NICOLÒ PAGAN, Ph.D. ETH

ABOUT ME

I am a computational data science engineer with a multi-disciplinary background in the social, economic, behavioural, and network sciences.

RESEARCH INTERESTS

I have a strong passion for mathematical modelling of real-world problems. My primary research interests lie in the area of algorithmic fairness, where I explore the complex interplay between AI and human decision-making so that I can design effective interventions that foster social well-being.

KEYWORDS

Algorithmic Fairness, Complex Systems, Human/AI decision-making, Social Networks.

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Website https://nicolo-pagan.github.io/

EXPERIENCE

ACADEMIC

05 / 2021 - Present — **Postdoctoral Researcher**, Social Computing Group, Department of Informatics, University of Zurich
Mentor: Prof. Dr. Anikó Hannák

05 / 2021 - 11 / 2021 — **Postdoctoral Researcher**, Social Networks Lab, Department of Humanities, Social and Political Sciences, ETH Zurich
Mentor: Prof. Dr. Christoph Stadtfeld

02 / 2021 - 05 / 2021 — **Lecturer**, Social Computing Group, Department of Informatics, University of Zurich

PROFESSIONAL

05 / 2013 - 12 / 2015 — **Software Engineer** and **Research Consultant** in Computational Fluid-Dynamics (CFD). Ascomp AG (Zürich, Switzerland).

07 / 2012 - 08 / 2012 — **Software Engineer Intern** at FLUXiM AG (Winterthur, Switzerland)

EDUCATION

2016 - 2021 — **Ph.D.**, Automatic Control Laboratory, Department of Information Technology and Electrical Engineering, ETH Zurich
Thesis: Modeling, analysis, and inference in social network formation
Advisor :Prof. Dr. Florian Dörfler

2011 - 2013 — **M.Sc. in Computational Science and Engineering** (5.45/6), EPF Lausanne
Thesis Coupling 1D system code OLGA with TransAT CFD
Advisors Prof. Dr. François Gallaire, Dr. Sylvain Reboux

2007 - 2010 — **B.Sc. in Mathematical Engineering** (110/110 cum Laude), Politecnico di Torino
Thesis Analysis of the car behaviour while transiting on an active speed bump
Advisor Prof. Dr. Luigi Preziosi

PUBLICATIONS

SELECTED

2023 **N. Pagan***, J. Baumann*, E. Elokda, G. De Pasquale, S. Bolognani, and A. Hannák: *A Classification of Feedback Loops and Their Relation to Biases in Automated Decision-Making Systems.* Accepted at EAAMO '23.

2021 **N. Pagan**, W. Mei, C. Li, and F. Dörfler: *A meritocratic network formation model for the rise of social media influencers*, Nature Communications 12, 6865.

2019 **N. Pagan** and F. Dörfler: *Game theoretical inference of human behavior in social networks*, Nature Communications 10, 5507.

GRANTS

01 / 2022 - 12 / 2023 *Ethical Auditing of Control Systems Methods,* Swiss National Science Foundation (SNSF). Grant #180545. CHF 192'000.

HONORS AND AWARDS

2019 Invited by the Department of Mathematical Sciences at Politecnico di Torino during the *Department of Excellence 2018-2022* program: awarded a scholarship

2011 Erasmus program at EPF Lausanne. Awarded a scholarship

2010 Admitted to the 7th cycle of *Alta Scuola Politecnica* Educational program

2007 Rank 1st at the Engineering admission test at Politecnico di Torino: awarded a scholarship

2007 High School Diploma: awarded with special distinction and a scholarship

INVITED TALKS

03 / 04 / 2023 *Strategic Interactions among Social Media Content Creators,* Workshop on *Games on Networks*, National University of Singapore.

28 / 02 / 2023 *Social Computing: Bridging the Gap Between Technology and Human Interaction, Digital Society Initiative (DSI) Professors Presentations,* Zürich.

01 / 09 / 2022 *The Interplay Between Content Quality and Recommender Systems in Social Network Dynamics*. **Keynote** at the *Media Consumption Habits of Young People* workshop, European Alliance of News Agencies (EANA), Zürich.

15 / 07 / 2021 *A meritocratic network formation model for the rise of social media influencers* Doctoral course on *Mining knowledge from complex network*, Torino.

12 / 12 / 2020 *A meritocratic network formation model for the rise of social media influencers Dynamics in Social and Economic Networks, CDC, South Korea (online)*

21 /09 / 2020 *Game Theoretical Inference of Human Behaviour in Social Networks*, *Autonomy Talk,* IDSC, ETH Zurich (online).

09 /06 / 2020 *Game Theoretical Inference of Human Behaviour in Social Networks*, *Intelligent Control Seminar,* Peking University (online).

28 /11 / 2019 *Game Theoretical Inference of Human Behaviour in Social Networks*, Workshop on *Networks Dynamics in the Social, Economic, and Financial Sciences,* Torino.

