

FRANCESCO TOSONI

PhD Graduate in Computer Science

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EDUCATION

PhD in Computer Science (EQF 8)

University of Pisa

Nov 2020 – Jan 2024

Pisa, Italy

I have been a member of the [Acube laboratory \(acube.di.unipi.it\)](https://www.acube.di.unipi.it) directed by Professor Paolo Ferragina. My doctoral thesis investigated computation-friendly lossless compression schemes that adapt general-purpose lossless compression tools (grammar-based, zip-like, entropy-based) to different application contexts, such as efficient machine-learning inference and string indexing. The proposed compressed solutions allow performing linear algebra operations directly upon the compressed representations within time proportional to the compressed-size representations, thereby reducing network requirements and energy costs in client-server architectures and local computations.

I have been interested in key-value storage, learned data structures, information retrieval and big-data analysis. I have been glad to be advised in my research by Prof. Paolo Ferragina and Prof. Giovanni Manzini.

Thesis title: “*Computation-friendly compression of matrices and tries*”. Advisors: P. Ferragina, G. Manzini. Date: 6th May 2024. Score: excellent.

MSc in Computer Science and Networking (EQF 7)

University of Pisa and Sant’Anna School of Advanced Studies

Nov 2017 – Mar 2020

Pisa, Italy

The MSc course in CS&N (conducted in English) was a joint initiative of TeCIP Institute (Scuola Sant’Anna) and the University of Pisa (Computer Science and Information Engineering departments). The course saw the participation of many international students. Relevant courses:

- Algorithm design, analysis and implementation
- Big Data analytics, Search Engines & Information Retrieval
- High-performance Computing (HPC) and Parallel Computing (in particular: multi-thread)
- Networking (protocols, components, configuration & management), JUNOS network operating system, optical fibres

Thesis title: “*Algorithms and Data Structures for Efficient Ride-Sharing Platforms*”. Advisors: P. Ferragina, A. Marino. Date: 6th March 2020. Score: 110/110 *cum laude*.

Achieved five times the score 30/30 *cum laude*.

Served as a *student representative* for the Master’s course (2018-2020).

BSc in Computer and Electronic Engineering (EQF 6)

Università di Perugia

Sep 2014 – Oct 2017

Perugia, Italy

Relevant courses:

- Foundations of Telecommunication, Signal Processing & Automation
- Algorithms, Databases & Computer Programming: Java (mainly) and C
- Foundations of Antennas & Electronic Circuits

Thesis title (translated): “*Implementation of a distributed graph clustering algorithm on the Giraph platform according to the TLAV paradigm*”. Advisor: E. Di Giacomo. Date: 27th October 2017. Score: 110/110 *cum laude*.

Achieved seven times the score 30/30 *cum laude*.

Secondary-School Degree (EQF 4)

Liceo scientifico annesso al convitto nazionale “Principe di Napoli”

Sep 2009 – Jul 2014

Assisi, Italy

Attended public High School of Science “Principe di Napoli” in Assisi (www.convittoassisi.com). In the final examination, I presented a survey about cryptographic methods. Score: 100/100

PUBLICATIONS

- A. Boffa, P. Ferragina, **F. Tosoni**, and G. Vinciguerra, “CoCo-trie: Data-aware compression and indexing of strings”, Information Systems (IS), doi: [10.1016/j.is.2023.102316](https://doi.org/10.1016/j.is.2023.102316).
- A. Boffa, P. Ferragina, **F. Tosoni**, G. Vinciguerra, “Compressed String Dictionaries via Data-Aware Subtrie Compaction,” in String Processing and Information Retrieval - 29th International Symposium (SPIRE 2022), doi: [10.1007/978-3-031-20643-6_17](https://doi.org/10.1007/978-3-031-20643-6_17).
- P. Ferragina, T. Gagie, D. Köppl, G. Manzini, G. Navarro, M. Striani and **F. Tosoni**, “Improving Matrix-vector Multiplication via Lossless Grammar-Compressed Matrices,” in Proceedings of the VLDB Endowment (PVLDB 2022), doi: [10.14778/3547305.3547321](https://doi.org/10.14778/3547305.3547321).
- **F. Tosoni**, P. Ferragina, A. Marino, G. Resta and P. Santi, “Locality Filtering for Efficient Ride Sharing Platforms,” in IEEE Transactions on Intelligent Transportation Systems (IEEE TITS), vol. 23, no. 7, pp. 7785-7804, July 2022, doi: [10.1109/TITS.2021.3072830](https://doi.org/10.1109/TITS.2021.3072830).

PARTICIPATION AT CONFERENCES

- SPIRE '22, 29th International Symposium on String Processing and Information Retrieval, 8-10 November 2022, Concepcion, Chile. ([web site](#))
- VLDB '22, 48th International Conference on Very Large Databases, 5-9 September 2022, Sydney, Australia. [virtual] ([web site](#))

TALKS

- *Improving Matrix-Vector Multiplication via Lossless Grammar-Compressed Matrices*, 16th September 2022, Complex Science Hub (CSH), Vienna, Austria. [virtual] ([web site](#))
- *Locality Filtering for Efficient Ride Sharing Platforms*, 19th February 2021, Mauriana Pesaresi’s Seminar Series, Department of CS, Pisa, Italy.

