

# Matteo De Francesco

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## About Me

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I'm a Master's degree holder in Computer Science, with a major in Artificial Intelligence, at University of Pisa, Italy. During my studies I had the opportunity to take different classes and doing practical experience with hands-on projects, exploring the vast subjects in Applied mathematics/Computer Science. My interests lie into Operations Research, Optimization, Machine Learning and Deep Learning, quantum algorithms, and probabilistic models for Deep Learning.

## Education

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**Master's Degree (MSc) in Computer Science - Artificial Intelligence** Sep. 2020 - Feb. 2023  
*University of Pisa* 110/110 with honors

**Bachelor's Degree (BSc) in Computer Science** Sep. 2017 - Jul. 2020  
*University of Pisa* 104/110

## Research/Work Experience

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**Research Intern** Sep. 2022 - Feb. 2023  
*EdF Lab R&D Paris-Saclay*

- \* Internship at the EdF (Électricité de France) R&D Laboratory of Paris-Saclay, at the OSIRIS (Optimisation Simulation Risques et Statistiques) departement.
- \* Development of a novel algorithmic framework, targeted to a specific class of problems, using a family of iterative methods called Bundle methods. Mathematical modelling of the problem, with the theoretical development and analysis of a cooperating entity with multiple capabilities, enforcing collaboration between multiple algorithms. Theoretical extension of many existing Bundle methods with the aforementioned capabilities. C++ implementation and testing of the algorithmic framework on the Unit Commitment problem, showing timing improvement.

**Research Fellow** Apr. 2022 - Aug. 2022  
*University of Pisa*

- \* Awarded of a fully funded scholarship by the Italian Ministry of Justice, in the context of an European project called "Giustizia Agile";
- \* Brought improvements to the law courts of Leghorn, Lucca and Pisa by improving the current ICT state-of-the-art, using novel technologies.
- \* Created an interactive webapp for storing/searching/visualize the different acts collected in the courts improving the old database-like system, by using the Flask framework of Python, HTML and Javascript for the website design and Elasticsearch for the search engine.
- \* Preliminary investigation of NLP techniques to analyze the different documents.

**Teaching Assistantship** Multiple periods  
*University of Pisa*

- \* Selected three times as teaching assistant by the Faculty Board of the Computer Science Department, for the practical lectures of "Fundamentals of Computer Science" and "Mobile Application Development" courses of the Bachelor's Degree in Computer Science;
- \* Provided help and feedback to the students improving their knowledge in the field, explaining them the basics of set operations, combinatorial math and graph theory;
- \* Created a simple application to let the students familiarize with Android development tools and correct implementation patterns, by using Android Studio framework and Kotlin language;

**Research Intern** Mar. 2020 - Jul. 2020  
*University of Pisa*

Final project for my Bachelor's thesis. Developed a Machine Learning framework for classifying topics on StackOverflow, using theoretical aspects of Deep Learning, statistical Machine Learning and NLP methods, coding everything in Python using the Tensorflow library.

**Mobile App Developer** Sep. 2019 - Mar. 2020  
*Omega Travel*

- \* Developed a mobile application for the travel agency "Omega Travel" increasing the amount and profits of booked trips, using a proper software engineering approach, using the Flutter framework and coding everything in Dart language.

## Projects

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### GoEmotions

Jan. 2022 - Apr. 2022

Human Language Technologies course. Implemented different BERT-based models, training and testing them over the GoEmotions dataset, achieving F1 scoring w.r.t. the state-of-the-art, by using the Pytorch framework in Python, Colab/Kaggle machines and additional Python libraries.

### Quadratic Disjoint Simplices

Jul. 2021 - Dec. 2021

Computational Mathematics and Optimization course. Carried out a theoretical analysis of the ADAGRAD algorithm, then I implemented a solver for specific optimization problem, obtaining good timing and convergence results, using the Julia language.

### Autonomous Driving

Sept. 2021 - Dec. 2021

Team work for the "Eteam Squadra Corse" of the University of Pisa. Implemented part of an autonomous driving system for the "Formula Student" competition, covering the SLAM task to build the track, using Python/C++ language and the fundamentals of ROS (Robot Operating Systems).

### Parallel Boruvka

Sept. 2021 - Dec. 2021

Parallel and Distributed System course. Developed a parallel implementation of the "Boruvka algorithm", for finding the Minimum Spanning Tree of a given graph, achieving a good speedup. Exploiting an ad hoc data structure tailored for this problem ("Disjoint Sets"), C++ language and many of its functionalities.

### Smart Park

May. 2021 - Jun. 2021

Developed an intelligent Smart park for bicycles, synchronizing bicycle locks smartly achieving good results in simulation of a crowded environment. The work was carried out using C and Python languages, by programming IoT sensors and a listening server for CoAP and MQTT.

## Technical Skills

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### Subjects

Machine Learning (ML), Deep Learning (DL), Operations Research (OR), Data Analysis  
Natural Language Processing (NLP), Algorithms, Big Data, Parallel Patterns Paradigms  
Reinforcement Learning (RL), Robotics, Statistical Data Analysis, Monte Carlo simulation  
Complex Systems

### Languages

Python, Julia, C++, C, MATLAB, Java, Bash, Dart, Kotlin, MySQL

### Software/Frameworks

Pytorch, Tensorflow, Git, Elasticsearch, Flutter, Android Studio, Flask, Docker, ROS

## Languages

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### Italian

Mother tongue

### English

Advanced

### French

Basic