

Elia Piccoli

PHD STUDENT IN COMPUTER SCIENCE

☎ (+39) 3459247156 | ✉ e.piccoli19@gmail.com | 🏠 eliapiccoli.github.io | 🌐 EliaPiccoli | 📄 elia-piccoli | 🎓 Elia Piccoli

Education

PhD in Computer Science, UNIVERSITY OF PISA, ITALY

Nov. 2022 - PRESENT

- Theme: *Reinforcement Learning, Lifelong Learning, Knowledge Representation, Compositionality*
- Title: *Formalizing Knowledge as Skills in Reinforcement Learning*
- Supervisor: *Davide Bacciu*
- Co-Supervisor: *Vincenzo Lomonaco*

Master Degree in Computer Science, UNIVERSITY OF PISA, ITALY

Sep. 2020 - Oct. 2022

- Curriculum: *Artificial Intelligence*
- Final Degree: *110 cum laude*
- Thesis: *Introducing Unsupervised Skills in Continual Reinforcement Learning Agents*
- Supervisors: *Davide Bacciu - Vincenzo Lomonaco*

Bachelor Degree in Computer Science, UNIVERSITY OF VERONA, ITALY

Sep. 2017 - Jul. 2020

- Final Degree: *110 cum laude*
- Thesis: *Deep Reinforcement Learning for Multi-Agent Navigation*
- Supervisors: *Alessandro Farinelli - Enrico Marchesini*

Experience

PhD Student Representative, UNIVERSITY OF PISA, ITALY

Nov. 2023 - PRESENT

Representative for the *PhD Steering Committee in Computer Science*.

Teaching Assistant, UNIVERSITY OF PISA, ITALY

Sep. 2023 - Dec. 2023

- Course: *Artificial Intelligence Fundamentals* (Master Degree in Computer Science, Curriculum AI)
- Teacher: *Vincenzo Lomonaco*
- Hands-on lessons throughout the course over several topics such as:
 - *Search Algorithms*
 - *Knowledge representation, reasoning & planning*
 - *Reasoning under uncertainty*

ESSAI Summer School, LJUBLJANA, SLOVENIA

Jul. 2023

- *European Summer School on Artificial Intelligence*.
- Five days with 4 different advanced courses (40 hours):
 - *AutoML: Accelerating Research on and Development of AI Applications*
 - *Learning to Act and Plan*
 - *Multi-Objective Reinforcement Learning*
 - *Game-Theoretic Approach to Planning and Synthesis*

Teaching Assistant, UNIVERSITY OF PISA, ITALY

Feb. 2023 - Jun. 2023

- Course: *Computer Architecture and Operating Systems* (Bachelor Degree in Computer Science).
- Teacher: *Massimo Torquati*
- Hands-on lessons solving exercises in preparation for intercourse exams.

Autonomous Planning Engineer, E-TEAM SQUADRA CORSE, PISA

Oct. 2022 - PRESENT

- Division: *Driverless*.
- Working on different strategies, using *Reinforcement Learning*, to train the car to complete the different tracks in the Formula Student competition, leveraging information from the camera and some other sensors.
- Study how to deploy and integrate the trained model to the real car.

Returning Officer, COMUNE DI SAN GIOVANNI LUPATOTO, VERONA

2018 - PRESENT

- Management and supervision of voting operations, ballot counting and compilation of minutes.

Tutoring, HIGH SCHOOL AND UNIVERSITY STUDENTS

2016 - PRESENT

- Worked in total with more than 30 students helping them studying and understanding the topics.
- The subjects space among *Computer Science, Math, Physics*.

CyberChallengeIT hosted by CINI, UNIVERSITY OF VERONA, ITALY

Feb. 2020 - Jun. 2020

- After passing the selection phase, I attended the course which was divided into two parts: theory and hands-on sessions.
- Learnt about hacking from a theoretical point of view, analyzing all the various fields that are strictly correlated to *cybersecurity* (e.g. cryptography, binary exploitation, web hacking etc.).
- Learnt how to approach and analyze different problems, how to spot possible exploits and take advantage of them to retrieve data or access machines.