TEACHING

Tutor

University of Pisa

📅 Sem. I, A.Y. 23/24

📍 Pisa PI

Tutoring (conducted in Italian) for the undergraduate course of “Laboratorio II” (24 hours).

Tutor

University of Pisa

📅 Sem. I, A.Y. 21/22

📍 Pisa PI

Tutoring (conducted in Italian) for the undergraduate course of “Laboratorio I-A” (20 hours).

RESEARCH VISITS

Visiting student

University of Chile

📅 Sem. I, A.Y. 22/23

📍 Santiago de Chile

Three-month stay at the laboratory directed by Professor Gonzalo Navarro. I worked on applications of the k^2 -tree data structure for the storage and operation of large and sparse graphs.

AWARDS

- €1500 - Awarded the “**Best Graduate Award**” (**Master in CS & Networking**) based on the best graduation grade, exam grades (GPA) and least amount of time spent to graduate, reserved for graduates from cohort 2017/2018 graduating in the academic year 2018/2019.
- €1000 - Awarded the “**Best Master’s Thesis Award 2020**”, reserved to master’s student who graduated between August 1, 2019 and July 31, 2020. The prize was offered by *con.Sienze*, the National Conference of Presidents and Directors of scientific and technological university facilities; see www.conscienze.it/premi_2020_vincitori.asp.

HACKATHONS



First Ascent 2018 finalist

Selected from 400+ applicants for the participation in *First Ascent 2018*

FA18 (Copenhagen, Denmark) was a coding challenge event organised and sponsored by Bending Spoons. 20 Italian top tech students coming from many universities in Italy (Bologna, Cagliari, Padua, Pisa, Rome, Trento), England (Cambridge, Oxford, Imperial College London) and Germany (TUM) participated in the event. Visit: firstascent.io



HackTheAlps, #weagainstvirus 2020, 3rd prize

Awarded 3rd prize with *Pharma-Q* application prototype

HackTheAlps was aimed at proposing software solutions and ideas to assist local communities during the *COVID-19* emergency; our team developed an AI-enabled web service to monitor queues at the entrance of the pharmacies of Bozen/Bolzano, using data acquired through surveillance cameras.

Visit: hackthealps.it/weagainstvirus

PROJECTS

- *Multicriteria Data Structures*, financed by the Italian MUR (Ministry of University and Research) through PRIN, number 2017WR7SHH. Period: 1st September 2019 – ongoing. Visit learned.di.unipi.it.
 - *SoBigData++*, financed by the European Union through H2020, ID 871042. Period: 1st January 2020 – ongoing. Visit plusplus.sobigdata.eu.
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SCHOLARSHIPS

PhD student

University of Pisa, CS Department

📅 Nov 2020 – Oct 2023

📍 Pisa, Italy

I hold a 3-year PhD research grant from the University of Pisa (Department of Computer Science).

Research scholarship

University of Pisa, CS Department

📅 Jun – Oct 2020

📍 Pisa, Italy

Title: *Algorithms and data structures for urban mobility platforms*. Duration: five months. Grant: MIT – Italy UNIPI Project. I worked on graph-based algorithmic solutions for vehicle routing and mobility problems.

INTERNSHIPS

Summer intern

EPLASS

📅 August 2014

📍 Würzburg, Bayern, Germany

Summer traineeship at EPLASS Project Collaboration GmbH, an internet-based software developing company working with several countries all over the world. Worked with the C# programming language.

Summer intern

Flyeralarm, Druckhaus Mainfranken

📅 August 2014

📍 Würzburg, Bayern, Germany

Intern at Flyeralarm GmbH, an online printing brand present in 15 European countries. During the internship, I assisted different departments (i.e. customer phone calls, printing, manufacturing).

PROGRAMMING LANGUAGES

Good knowledge of **C/C++** (esp. c++11), and **Python 3** and programming tools. In the past, I have also worked with **Java**.

LANGUAGE SKILLS

I get by with several languages, though with varying levels of active engagement and passive comprehension. These include: English (CEFR C1/C2) —*Deutsch* [German] (CEFR B1; language proficiency certificate from the Centre for Applied Linguistics [CLA], UNIPG, Perugia, Italy, July 2017) —*Castellano* [Spanish] (CEFR B1-B2; particularly strong in listening, reading, and AI-assisted writing; I have attended scientific seminars conducted in Spanish) —हिन्दी [Hindi] (CEFR A1; basic grammar and vocabulary) —*Italiano* [Italian] (native speaker).

INTERESTS

data compression lossless compression string indexing graph algorithms
key-value storage learned data structures information retrieval stringology

OTHERS

- European Computer Driving Licence (ECDL)
- B - Motor car driving licence

HOBBIES

I like reading books and listening to music. I'm a contributor to various Wikimedia projects; as of December 2023, I am the initiator and main contributor of 150+ Wikipedia pages and the operator of a Wikipedia bot that corrects frequent mistakes across wiki-pages.

Perugia (Italy), 21st May '24

Francesco Tononi