

Melvyn Tyloo

Education

- Oct.2016– Feb.2020 **PhD in Physics**, *Swiss Federal Institute of Technology in Lausanne - EPFL*
Local Vulnerabilities and Global Robustness of Coupled Dynamical Systems on Complex Networks.
[<https://infoscience.epfl.ch/record/274264>]
Supervisors: Profs. Philippe Jacquod and Frédéric Mila.
Private defense: December 16, 2019.
Public defense: February 6, 2020.
Experts: Profs. Mauricio Barahona, Enrique Mallada, Paolo De Los Rios.
President: Prof. Henrik Rønnow
- Sep.2014– Jul.2016 **Master of Science in Physics**, *Swiss Federal Institute of Technology in Lausanne - EPFL*
Specialisation in theoretical physics (RQFT, Relativity and Cosmology, Statistical, Solid-state physics, Doctoral quantum class, Information Theory). Completed 96/90 ETCS.
Thesis at the Chair of Condensed Matter Theory: *Quantum Monte Carlo simulation of $SU(N)$ antiferromagnetic Heisenberg chain in the fully symmetric/antisymmetric representations.*
Supervisor: Prof. Frédéric Mila
- Sep.2011– Jul.2014 **Bachelor of Science in Physics**, *Swiss Federal Institute of Technology in Lausanne - EPFL*
Emphasis on theoretical courses (Statistical, Solid-state, Quantum, Computational, Plasma physics).

Employment History

- Feb.2022– present **Director's Postdoc Fellow**, *Theoretical Division, T-4/T-5, Los Alamos National Laboratory (LANL)*
Advisors: Dr. Marc Vuffray and Dr. Andrey Lokhov.
- Apr.2021– Oct.2021 **Postdoctoral researcher**, *University of Geneva (UNIGE), Department of Quantum Matter Physics (DQMP)*
- Feb.2020– Mar.2021 **Postdoctoral researcher**, *University of Applied Sciences of Western Switzerland, HES-SO Valais/Wallis*
Advisor: Prof. Philippe Jacquod.
- Jul.- Aug.2019 **Invited researcher**, *Center for Nonlinear Studies, Los Alamos National Laboratory - LANL*
Advisors: Dr. Andrey Lokhov and Dr. Marc Vuffray.

Teaching activities

- 2023- 2020-2022 PhD student internship supervision, Ayrton Almada, *Fault detection in electric power grids.*
- 2020-2022 PhD student supervision, Julian Fritzsche, *Interarea oscillations in coupled oscillator networks and power grids.*
- 2016-2021 Substitute lecturer for the course of general physics at the University of Applied Sciences of Western Switzerland, HES-SO Valais/Wallis.

2011-2016 Tutoring for physics, maths, chemistry, probability and programming given to bachelor, master and doctoral students at EPFL and UNIL.

Prizes, awards, fellowships

- Aug.2022 Los Alamos National Laboratory SPOT Award.
- Mar.2022 Los Alamos National Laboratory Director's Postdoc Fellowship.
- Feb.2020 PhD thesis nominated for the Asea Brown Boveri Ltd. (ABB) Award and the EPFL Doctorate Award.
- Oct.2018 Best presentation Award at the International School on Informatics and Dynamics in Complex Networks, University of Catania, Italy.

Grants

2022

- **LDRD/ER Seedlings**, Co-PI, Los Alamos National Laboratory (LANL), 1 years funding
- **LDRD/PRD**, Director's Postdoc Fellow, Los Alamos National Laboratory (LANL) + additional M&S funding, 3 years funding

Personal skills

Languages French (native), English (fluent), German (intermediate).

Programming C++, Matlab, Julia.

Research interests

Complex networks, dynamical systems, inference, reservoir computing, graphical models.

Reviewer

Journal of Physics: Complexity; Scientific Reports; Chaos; SIADS (SIAM Applied Dynamical Systems); Physica A (Elsevier); EPL (Europhysics Letters); IEEE TNSE (Transactions on Network Science and Engineering); Chaos, Solitons and Fractals; Patterns; IEEE TPS (Transactions on Power Systems); Nature Communications Physics.

Publications in peer-reviewed scientific journals

All publications can be found on my personal website (melvyntyloo.com).

