Antoine Aspeel · Paris, France · **antoineaspeel@gmail.com**

Antoine Aspeel | CV

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Professional Summary

I am a Ph.D. in Mathematical Engineering with a focus on control theory and optimization. In the last years, I have published papers focusing on safety control, Koopman theory, reachability analysis, networked control systems, and resource-aware control. During my PhD and my postdoc, I worked on multiple team projects as well as on my own personal research. I also had the opportunity to be a teaching assistant and to mentor several master and Ph.D. students. I am excited about the opportunity to bring my expertise to a new team and continue my research in an open-minded setting.

Skills

Areas of Expertise

Safety control | Reachability analysis | Koopman theory | Reinforcement learning | Predictive control | Optimization

Software / programming

Python ●●●●●
Julia ●●●●●
Matlab ●●●●○

Languages

French ●●●●●
English ●●●●●
Italian ●●●○○

Education

2024 - 2025 **Postdoc in Control and Optimization** — CentraleSupélec, Gif-sur-Yvette, France

- With **Antoine Girard** and **Thiago Alves Lima** in the *Laboratoire des Signaux et Systèmes* (L2S). Focus on formal methods for safety-critical control.

2022 - 2024 **Postdoc in Control and Optimization** — University of Michigan, Ann Arbor, United States of America

- With **Prof. Necmiye Ozay**. Focus on safety control, formal methods, Koopman theory, reachability analysis, and inverse reinforcement learning.

2022 **Postdoc in Control and Optimization** — Université Catholique de Louvain, Louvain-la-Neuve, Belgium

- With **Prof. Raphaël M Jungers** and **Prof. Benoit Macq**. Focus on networked control systems, and resource-aware control.

2017 - 2022 **Ph.D. in Mathematical Engineering** — Université Catholique de Louvain, Louvain-la-Neuve, Belgium

- Thesis title: "Optimal Sampling for State Estimation of Stochastic Dynamical Systems". Supervisors: **Prof. Raphaël M Jungers**, and **Prof. Benoit Macq**.
- From May to June 2019, I was a visiting PhD student at McGill University, Montreal, Canada. I was working with **Prof. Vincent François-Lavet** on applications of deep reinforcement learning to sensor scheduling.

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2015 - 2017 **Master of Mathematical Engineering** Université Catholique de Louvain, Louvain-la-Neuve, Belgium

- Advanced courses in dynamical systems, control, optimization and graph theory.
- Thesis title: "Community detection in large-scale time-varying networks: a modularity based approach". Supervisor: **Prof. Jean-Charles Delvenne**.
- International exchange in 2016 at the École Polytechnique Fédérale de Lausanne (EPFL), Switzerland.

2012 - 2015 **Bachelor of Mathematical and Mechanical Engineering** Université Catholique de Louvain, Louvain-la-Neuve, Belgium

- I have completed the credits for the double bachelor's degree in applied mathematics and mechanical engineering.

Publications

I have published scientific articles in control journals and conferences (check my Google Scholar profile here).

Articles published in scientific journals

- Michaël Fanuel, **Antoine Aspeel**, Michaël T. Schaub, Jean-Charles Delvenne. Ellipsoidal embeddings of graphs. *SIAM Journal on Applied Mathematics*, 2024. (Accepted for publication).
- **Antoine Aspeel**, Jakob Nylof, Jing Shuang (Lisa) Li, and Necmiye Ozay. A Low Rank Approach to Minimize Sensor-to-Actuator Communication in Finite Horizon Output Feedback. *IEEE Control Systems Letters*, 2023. (With presentation at ACC24).
- Haldun Balim, **Antoine Aspeel**, Zexiang Liu, and Necmiye Ozay. Koopman-inspired Implicit Backward Reachable Sets for Unknown Nonlinear Systems. *IEEE Control Systems Letters*, 2023. (With presentation at CDC23).
- **Antoine Aspeel**, Amaury Gouverneur, Raphaël M Jungers, and Benoit Macq. Optimal intermittent particle filter. *IEEE Transactions on Signal Processing*, 2022.
- Michaël Fanuel, **Antoine Aspeel**, Jean-Charles Delvenne, and Johan AK Suykens. Positive semi-definite embedding for dimensionality reduction and out-of-sample extensions. In *SIAM Journal on Mathematics of Data Science*, 2022.
- Damien Dasnoy, **Antoine Aspeel**, Kevin Souris, and Benoit Macq. Locally tuned deformation fields combination for 2D cine-MRI-based driving of 3D motion models. In *Physica Medica*, 2022.
- **Antoine Aspeel**, Axel Legay, Raphaël M Jungers, and Benoit Macq. Optimal measurement budget allocation for Kalman prediction over a finite time horizon by genetic algorithms. *EURASIP Journal on Advances in Signal Processing*, 2021.