TEACHING

2022	**Examiner** of *Fundamentals of People Oriented Computing*, Department of Informatics, University of Zurich
2021	**Lecturer** of *Social Computing*, Department of Informatics, University of Zurich
2019 - 2020	**Head Teaching Assistant** of *Game Theory and Control*, Department of Information Technology and Electrical Engineering, ETH Zurich
2016 - 2019	**Head Teaching Assistant** of *Linear Systems Theory*, Department of Information Technology and Electrical Engineering, ETH Zurich
2017 - 2018	**Head Teaching Assistant** of *Non-linear Systems and Control*, Department of Information Technology and Electrical Engineering, ETH Zurich
2012	**Teaching Assistant** of Informatics 2, Department of Informatics, EPF Lausanne

SUPERVISING

03 / 2023 - 08 / 2023	Michael Blum, University of Zurich. Independent Study.
05 / 2022 - 05 / 2023	Maria Helena Margareta Pelli and Andrianos Michail, University of Zurich. Master Project: *A longitudinal study of emotions on Twitter chains of re-tweets*
03 / 2022 - 07 / 2022	Jules Authier, ETH Zurich. Semester Project: *Analysis of the Closed-Loop between Recommender Systems and Opinion Dynamics*
06 / 2021 - 11 / 2021	Michael Blum, University of Zurich. Bachelor Thesis: *Learning and success in chess: the role of openings patterns*
09 / 2020 - 04 / 2021	Anna M. Maddux, ETH Zurich. Master Thesis: *Behavior estimation in dynamic games*
05 / 2020 - 12 / 2020	Cheng Li, ETH Zurich. Master Thesis: *Data-driven analysis of the ranking-quality network formation model*
05 / 2017 - 08 / 2018	Marco Buob, ETH Zurich. Semester Project: *Dynamics of cooperative agents in social network formation: theory and simulation*
10 / 2017 - 02 / 2018	Tomer Gidron, ETH Zurich. Semester Project: *Centrality games in social and economic networks*
02 / 2015 - 08 / 2015	Jiadong Bao, ETH Zurich. Master Thesis at Ascomp AG: *Cathare-TransAT Coupling for the Prediction of Boron Dilution in the ROCOM Test Facility*
02 / 2014 - 08 / 2014	Hassan Bahramian, Politecnico di Milano. Master Thesis at ASCOMP AG: *Coupling 1D System Code with TransAT CFD*

REVIEW ACTIVITY

Journals	Nature Communications, Artificial Intelligence Reviews, Automatica, Chaos, Journal of Complex Networks, VLDB, IEEE Transactions on Control of Network Systems
Conferences	The Web Conference, International Conference on Computational Social Science (IC2S2), ACM Conference on Fairness, Accountability, and Transparency (FAccT), Network Science Conference (NetSci), Complex Networks Conference, European Control Conference (ECC), IFAC World Congress
Conference Organizer	IC2S2 2022

INDEPENDENT COURSES

10 / 2021	AI + X Summit Workshop, Zürich
06 / 2020	Data Science in Techno-Socio-Economic Systems Workshop, ETH Zurich and NYU Courant (online)
11 / 2019	Network Dynamics in the Social, Economic, and Financial Sciences Workshop, Politecnico di Torino
06 / 2018	Summer School on Economic Networks, Oxford
10 / 2017	Autonomous Decision-Making Workshop, ETH Risk Center, Zürich

IT SKILLS

Software

Foundational
- MacOS-Unix
- Windows OS
- MS Office
- iWork

Programming
- C / C++
- Bash
- Fortran
- Git

Data Science
- Python
- SQL/Pandas
- TensorFlow
- Matlab/R

Web Tools
- HTML
- CSS

LANGUAGES

Mother Tongue: Italian

Other Languages: English C2 | French B1 | German A2

APPENDIX

Full list of publications

List of conference talks

REFERENCES

Prof. Dr. Anikó Hannák, Assistant Professor, Social Computing Group, Department of Informatics, University of Zurich
hannak@ifi.uzh.ch

Prof. Dr. Florian Dörfler, Associate Professor, Automatic Control Laboratory, Department of Information Technology and Electrical Engineering, ETH Zurich
dorfler@ethz.ch

PERSONAL INFO

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C Permit (CH)
B Driving License, own auto

APPENDIX A

FULL LIST OF PUBLICATIONS

Journal Articles

[J3] S. Ioneuscu, A. Hannák, and **N. Pagan:** *The Role of Luck in the Success of Social Media Influencers*, Applied Network Science (2023). **DOI**:10.1007/s41109-023-00573-4

[J2] **N. Pagan,** W. Mei, C. Li, and F. Dörfler**:** *A meritocratic network formation model for the rise of social media influencers***,** Nature Communications 12, 6865 (2021) **DOI**:10.1038/s41467-021-27089-8

[J1] **N. Pagan** and F. Dörfler: *Game theoretical inference of human behavior in social networks*, Nature Communications 10, 5507 (2019) **DOI**:10.1038/s41467-019-13148-8

Conference Articles

[C8] **N. Pagan***, J. Baumann*, E. Elokda, G. De Pasquale, S. Bolognani, and A. Hannák: *A Classification of Feedback Loops and Their Relation to Biases in Automated Decision-Making Systems,* 3rd ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization (EAAMO '23), Manuscript available upon request.

