

I.T.I.S. Enrico Fermi   *2009 → 2014*
Secondary School Diploma in Electronic and Telecommunication Engineering.

Graduation Mark: 98/100
Covered subjects: Electronic, Telecommunication, Embedded Systems, and Operative Systems.

OTHER ACTIVITIES:

▷ Speaker at the *IEEE Conference on Communications and Network Security* (CNS): "Are Existing Out-Of-Distribution Techniques Suitable for Network Intrusion Detection?". Oct 2023, Florida.

▷ Speaker at the *International Conference on Optimization and Decision Science* (ODS): "Using Self-Supervised Learning to Solve the Job Shop Scheduling Problem". Sep 2023, Italy.

▷ Participant at the *European Operational Research Societies* (EURO) PhD School for "Data Driven Decision Making and Optimization". Jun 2022, Spain.

▷ Speaker at the *International Conference on Availability, Reliability, and Security* (ARES): "On the Evaluation of Sequential Machine Learning for Network Intrusion Detection". Aug 2021, virtual event.

▷ Attendee at the *International Physical Internet Conference* (IPIC). Jun 2021, virtual event.

▷ Participant at the *Italian Association of Operations Research* (AIRO) PhD School for "Optimization and Data Science: Trends and Applications". Feb 2021, Italy.

EXPERIENCES

University of Modena and Reggio Emilia   Sept 2021 → Present
Teaching Assistant

Teaching Assistant for the course "Models and Methods for Decision Making 2", offered at the Master's degree in Management Engineering.

▷ Teaching Professor: Prof. Mauro Dell'Amico.

▷ Teaching Modules: (I) Data pre-processing. (II) Machine Learning. (III) Advanced Mathematical Optimization. (IV) Combining Mathematical Optimization with Machine Learning.

National Inter-University Consortium for Telecommunications   Feb 2021 → Sept 2021
Researcher

Researcher for the development of internal optimization solutions.

▷ Design and creation of simulators in C++.

▷ Creation of optimization software (C++).

National Inter-University Consortium for Telecommunications   Jan 2019 → Oct 2020
Researcher

Researcher in the European project "5G for Connected and Automated Road Mobility in the European uNion (5G-CARMEN)".

▷ Construction of simulated scenarios and analysis of use-cases.

▷ Tracking of deliverables and pilots.

Center of Formation and Innovation Ferrara   Mar 2018 - Sept 2019
Teacher

Course on the design and development of multimedia and Virtual Reality applications with Unity.

▷ Course organization and preparation of the educational material.

▷ Introduction to the Unity environment and its coding language (C#).

▷ Tutoring of students during the development of projects in partnership with local companies.

University of Modena and Reggio Emilia   Jan 2018 - Dec 2018
Research Fellow

Member of the Operations Research team working on routing problems for industrial applications.

  ▷ Development of an application for tackling the capacitated Vehicle Routing Problems with time windows and fleet constraints.
  ▷ Researching and designing a new algorithm for tuning the hyperparameters of Neural Networks.

Valsania IT Consulting   Jan 2017 - Nov 2017
Apprentice

Bachelor's degree thesis in the Information Technology (IT) field. Development of a server plug-in application for monitoring workloads of an enterprise IT system.

  ▷ Planning and creation of IT architecture (Java and HTML).
  ▷ Modeling software interfaces and design of relational databases.
  ▷ Software testing and documentation.

Elettra Sincrotrone Trieste   Jun 2014 - Aug 2014
Apprentice

Summer training in the R&D laboratory of the Elettra Sincrotrone Trieste (particle accelerator) that builds and fixes electronic equipment for research teams.

  ▷ Design and realization of systems for processing analog signals.
  ▷ Assembling of various detectors and electronic equipment for research teams.