- **M. Tyloo**, *Assessing the impact of Byzantine attacks on coupled phase oscillators*, *J. Phys. Complex.* **4**, 045005 (2023). [[Link](#)].
- R. Delabays, L. Pagnier, B. Schäfer, **M. Tyloo**, D. Witthaut (Guest Editors), *Focus on Monitoring and Control of Complex Supply Systems*, *J. Phys. Complex.* (2023). [[Link](#)].
- R. Delabays, A.Y. Lokhov, **M. Tyloo**, M. Vuffray (Featured in [Physics]), *Locating the source of forced oscillations in transmission power grids*, *PRX Energy* **2**, 023009 (2023). [[Link](#)]
- **M. Tyloo** (Invited Comment), *More is definitely different: the zebrafish as witness: Comment on "Structure and function in artificial, zebrafish and human neural networks" by Peng Ji et al.*, *Physics of Life Reviews* **46**, 71-72 (2023). [[Link](#)].

- **M. Tyloo**, J. Hindes, P. Jacquod, *Finite-time Correlations Boost Large Voltage-Angle Fluctuations in Electric Power Grids*, *J. Phys. Complex.* **4**, 015006 (2023). Focus on Monitoring and Control of Complex Supply Systems. [Link].
- **M. Tyloo** (Invited Paper), *Faster network disruption from layered oscillatory dynamics*, *Chaos* **32**, 121101 (2022). Fast Track in the Focus Issue on Disruption of Networks and System Dynamics. [Link].
- R. Delabays, **M. Tyloo**, *Heavy-tailed distribution of the number of papers within scientific journals*, *Quantitative Science Studies* **3** (3), 776-792 (2022). [Link].
- **M. Tyloo**, *Layered complex networks as fluctuations amplifiers*, *J. Phys. Complex.* **3**, 03LT01 (2022). [Link].
- **M. Tyloo**, R. Delabays, P. Jacquod, *Reconstructing network structures from partial measurements*, *Chaos* **31**, 103117 (2021). [Link].
- L. Pagnier, R. Delabays, **M. Tyloo**, *Locating line and node disturbances in networks of diffusively coupled dynamical agents*, *New J. Phys.* **23**, 043037 (2021). [Link].
- **M. Tyloo**, R. Delabays, *System Size Identification from Sinusoidal Probing in Diffusive Complex Networks*, *J. Phys. Complex.* **2**, 025016 (2021). [Link].
- F. Baumann, I.M. Sokolov, **M. Tyloo**, *Periodic Coupling inhibits Second-order Consensus on Networks*, *Phys. Rev. E* **102**, 052313 (2020). [Link]
- F. Baumann, I. M. Sokolov, **M. Tyloo**, *A Laplacian approach to stubborn agents and their role in opinion formation on influence networks*, *Phys. A* **557**, 124869 (2020). [Link]
- **M. Tyloo**, P. Jacquod, *Primary Control Effort in Realistic High-Voltage Power Networks*, *IEEE Control Systems Letters*, **5** (3), (2020). [Link]
- **M. Tyloo**, L. Pagnier, P. Jacquod, *The key player problem in complex oscillator networks and electric power grids: resistance centralities identify local vulnerabilities*, *Sci. Adv.* **5** (11), eaaw8359 (2019). [Link]
- R. Delabays, **M. Tyloo**, P. Jacquod, *Rate of change of frequency under line contingencies in high voltage electric power networks with uncertainties*, *Chaos* **29**, 103130 (2019). Focus Issue on the Dynamics of Modern Power Grids [Link]
- **M. Tyloo**, P. Jacquod, *Global robustness versus local vulnerabilities in complex synchronous networks*, *Phys. Rev. E* **100**, 032303 (2019). [Link]
- **M. Tyloo**, R. Delabays, P. Jacquod, *Noise-induced desynchronization and stochastic escape from equilibrium in complex networks*, *Phys. Rev. E* **99**, 062213 (2019). [Link]
- **M. Tyloo**, T. Coletta, P. Jacquod, *Robustness of synchrony in complex networks and generalized Kirchhoff indices*, *Phys. Rev. Lett.* **120**, 084101 (2018). [Link]
- R. Delabays, **M. Tyloo**, P. Jacquod, *The size of the sync basin revisited*, *Chaos* **27**, 103109 (2017). [Link]

Peer-reviewed conference proceedings

- P. Jacquod, **M. Tyloo**, *Propagation of non-Gaussian voltage angle fluctuations in high-voltage power grids*, *IFAC-PapersOnLine* **55-13** (2022) 67-72, *Necsys 22, Zürich, Switzerland, July 5-7, 2022*. [Link]