[C7] S. Ionescu, A. Hannák, and **N. Pagan**: *Group Fairness for Content Creators: the Role of Human and Algorithmic Biases under Popularity-based Recommendations,* 17th ACM Conference on Recommender Systems 2023. Manuscript available upon request.

[C6] N. Lanzetti, F. Dörfler, and **N. Pagan**: *The Impact of Recommendation Systems on Opinion Dynamics: Microscopic versus Macroscopic Effects,* 62nd IEEE Conference on Decision and Control (CDC) (2023). Manuscript available upon request.

[C5] A. Maddux, **N. Pagan**, G. Belgioioso, and F. Dörfler: *Data-Driven Behaviour Estimation in Parametric Games,* 22nd World Congress of the International Federation of Automatic Control (2023) **DOI**:10.48550/arXiv.2202.01229.

[C4] S. Ionescu, **N. Pagan**, and A. Hannák: *Individual Fairness for Social Media Influencers*, The 11th International Conference on Complex Networks and their Applications (2022) **DOI**:10.1007/978-3-031-21127-0_14.

[C3] J. Bao, S. Reboux, **N. Pagan**, and D. Lakehal: *Cathare-TransAT Coupling for the Prediction of Boron Dilution in the ROCOM Test Facility*, 16th International Topical Meeting on Nuclear Reactor Thermal Hydraulics, (2015).

[C2] Labois, M., **N. Pagan**, D. Lakehal, and C. Narayanan: *Computational modelling of subsea hydrate formation and associated risks and impact on flow assurance,* In Proceeding of 10th International Conference on CFD in the Minerals and Process Industries. (2014)

[C1] S. Altazin, B. Perucco, **N. Pagan**, K. Lapagna, T. Lanz, R. Knaack, E. Knapp, B. Ruhstaller: *Multi-scale modeling of organic light-emitting devices*, SID Symposium Digest of Technical Papers (2013).

Conference Articles -Under Review

[C9] A. Bouleimen, **N. Pagan**, S. Cresci, A. Urman, and S. Giordano: *Dynamics of toxic behavior in the Covid-19 vaccination debate.* Manuscript available upon request.

Conference Articles -in Preparation

[C10] A. Michail*, M. H. M. Pelli*, A. M. Günster, and **N. Pagan**: *Emotions and Opinion Biases on Social Media: The Case of Abortion on Twitter*. Manuscript available upon request.

Extended Abstracts

[EA6] **N. Pagan***, J. Baumann*, E. Elokda, G. De Pasquale, S. Bolognani, and A. Hannák: *Closing the Loop: Feedback Loops and Biases in Automated Decision-Making Systems*, 2nd European Workshop on Algorithmic Fairness (EWAF'23).

[EA5] **N. Pagan***, J. Baumann*, E. Elokda, G. De Pasquale, S. Bolognani, and A. Hannák: *Closing the Loop: Feedback Loops and Biases in Automated Decision-Making Systems,* 9th International Conference on Computational Social Science (IC2S2) 2023.

[EA4] A. Bouleimen, **N. Pagan**, S. Cresci, A. Urman, G. Nogara, and S. Giordano: *User's Reaction Patterns in Online Social Network Communities,* the International School and Conference on Network Science (NetSci) (2023).

[EA3] S. Ionescu, A. Hannák, and **N. Pagan**: *The impact of users' homophily and recommendation biases on social network inequalities*, the International School and Conference on Network Science (NetSci) (2023).

[EA2] **N. Pagan**, W. Mei, and F. Dörfler: *Emergence of Zipf's law among social networks influencers*, IFAC Conference on Networked Systems (NecSys) (2022).

[EA1] **N. Pagan** and F. Dörfler: *Learning strategic behavior in social and economic networks*, The 7th International Conference on Complex Networks and Their Applications: book of abstracts, p.207-209 (2018).

Monograph

[Th1] **N. Pagan**: *Modeling, analysis, and inference in social network formation*, ETH Zurich Research Collection (2021). **DOI**: 10.3929/ethz-b-000501329.

Media Coverage

[M3] Mathematics: Investigating how social media influencers arise, In: NatureAsia (2021).

[M2] What influences the rise of influencers?, In: Phys.org (2021).

[M1] **N. Pagan** Can social network structure reveal human behavior?, Behind the paper blog post at Behavioural and Social Sciences - Nature Research (2019).

APPENDIX B

LIST OF CONFERENCE TALKS

08 / 11 / 2022 — *Individual Fairness for Social Media Influencers,*
11th International Conference on Complex Networks and their Applications, Palermo (Italy)

08 / 09 / 2021 — *A meritocratic network formation model for User-Generated Content based platforms*,
5th European Conference on Social Networks, Naples (Italy)

12 / 12 / 2018 — *Learning strategic behavior in social and economic networks*,
7th International Conference on Complex Networks, Cambridge (UK)

12 / 06 / 2018 — *Social network formation: from individual incentives to systemic stability*,
GameNet at NETSCI, Paris (France)

14 / 02 / 2018 — *From individuals decisions to emerging social structure*,
Infrastructure Resilience Conference, Zürich (Switzerland)