FRANCESCO FACCIO

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Currently a Postdoctoral Researcher at IDSIA, mentored by Prof. Jürgen Schmidhuber. Successfully acquired over $3 million in AI research funding, and spearheaded initiatives expected to secure more than $25 million in funding for AI projects over the next 5 years.

EDUCATION

Postdoc in Computer Science Feb 2024 – present
Università della Svizzera italiana (Dalle Molle Institute for Artificial Intelligence Research)
Supervisor: Jürgen Schmidhuber
Focus: Reinforcement Learning, Large Language Models, Machine Learning

Ph.D. in Computer Science Feb 2019 – Feb 2024
Università della Svizzera italiana (Dalle Molle Institute for Artificial Intelligence Research)
Supervisor: Jürgen Schmidhuber
Ph.D. Thesis: Reinforcement learning with general evaluators and generators of policies.
Focus: Reinforcement Learning, Neural Networks, Machine Learning

M.Sc. in Mathematical Engineering Mar 2016 – Dec 2018
Politecnico di Milano
Supervisor: Marcello Restelli
Focus: Advanced Mathematics, Advanced Programming, Machine Learning, Applied Statistics.

B.Sc. Mathematical Engineering Sep 2012 – Feb 2016
Politecnico di Milano

WORK EXPERIENCE

Research Consultant Oct 2022 – Present
AI Initiative, King Abdullah University of Science and Technology

- Conducted several research projects between industry and academia to advance KAUST AI Initiative.
- Co-organized the KAUST Rising Stars in AI Symposium 2023, 2024.
- Helped recruit and hire new talents at KAUST.

Intern 2018 – 2019
The Swiss AI Lab IDSIA, USI, SUPSI

- Compared LSTM and GRU Recurrent Neural Networks on language tasks.

Google Summer of Code (GSoC) Student 2016
GNU Octave

- Implemented two Matlab-compatible adaptive solvers for Differential Algebraic Equations.
- Increased sparse matrix speed by 150x over the classic Octave DASPK solver.

PROJECTS AWARDED (> $3M FUNDS)

AI for Chemical Material Discovery 2024 –
KAUST AI Initiative + Undisclosed Industrial Partner

- Contribution: Designed, wrote, and led a project on Reinforcement Learning for the discovery of Chemical Materials with an industrial partner.
- Status: Awarded an undisclosed amount over multiple years duration.

From Generative AI to General AI 2024 – 2029
KAUST AI Initiative

- Contribution: Designed and wrote a proposal on General AI research for internal funds.
- Status: Awarded an undisclosed amount over 5 years duration.

AI-Driven Car Optimization. 2024 –
KAUST AI Initiative + Formula 1 team

- Contribution: Designed, wrote, and led a project on Reinforcement Learning for Car Optimization with a Formula 1 team.
- Status: Awarded an undisclosed amount.

Computer Vision for the KAUST Coral Restoration Initiative 2024 –
KAUST AI Initiative + KCRI

- Contribution: Major contribution in initiating the project proposal, developing its first draft, and involving the sponsoring partner.
- Status: Awarded an undisclosed amount over multiple years duration.

Computational Resources for Reinforcement Learning Research 2021 – 2022
IDSIA, USI, SUPSI

- Contribution: Designed, wrote, and led a proposal for computational resources.
- Status: Awarded 220 thousand GPU hours on the Swiss National Supercomputer. Estimated value $500k.

PROJECTS PENDING APPROVAL ($5.1M FUNDS)

Curious Robot Babies Learn Through Self-Invented Experiments 2024 – 2028
KAUST AI Initiative + Undisclosed Industrial Partners

- Contribution: Major contribution in writing the proposal and organizing the collaboration between industry partners.
- Status: Under review for $2.7M over 5 years duration.

Societies and Economies of Natural Language-Based AIs 2024 – 2026
KAUST AI Initiative

- Contribution: Developed the techniques in the proposal and its organization.
- Status: Under review for $420k over 2 years duration.

Additional undisclosed projects for approximately $2M 2024 – 2027
KAUST AI Initiative + Undisclosed Industrial Partner

- Contribution: Designed, and wrote the projects in collaboration with the industry.
- Status: Under review.