- R. Delabays, L. Pagnier, **M. Tyloo**, *Locating fast-varying line disturbances with the frequency mismatch*, *IFAC-PapersOnLine* **55-13** (2022) 270-275, *Necsys 22, Zürich, Switzerland, July 5-7, 2022*. [Link]
- J. Fritzsche, **M. Tyloo**, P. Jacquod, *Matrix Perturbation Theory of Inter-Area Oscillations*, *2021 60th IEEE Conference on Decision and Control (CDC)*, 3507-3512. [Link]
- R. Delabays, **M. Tyloo**, *Network inference using sinusoidal probing*, *IFAC-PapersOnLine* **54** (9), 696-700, *24th International Symposium on Mathematical Theory of Networks and Systems MTNS 2020: Cambridge United Kingdom*, (2021). [Link]
- **M. Tyloo**, P. Jacquod, *Primary Control Effort in Realistic High-Voltage Power Networks*, *Proceedings of the 59th IEEE Conference on Decision and Control 2020*, (2020). [Link]

Submitted but not yet accepted/published publications

- **M. Tyloo**, *Assessing the impact of Byzantine attacks on coupled phase oscillators*, *arXiv:2303.16355* (2023). [Link]
- J. Hindes, I.B. Schwartz, **M. Tyloo**, *Large and small fluctuations in oscillator networks from heterogeneous and correlated noise*. (2023)

Organization of international conferences

2023

- Nov. 28-30 Twelfth International Conference on Complex Networks & Their Applications (Complex Networks 2023), Menton, France. **Member of the program committee**. [Site]
- Oct. 18-19 Recent Advances in Learning and Data-Driven Modeling of Complex Systems, CCS2023 Satellite Symposium, Savador, Brazil. **Organisation**. [Site]

2021

- Oct. 27 Data-based Diagnosis of Networked Dynamical Systems, CCS2021 Satellite Symposium, Lyon, France. **Organisation**. [Site] [Link]

Guest Editor

2022-2023

- *Journal of Physics: Complexity – Focus on Monitoring and Control of Complex Supply Systems*. **Editor** [Site]

Invited speaker to international conferences and seminars

Presentations can be found on my personal website (melvyntyloo.com).

2023

- Sep. 11 Santa Fe Institute Seminar, Santa Fe, NM, USA. **Invited Speaker**. *Fluctuations in networked systems*.
- Sep. 3-8 Dynamics Days, symposium on *Coupled phase oscillators: Fundamentals to applications in Brain and Power Grid*, Naples, Italy. **Invited Speaker**. *Disruption of Kuramoto oscillator networks*.
- Jul. 10-13 Conclave on Complexity in Physical Interacting Systems, Computation and Thermodynamics, Santa Fe, NM, USA. **Invited Speaker**. *Tutorial on Synchronization*.

- Apr. 24 BLABS Seminar, T-4, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker.** *Robustness of synchronous networks.* [[Link](#)]
- Apr. 20 CNLS Postdoc Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker.** *Cyber and physical attacks on networked systems: the Byzantine generals problem and the energy transition.*
- Apr. 17 Applied Math Brown Bag, University of Arizona, Tucson, AZ, USA. **Invited Speaker.** *Robustness of synchronous networks.* [[Link](#)]

2022

- Nov. 14 Prof. De Lellis group seminar, University of Naples Federico II, Naples, Italy. **Invited Speaker.** *Noise transmission and disruption in layered complex networks.* [[Link](#)]
- Oct. 20 CNLS Postdoc Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker.** *Heavy-tailed distribution of the number of papers within scientific journals.* [[Link](#)]
- Aug. 18 CNLS Postdoc Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker.** *More complexity for richer network dynamics.* [[Link](#)]
- Apr. 11 BLABS Seminar, T-4, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker.** *Fault detection and inference in networks of diffusively coupled dynamical agents.* [[Link](#)]
- Mar. 16 CNLS Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker.** *Local vulnerabilities and global robustness of equilibrium in network-coupled systems.* [[Link](#)]

