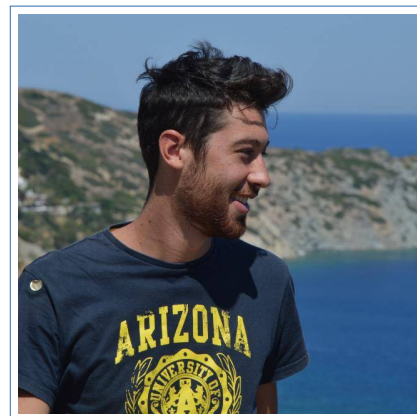


Lorenzo Fiaschi

Research Fellow



Personal Data

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Education

2022–present **Postdoctoral researcher**, *University of Pisa*, Pisa, Italy.
2019–2022 **Ph.D. in Information Engineering**, *University of Pisa*, Pisa, Italy.
Thesis Title: Numerical non-Archimedean Calculus: Applications, Software Implementation and Preliminary Hardware Design
2017–2019 **Master's Degree in Computer Science and Engineering**, *University of Genoa*, Genoa, Italy.
Thesis Title: Non-Archimedean Game Theory, a Numerical Approach (Supervisor: Marco Cococcioni, Alessandro Verri)
Mark - 110 cum Laude | Average Weighted Mark - 32.09 | Major: Machine Learning | Minors: Game Theory & Non-Standard Analysis
2014–2017 **Bachelor's Degree in Information Engineering**, *University of Pisa*, Pisa, Italy.
Thesis Title: Game Theory with Infinite or Infinitesimal Quantities: New Numerical Results (Supervisor: Marco Cococcioni)
Mark - 110 cum Laude | Average Weighted Mark - 28.73

Achievements (Scholarships, Fellowships and Awards)

- 2022 Winner of a postdoctoral fellowship at Department of Information Engineering, University of Pisa, granted by the European Project EPI SGA2 H2020
- 2022 Winner of 3,000€ grant for Ph.D. students mobility abroad of at least 3 months, funded by University of Pisa within “Bando per l’assegnazione di contributi di mobilità per periodi di ricerca all’estero di dottorandi - Anno 2022”
- 2020 Winner of 5,000€ grant for “Hardware accelerators for Deep Neural Networks and Machine Learning” workshop organization, funded by University of Pisa within “Progetto Giovani” initiative
- 2019 Winner of a three-year doctoral fellowship at Dipartimento di Ingegneria dell’Informazione, University of Pisa, granted by the Italian Ministry of Education, University and Research
- 2019 Winner of the “Springer Young Researcher Prize”, for the best talk provided by a young researcher during the 3rd *International Conference on Numerical Computations: Theory and Algorithms* (NUMTA’19)
- 2009 Winner of the scholarship “Francesca Paola Nicotra”, ranking first out of all the first-three-years high school students of Piombino (LI), Italy

Attended Conferences (* if presenting a work)

- September 2022* *International Conference on Applications in Electronics Pervading Industry, Environment and Society*, Genoa, Italy
- March 2021* 11th *International Conference on Evolutionary Multi-Criterion Optimization* (EMO2021), Shenzhen, China
- October 2020* 14th *International Conference on Game Theory and Management* (GTM2020), St. Petersburg, SPB, Russia
- June 2019* 3rd *International Conference on Numerical Computations: Theory and Algorithms* (NUMTA’19), Isola di Capo Rizzuto, KR, Italy

Teaching

- 2022/2023 Assistant lecturer of Elements of Programming, Information Engineering Bachelor's degree, 20h, 9 CFU, 250 students)
- 2021/2022 Assistant lecturer of Symbolic and Evolutionary AI, Information Engineering Masters's degree, 20h, 6 CFU, 50 students)
- 2021/2022 Assistant lecturer of Elements of Programming, Information Engineering Bachelor's degree, 20h, 9 CFU, 250 students)
- 2020/2021 Assistant lecturer of Symbolic and Evolutionary AI, Information Engineering Masters's degree, 20h, 6 CFU, 75 students)
- 2020/2021 Assistant lecturer of Elements of Programming, Information Engineering Bachelor's degree, 20h, 9 CFU, 150 students)
- 2019/2020 Assistant lecturer of Elements of Programming, Information Engineering Bachelor's degree, 40h, 9 CFU, 300 students)