Works in proceedings of conferences

- **Antoine Aspeel**, Laurent Bako, and Necmiye Ozay. Minimal L2-Consistent Data-Transmission. 2024 63rd IEEE Conference on Decision and Control (CDC), 2024. (accepted for publication).
- **Antoine Aspeel**, and Necmiye Ozay. A Simulation Preorder for Koopman-like Lifted Control Systems. Presentation in The 8th IFAC Conference on Analysis and Design of Hybrid Systems, 2024. (accepted for publication).
- Mohamad Louai Shehab, **Antoine Aspeel**, Nikow Aréchiga, Andrew Best, and Necmiye Ozay. Learning True Objectives: Linear Algebraic Characterizations of Identifiability in Inverse Reinforcement Learning. In the 6th Learning for Dynamics and Control Conference, 2024. (accepted for publication).
- **Antoine Aspeel**, Kwesi Rutledge, Raphaël M Jungers, Benoit Macq, and Necmiye Ozay. Optimal control for linear networked control systems with information transmission constraints. In *The 60th IEEE International Conference on Decision and Control*, 2021.
- **Antoine Aspeel**, Amaury Gouverneur, Raphaël M Jungers, and Benoit Macq. Optimal measurement budget allocation for particle filtering. In *27th IEEE International Conference on Image Processing*, 2020.

- **Antoine Aspeel**, Damien Dasnoy, Raphaël M Jungers, and Benoit Macq. Optimal intermittent measurements for tumor tracking in X-ray guided radiotherapy. In *Medical Imaging 2019: Image-Guided Procedures, Robotic Interventions, and Modeling*, volume 10951, page 109510C. International Society for Optics and Photonics, 2019.

Presentations in Events

- I presented the work *A Low Rank Approach to Minimize Sensor-to-Actuator Communication in Finite Horizon Output Feedback* at the *IEEE American Control Conference (ACC)*, Toronto, 2024.

- I presented the work *A Simulation Preorder for Koopman-like Lifted Control Systems* at the *IFAC Conference on Analysis and Design of Hybrid Systems (ADHS)*, Boulder, 2024.

- Our work *Koopman-inspired Implicit Backward Reachable Sets for Unknown Nonlinear Systems* was presented at the *62th Conference on Decision and Control (CDC)*, Singapore, 2023.

- I presented the work *Koopman-inspired Implicit Backward Reachable Sets for Unknown Nonlinear Systems* at the *CLEVR-AI, MURI Symposium*, Boston, 2023.

- I presented the content of my Ph.D. thesis to the group of Prof. Necmiye Ozay, at the *University of Michigan*, Ann Arbor, 2022.

- I presented the work *Optimal Control for Linear Networked Control Systems with Information Transmission Constraints* in the *60th Conference on Decision and Control (CDC)*, Texas, 2021.

- I presented the work *Optimal measurement budget allocation for particle filtering* in the *IEEE International Conference on Image Processing (ICIP)*, Abu Dhabi, 2020.

- I presented the work *Optimal intermittent measurements for tumor tracking in x-ray guided radiotherapy* in the *International Conference Medical Imaging 2019: Image-Guided Procedures, Robotic Interventions, and Modeling (SPIE)*, San Diego, 2019.

- I presented the work *Genetic Algorithms for optimal intermittent measurements for tumor tracking* in the *International Conference on the Use of Computers in Radiation Therapy (ICCR)*, Montreal, 2019.

Service to scientific community

I was the chair of the *Control over Communications* session at the Conference on Decision and Control (CDC) 2021. I am also a reviewer for the following journals and conferences (check my web of science profile here):

- Automatica, Elsevier Journal.

- TAC — IEEE Transactions on Automatic Control.

- L-CSS — IEEE Constrol Systems Letters.

- EURASIP Journal on Advances in Signal Processing.

- CDC — Conference on Decision and Control.

- L4DC — Conference on Learning for Dynamics ans Control.

- AAAI — Association for the Advancement of Artificial Intelligence.

Teaching Activities

Since 2014, I have been developing my teaching skills by creating and correcting assignments and teaching in the following courses:

- Introduction to Algebra, undergraduate level.

- Algebra, undergraduate level.

- Introduction to Calculus, undergraduate level.
- Calculus, undergraduate level.
- Discrete mathematics and probabilities, undergraduate level.
- Economics, undergraduate level.
- Sustainable development, master level.

Mentoring and proposal writing

- Mentored 5 Ph.D. students on topics in control theory and reinforcement learning, serving as a member of the Ph.D. committee for one of them.
- Mentored 3 visiting master students: **Jakob Nylof** (co-author in *IEEE Control System Letters, 2023*), **Haldun Balim** (co-author in *IEEE Control System Letters, 2023*), and **Amaury Gouverneur** (co-author in *IEEE Transactions on Signal Processing, 2022* and *IEEE International Conference on Image Processing, 2020*).
- Supervised and was a member of the jury for 6 master's theses.
- Co-authored a research proposal on reinforcement learning that received 1.1 M€ from the Walloon region of Belgium.

References

- **Prof. Necmiye Ozay** from University of Michigan (USA): necmiye@umich.edu
- **Prof. Raphaël Jungers** from UCLouvain (Belgium): raphael.jungers@uclouvain.be
- **Prof. Benoît Macq** from UCLouvain (Belgium): benoit.macq@uclouvain.be

Other Activities

- Between 2014 and 2016, I was a founding member, treasurer and then elected president of a non-profit organization. I was responsible for the management of reusable glasses for student activities (turnover $\sim 30,000$€/year).
- I have been an organizer of youth movements.
- I run regularly, enjoy playing chess and piano, reading and learning new things.