LANGUAGES

Mother tongue:	Italian
Other languages:	English

COMPUTER SKILLS

Programming Languages:	Python, C, C++, Java, HTML, SQL
Databases:	MySQL, PostgreSQL
Framework:	Scikit-Learn, PyTorch, Pandas, Keras
Other technologies:	GIT, LaTex

RESEARCH ACTIVITIES

My primary research activities focus on applying Artificial Intelligence to solve combinatorial problems like scheduling and routing. In my research efforts, I strive to design effective deep-learning models and new training strategies that better suit such problems. The main goal is to propose new cutting-edge methodologies that can also bridge the gap between academia and industry. Furthermore, my ongoing collaborations have driven my exploration into how Artificial Intelligence can enhance network security measures. Lastly, I am actively engaged in the development of algorithms and exact methods to address large-scale and intricate industrial problems. Some of the most notable activities:

- Develop new data-driven approaches, like Deep and Reinforcement Learning ones, to solve scheduling problems characterized by machine eligibility and precedences. This was the primary goal of my Ph.D.: studying whether learning techniques can be an effective means to tackle scheduling and other complex combinatorial problems.

- Study the benefits and trade-offs of Deep Learning techniques in the field of network (cyber-)security. In this work, I devised a new methodology to train sequential models on network traffic data and I studied the applicability of Out-Of-Distribution techniques to detect new and unknown forms of network intrusions.

- Designing algorithms and exact methods for tackling new optimization problems. In my activities, I faced novel problems or variations of existing ones that presented unique and complex combinations of constraints. To solve such problems, I had to dive into existing literature and design new (meta-)heuristics and mathematical techniques to tackle these unexplored territories.

- Simulating the behavior of industrial systems to develop optimization algorithms for local companies. One of the most notable works focused on building an abstract representation of a line sorter system through statistical and data-driven approaches. This representation served to develop and validate the final optimization algorithm.

PUBLICATIONS

- Andrea Corsini, Angelo Porrello, Simone Calderara and Mauro Dell'Amico. *"Self-Labeling the Job Shop Scheduling Problem"*. Preprint. Submitted to the International Joint Conference on Artificial Intelligence. 2024.

- Roberto Montemanni, Mauro Dell'Amico and Andrea Corsini. *"Modeling the Parallel Drone Scheduling Vehicle Routing Problem as a Heterogeneous Vehicle Routing Problem"*. International Conference on Intelligent Information Technology (ICIIT). 2024.

- Roberto Montemanni, Mauro Dell'Amico and Andrea Corsini. *"The Parallel Drone Scheduling Vehicle Routing Problem with Collective Drones"*. Computers & Operations Research, volume 163, 2023.

- Andrea Corsini, Dario Bezzi, Mauro Dell'Amico. *"Heuristics for Scheduling an Assembly Problem with Lobster Precedences and Resource Constraint"*. Submitted to Computers & Operations Research. 2023.

- Andrea Corsini and Mauro Dell'Amico. *"Using Self-Supervised Learning to Solve the Job Shop Scheduling Problem"*. International Conference on Optimization and Decision Science, 2023.

- Andrea Corsini, Angelo Porrello, Simone Calderara and Mauro Dell'Amico. *"Efficiently Learning to Solve the Job Shop Scheduling Problem by means of Multiple Optima and Self-Supervised Learning"*. Submitted to IEEE Transaction on Industrial Informatics. 2023.

- Andrea Corsini and Shanchieh Jay Yang. *"Are Existing Out-Of-Distribution Techniques Suitable for Network Security?"*. International Conference on Communications and Network Security. IEEE, 2023.

- Andrea Corsini, Simone Calderara and Mauro Dell'Amico. *"Learning the Quality of Machine Permutations in Job Shop Scheduling"*. IEEE Access, vol. 10, 2022.

- Andrea Corsini, Shanchieh Jay Yang and Giovanni Apruzzese. *"On the Evaluation of Sequential Machine Learning for Network Intrusion Detection"*. The 16th International Conference on Availability, Reliability and Security, 2021. Association for Computing Machinery, NY, USA.

Date, 25/01/2024   Andrea Corsini