Fiaschi has supervised multiple theses for the following degrees:

- 2 theses Master's Degree in Artificial Intelligence and Data Engineering (University of Pisa)

Service to the Research Community

Fiaschi has been program committee member of the following conferences:

- December 2019 IEEE Symposium on Computational Intelligence for Security and Defense Applications (IEEE CISDA), Xiamen, China

Fiaschi has served as organizer of the following conferences:

- November 2020 PhD Workshop on Hardware accelerators for AI and HPC applications, Pisa, Italy

Fiaschi has served as peer reviewer for the following journals:

- 1 paper Journal of Marine Science and Engineering
- 1 paper Computers and Operations Research

Fiaschi has served as peer reviewer for the following books:

- 1 chapter Numerical infinities and infinitesimals

Attended Summer Schools and Seminars

- September 2019 Summer school on Applied Harmonic Analysis and Machine Learning, Department of Mathematics, Genoa, Italy
- December 2018 Seminar on "Weak Interactions", taught by prof. Andreas Maurer, independent researcher, Genoa, Italy
- July 2018 2nd International Summer School on Deep Learning 2018, Genoa, Italy

Internships

2019 **Public Seminar**, *Machine Learning for non-linear dynamics inference and prediction*, Electronic Engineering Department, Genoa, Italy.

Description:

- sparse non-linear fields inference (potentially constrained)
- interpretable inference of a Koopman operator by means of autoencoders
- CNN and Pseduo-Huber loss for Dynamical Smoothing of non-linear stochastic fields
- Supervisor: Marco Storace

2018 **University Project**, *field: Computational Biology*, DIBRIS, Genoa, Italy.

Description:

- Collaboration with San Martino Hospital (GE)
- Exploitation of machine learning techniques (MKL) for prediction of heart attacks and dementia rising
- Data: genome,retina segmentation and common clinical information of 1000 people

Achievements:

- Design and implementation of the whole framework
- Improved prediction performances w.r.t. the literature

2017 **University Project**, *field: Non-Standard Game Theory*, Information Engineering Department, Pisa, Italy.

Description:

- Extension of Prisoner's Dilemma Tournaments to non-standard quantities
- Exploitation of the Grossone Methodology
- Numerical verification of the theoretical results in Matlab
- The study has been realized with the agreement of the University of Genoa

Achievements:

- Characterization of the solutions of a constrained infinite tournament, when they exist
- Numerical analysis of new and never studied tournament scenarios

Relevant Classes

Machine Learning Machine Learning, Inverse Problems, Computational Vision, Bioinformatics & Computational Biology, Graph Analytics

NSA Ultrafilters and Non-Standard Methods

HPC High Performance Computing

Game Theory Game Theory

Language Skills

Italian	mother tongue
English	fluent: attending PhD program mainly in English (2019-), attending C1/C2-level IELTS proficiency course, C1-level CLI certification for academic English (2020), attended for two years master's classes taught in English (2017-2019), B2-level Cambridge Certification (2012)

Computer Skills

Programming Languages	C and C++11 (advanced), Java (advanced), Julia (advanced), Python (advanced), SQL (fair)
Parallel Paradigms	OpenMP (advanced), MPI(advanced), OpenCL (basic)
Math Packages	Matlab (fair), R (basic)
Typesetting Packages	Latex (advanced), Microsoft Word (advanced), Microsoft PowerPoint (advanced)
Development tools	Visual Studio Code (advanced), Anaconda (advanced)
Database	MySQL (fair)