University Internship, UNIVERSITY OF VERONA, ITALY

Nov. 2019 - Feb. 2020

- Studied and tested new techniques for Reinforcement Learning (e.g. *Genetic Deep Reinforcement Learning*).
- Created a customizable *Unity* game environment and used it as learning environment to train agents via *Python* and *Keras* using *ml-agents* tool. The created environment included both single/multiple agents scenarios and single/multiple instances.
- In depth analysis and comparison of different state-of-the-art models using several environments and learning approaches.

High school Stage, DGROOVE SRL, VERONA

Jun. 2016 - Jul. 2016

- Studied the basis of *AngularJs* via some online courses.
- Realized the Front-End and Back-End of a website that was connected to a database in order to retrieve information and display them.

Languages

Italian *Native speaker*

English *Fluent*

First Certificate in English (B2 - 2016)

English for Research Publication and Presentation (C1 - 2023)

Skills

Programming Languages Python, C, C++, Java, MATLAB & Simulink, Bash, SQL

Libraries/Frameworks PyTorch, Keras, TensorFlow, Numpy, Sklearn, Pandas, StableBaselines3

Markup Languages HTML, XML, RDF

Softwares Visual Studio, Git, Microsoft Office, PostgreSQL, Unity, Blender

Projects

Here are reported some of my projects, all of them can be found on my [GitHub page](#).

Avalanche-RL

2023

- Branch of the main library *Avalanche*, based on *Pytorch*, it aims at providing an easy implementation of *Continual Reinforcement Learning* benchmarks and experiments.
- It offers implementation of different RL algorithms and all CL plugins or strategies inherited from *Avalanche*.
- As part of my PhD, I will be working on the library extending it with new features.

SmartPA, GROUP PROJECT

2021

- The project was developed in collaboration with *Compagnia Trasporti Toscana (CTT)*. The focus of the project was to improve the document archiving process in Public Administration exploiting Artificial Intelligence.
- We created from scratch a Transformer architecture, using *Python* and *Pytorch*, that would predict the archiving class for the documents. Using real data from the last two years, we were able to obtain models with more than 90% accuracy.

Customer Analysis, GROUP PROJECT

2021

- In depth analysis of *Customer Supermarket* dataset which includes tasks such as *clustering*, *classification* and *sequential pattern mining* using *Pandas* and *Python*.

Defect Detection, GROUP PROJECT

2020

- Analysis and highlighting of texture defects using *Matlab* and *Spectral Analysis* on images.

Supervised Theses

Alessandro Guerriero, SEARCH ALGORITHMS AS SKILLS FOR REINFORCEMENT LEARNING AGENTS

2023

- *Bachelor Degree in Computer Science, University of Pisa*
- Co-supervised with *Davide Bacciu*
- Created a small Maze environment to study how Q-Learning agents leverage compositionally different search algorithms.

Malio Li, SOLVING MULTIPLE TASKS SIMPLY USING PRIOR POLICIES IN LIFELONG REINFORCEMENT LEARNING

2023

- *Master Degree in Computer Science, Curriculum AI, University of Pisa*
- Co-supervised with *Vincenzo Lomonaco*
- The work studies methodologies to learn how to leverage a set of pre-trained policies in order to solve a new task, exploiting prior knowledge and without further learning.

Marco Petix, LEARNING TASK DESCRIPTIONS IN REINFORCEMENT LEARNING

2023

- *Master Degree in Computer Science, Curriculum AI, University of Pisa*
- Co-supervised with *Davide Bacciu*
- The work focuses on studying different methodologies to create and/or learn a representation of the underlying task solved by a policy. The representations are then used to compare similarity between tasks/policies while improving knowledge transfer.

Alessandro Capurso, EXPLOITING TASK DESCRIPTIONS IN REINFORCEMENT LEARNING

2023

- *Master Degree in Computer Science, Curriculum AI, University of Pisa*
- Co-supervised with *Davide Bacciu*
- The work aims at developing different approaches to leverage policies' description to accelerate the learning process of an out of distribution task re-using prior knowledge.

Giacomo Carfi, LEVERAGING SKILLS IN REINFORCEMENT LEARNING

2023

- *Master Degree in Computer Science, Curriculum AI, University of Pisa*
- Co-supervised with *Davide Bacciu*
- The work develops and compares different ways to combine several pre-trained representations to solve more efficiently tasks by leveraging and composing prior knowledge.

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