2021

- Oct. 4-8 PhysCon2021, The 10th International Scientific Conference on Physics and Control, Fudan University, Shanghai, China. **Invited Speaker.** *Fault detection and probing in high-voltage power networks.* [[Link](#)]
- May 30-Jun.3 The 11th International Conference on Smart Grids, Green Communications and IT Energy-aware Technologies ENERGY 2021, Special Track on Modelling Dynamics of Power Grids (MoDyPoG). **Invited Speaker.** *Power grids: Small Signal Stability vs. Dynamical Parameters.* [[Link](#)]

2019

- Oct.17 Institute of Physics, Humboldt University, Berlin. **Invited speaker for the seminar talk.** *Near Equilibrium Dynamics and Transitions in Complex Network-Coupled Systems.* [[Link](#)]
- Sep.2-6 Dynamics Days Europe 2019, Rostock, Germany. **Invited speaker in the Power Grid minisymposium.** *The Key Player Problem in Realistic Large-Scale Power Grids.* [[Link](#)]
- Aug.26-27 Whiting School of Engineering, Johns Hopkins University, Baltimore, MD, USA. **Invited speaker for the group seminar** (Profs. D. Gayme and E. Mallada). *Quantifying Vulnerabilities of Complex Oscillatory Networks.* [[Link](#)]
- Jan.14 National Renewable Energy Laboratory (NREL), Golden CO, USA. **Invited speaker of the Brown Bag Talk.** *Quantifying Fragility of Network-Coupled Oscillators and Electric Power Grids with Resistance Distances.* [[Link](#)]

Visits in international research groups

2023

Apr.12-19 Program in Applied Mathematics, University of Arizona, Tucson, AZ. **Visiting researcher** (Dr. L. Pagnier, Prof. M. Chertkov).

2022

Nov.14-15 Department of Electrical Engineering and Information Technology, University of Naples Federico II, Naples, Italy. **Visiting researcher** (Prof. De Lellis).

2019

Sep.6-11 Statistical Physics and Nonlinear Dynamics & Stochastic Processes Group, Humboldt University, Berlin. **Visiting researcher** (Dr. F. Baumann, Prof. I.M. Sokolov).

Aug.26-27 Whiting School of Engineering, Johns Hopkins University, Baltimore, MD, USA. **Visiting researcher** (Profs. D. Gayme and E. Mallada).

Jul.-Aug. Los Alamos National Laboratory (LANL), Theory Division T-5, Los Alamos, NM, USA. **Invited researcher**.

Jan.16-18 Center for Control, Dynamical Systems and Computation, University of California, Santa Barbara (UCSB). **Visiting researcher** (Prof. F. Bullo).

Jan.14-15 National Renewable Energy Laboratory (NREL), Golden, CO, USA. **Visiting researcher** (Dr. M. Colombino).

Contributions to international conferences (oral presentations, posters, participation)

Posters and presentations can be found on my personal website (melvynty100.com).

2023

Oct. 16-20 Conference on Complex Systems (CCS), Salvador, Brazil. Presentation. *Propagation of non-Gaussian noise in complex oscillatory networks and electric power grids*.

Jun. 20-22 Collective Intelligence: Foundations + Radical Ideas A Santa Fe Institute Symposium & Short Course, Santa Fe, NM, USA. Participation.

Apr. 4-5 NASPI Work Group Meeting and Vendor Show, Tempe, AZ, USA. Poster. *Locating the source of forced oscillations in transmission grids*. [[Link](#)]

Mar. 5-11 APS March Meetings, Las Vegas, NV, USA. Poster. *Fluctuations in Layered Complex Networks*. [[Link](#)]

Mar. 5-11 APS March Meetings, Las Vegas, NV, USA. Presentation. *Locating the source of forced oscillations in complex oscillator networks and power grids*. [[Link](#)]

Jan.9-13 Grid Science Winter School and Conference, Santa Fe, NM, USA. Poster. *Primary control effort and noise propagation in high-voltage power grids*. [[Link](#)]

2022

Nov.8-10 Complex Networks 2022, The 11th International Conference on Complex Networks and their Applications, Palermo, Italy. Oral presentation. *Noise transmission in layered complex networks*. [[Link](#)]

Jul.13-15 5th Workshop on Autonomous Energy Systems, NREL, Golden, CO, USA. Poster. *Primary control effort and noise propagation in high-voltage power grids*. [[Link](#)]

Jul.5-7 Necsys 22, Zürich, Switzerland. **Paper presentation**. *Propagation of non-Gaussian voltage angle fluctuations in high-voltage power grids*. [[Link](#)]