Publications

- [1] Fiaschi L. and Cococcioni M. A non-archimedean interior point method and its application to the lexicographic multi-objective quadratic programming. *Mathematics*, 10(23):4536, 2022, doi:10.3390/math10234536.
- [2] Rossi F., Fiaschi L., Cococcioni C., and Saponara S. Design and fpga synthesis of ban processing unit for non-archimedean number crunching. In *International Conference on Applications in Electronics Pervading Industry, Environment and Society*, 2022. to appear.
- [3] Lai L., Fiaschi L., Cococcioni C., and Kalyanmoy D. Pure and mixed lexicographic-paretian many-objective optimization: state of the art. *Natural Computing*, 1:1–16, 2022, doi:10.1007/s11047-022-09911-4.
- [4] Cococcioni M., Fiaschi L., and Lambertini L. On impure prisoners’ dilemmas, folk theorems, and correlation devices. In *EARIE 2022 (VIENNA)*, 2022. to appear.
- [5] Cococcioni M., Fiaschi L., and Lermusiaux P. Game theory for unmanned vehicles path planning in the marine domain: state of the art and new possibilities. *Journal of Maritime Science and Engineering*, 9:1175, 2021, doi:10.3390/jmse9111175.
- [6] Benci V., Cococcioni M., and Fiaschi L. Non-standard analysis revisited: an easy axiomatic presentation oriented towards numerical applications. *Applied Mathematics and Computer Science*, 32(1):65–80, 2022, doi:10.34768/amcs-2022-0006.
- [7] Cococcioni M., Fiaschi L., and Lambertini L. Computing optimal decision strategies using the infinity computer: the case of non-Archimedean zero-sum games. In *Numerical Infinities and Infinitesimals in Optimization*, pages 271–295. Springer, 2021, doi:10.1007/978-3-030-93642-6_11.
- [8] Lai L., Fiaschi L., Cococcioni M., and Deb K. On the use of grossone methodology for handling priorities in multi-objective evolutionary optimization. In *Numerical Infinities and Infinitesimals in Optimization*, pages 183–218. Springer, 2021, doi:10.1007/978-3-030-93642-6_8.
- [9] Lai L., Fiaschi L., Cococcioni M., and Deb K. Solving mixed Pareto-lexicographic multi-objective optimization problems: The case of priority levels. *IEEE Transaction on Evolutionary Computation*, 25:971–985, 2021, doi:10.1109/TEVC.2021.3068816.
- [10] Cococcioni M., Fiaschi L., and Lambertini L. Non-Archimedean zero-sum games. *Journal of Computational and Applied Mathematics*, 393:113483, 2021, doi:10.1016/j.cam.2021.113483.

- [11] Lai L., L. Fiaschi, M. Cococcioni, and Deb K. Handling priority levels in mixed pareto-lexicographic many-objective optimization problems. *11th Edition of International Conference Series on Evolutionary Multi-Criterion Optimization (EMO2021)*, pages 362–374, 2021, doi:10.1007/978-3-030-72062-9_29.
- [12] M. Cococcioni and L. Fiaschi. The big-M method with the numerical infinite M . *Optimization Letters*, 15(7):2455–2468, 2021, doi:10.1007/s11590-020-01644-6.
- [13] L. Lai, L. Fiaschi, and M. Cococcioni. Solving mixed Pareto-lexicographic multi-objective optimization problems: The case of priority chains. *Swarm and Evolutionary Computation*, 55:100687, 2020, doi:10.1016/j.swevo.2020.100687.
- [14] L. Fiaschi and M. Cococcioni. Non-Archimedean Game Theory: A numerical approach. *Applied Mathematics and Computation*, 409:125356, 2020, doi:10.1016/j.amc.2020.125356.
- [15] L. Fiaschi and M. Cococcioni. Generalizing Pure and Impure Iterated Prisoner’s Dilemmas to the Case of Infinite and Infinitesimal Quantities. *In Numerical Computations: Theory and Algorithms*, pages 370–377, Cham, 2020. Springer International Publishing, doi:10.1007/978-3-030-40616-5_32.
- [16] L. Fiaschi and M. Cococcioni. Numerical Asymptotic Results in Game Theory Using Sergeyev’s Infinity Computing. *International Journal of Unconventional Computing*, 14(1):1–25, 2018.