Jul.5-7 Necsys 22, Zürich, Switzerland. **Paper presentation**. *Locating high-frequency line disturbances with the frequency mismatch*. [[Link](#)]

2021

- Aug.23-27 Dynamics Days Europe, Nice, France. Talk. *Reconstructing Network Structures from Partial Measurements*. [Link]
- Jun.21-Jul.10 Networks 2021: A Joint Sunbelt and NetSci Conference. Talk. *Periodic coupling inhibits second-order consensus on networks*. [Link]

2020

- Dec.14-18 59th IEEE Conference on Decision and Control, online conference. **Paper presentation**. *Primary Control Effort in Realistic High-Voltage Power Networks*.
- Dec.7-11 Conference on Complex Systems 2020 (CCS2020), online conference. Talk. *The key player problem in complex oscillator networks*. [Video (->16:59)]
- Dec.9-10 Complexity in Energy Systems satellite of Conference on Complex Systems 2020 (CCS2020), online conference. Talk. *The Key Player Problem in High-Voltage Power Networks*. [Video]
- Aug.22-27 Digital Dynamics Days 2020 (DDD2020), online conference. Talk. *A Laplacian approach to stubborn agents and their role in opinion formation on influence networks*. [Video]
- Feb.2-5 Geometry of Complex Webs International Minicourse and Exploratory Workshop (GeoCow), Les Diablerets. Poster. *Coupled Oscillators vs. Opinion Formation*. [Link]

2019

- Dec.16 PhD Defense, EPFL Lausanne, Switzerland. Oral presentation. *Local Vulnerabilities and Global Robustness of Coupled Dynamical Systems on Complex Networks*. [Link]
- Feb.3-8 Future Electric Power Systems and the Energy Transition, 2nd International conference in Champéry, Switzerland. Oral presentation. *Resistance Centralities Identify Local Vulnerabilities in Electric Power Grids*. [Link]
- Jan.7-11 2019 Grid Science Winter School & Conference, Santa Fe NM, USA. Poster. *Robustness of Synchrony in Complex Networks, Generalized Kirchhoff Indices and Resistance Centralities*. [Link]

2018

- Oct.15-19 International School on Informatics and Dynamics in Complex Networks, University of Catania, Italy. Oral presentation. *Robustness of Synchrony in Complex Networks and Generalized Kirchhoff Indices*. **Best Presentation Award**. [Link]
- Sep.3-7 Dynamics Days Europe 2018, Loughborough, England.
- Jan.29-31 661. WE-Heraeus-Seminar: Nonlinear Dynamics, Optimization and Control of Distributed Energy Systems, Physikzentrum Bad Honnef, Germany. Poster. *Robustness of Synchrony in Electrical Grids and Generalized Kirchhoff Indices*. [Link]

2017

- Feb.5-9 Future Electric Power Systems and the Energy Transition, International conference in Champéry, Switzerland. Poster. *Numerical method to determine different power flow solutions*.

Ongoing collaborations

- A. Lokhov, M. Vuffray, T-4, T-5, Center for Nonlinear Studies (CNLS), Los Alamos National Laboratory (LANL), NM, USA.
- F. Caravelli, M. Saccone, T-4, Center for Nonlinear Studies (CNLS), Los Alamos National Laboratory (LANL), NM, USA.

- F. Baumann, Humboldt-Universität zu Berlin, Max Planck Institute for Human Development, Berlin, Germany.
- L. Pagnier, Program in Applied Mathematics, University of Arizona, Tucson, USA.
- R. Delabays, University of Applied Science of Western Switzerland, Sion, Switzerland.
- V. Chavez, University of Lausanne, Switzerland.
- J. Hindes, I.B. Schwartz, US Naval Research Laboratory, Washington DC, USA.
- P. Ji, Y. Mu, Fudan University, Shanghai, China.
- K. O'Keeffe, Apple, USA.

Seminar organizations

2022-2023 Host for the CNLS seminar: R. Delabays, Y. Zhang, L. Pagnier.

2021-2022 Bi-monthly seminar talks, University of Applied Science of Western Switzerland.

Other activities

Judge representing T-4, for LANL Summer students lightning talks 2022.

Cycling → [\[Link\]](#)

Accoustic guitar

Appearance in media → [\[Link\]](#) (bottom of the page)