PUBLICATIONS

- V. Herrmann, **F. Faccio**, and J. Schmidhuber. Learning Useful Representations of Recurrent Neural Network Weight Matrices (2024). *International Conference on Machine Learning (ICML)*. Selected for an **oral** presentation. **Acceptance rate for oral presentation 144/9473 (1.5%)**. https://arxiv.org/abs/2403.11998
- M. Zhuge, W. Wang, L. Kirsch, **F. Faccio**, D. Khizbullin, and J. Schmidhuber. Language Agents as Optimizable Graphs (2024). *International Conference on Machine Learning (ICML)*. Selected for an **oral** presentation. **Acceptance rate for oral presentation 144/9473 (1.5%)**. https://arxiv.org/abs/2402.16823
- Y. Wang, W. Li, **F. Faccio**, Q. Wu, and J. Schmidhuber. Highway Value Iteration Networks (2024). *International Conference on Machine Learning (ICML)*. https://arxiv.org/abs/2406.03485v1
- **F. Faccio***, V. Herrmann*, A. Ramesh, L. Kirsch and J. Schmidhuber. Goal-Conditioned Generators of Deep Policies (2023). *Proceedings of the Thirty-Seventh AAAI Conference on Artificial Intelligence*. Selected for an **oral** presentation. Acceptance rate 1721/8777 (19.6%). https://doi.org/10.1609/aaai.v37i6.25912
- H. Liu, M. Zhuge, B. Li, Y. Wang, **F. Faccio**, B. Ghanem, and J. Schmidhuber. Learning to Identify Critical States for Reinforcement Learning from Videos (2023). *Proceedings of the International Conference on Computer Vision (ICCV)*. https://doi.org/10.1109/ICCV51070.2023.00187
- M. Štrupl*, **F. Faccio***, D. R. Ashley, R. K. Srivastava, and J. Schmidhuber. Reward-Weighted Regression Converges to a Global Optimum (2022). *Proceedings of the Thirty-Sixth AAAI Conference on Artificial Intelligence*. Acceptance rate 1349/9251 (14.6%). https://doi.org/10.1609/aaai.v36i8.20811
- N. Sajid*, **F. Faccio***, L. Da Costa, T. Parr, J. Schmidhuber, and K. Friston. Bayesian brains and the Rényi divergence (2022). *Neural Computation*. https://doi.org/10.1162/neco_a_01484
- K. Irie, **F. Faccio**, and J. Schmidhuber. Neural Differential Equations for Learning to Program Neural Nets Through Continuous Learning Rules (2022). *Advances in Neural Information Processing Systems (NeurIPS)*. Acceptance rate 2672/10411 (25.6%). https://doi.org/10.48550/arXiv.2206.01649
- **F. Faccio**, L. Kirsch, and J. Schmidhuber. Parameter-based Value Functions (2021). *International Conference on Learning Representations (ICLR)*. Acceptance rate 860/2997 (28.7%). https://openreview.net/forum?id=tV6oBfuyLTQ
- A. M. Metelli, M. Papini, **F. Faccio**, and M. Restelli. Policy Optimization via Importance Sampling (2018). *Advances in Neural Information Processing Systems (NeurIPS)*. Selected for an **oral** presentation. Acceptance rate 1011/4856 (20.8%). **Acceptance rate for oral presentation 30/4856 (0.6%)**. https://dl.acm.org/doi/10.5555/3327345.3327449

* equal contribution

PREPRINTS AND WORKSHOPS

- Y. Wang, Q. Wu, W. Li, D. R. Ashley, **F. Faccio**, C. Huang, and J. Schmidhuber. Scaling Value Iteration Networks to 5000 Layers for Extreme Long-Term Planning (2024). *Under review*. https://arxiv.org/abs/2406.08404
- Y. Wang, H. Liu, M. Strupl, **F. Faccio**, Q. Wu, X. Tan, and J. Schmidhuber. Highway Reinforcement Learning (2024). *Preprint*. https://arxiv.org/abs/2405.18289
- M. Alhakami, D. R. Ashley, J. Dunham, **F. Faccio**, E. Feron, and J. Schmidhuber. Towards a Robust Soft Baby Robot With Rich Interaction Ability for Advanced Machine Learning Algorithms (2024). *Preprint.* https://arxiv.org/abs/2404.08093
- W. Zhang, H. Liu, J. Xie, **F. Faccio**, M.Z. Shou, and J. Schmidhuber. Cross-Attention Makes Inference Cumbersome in Text-to-Image Diffusion Models (2024). *Under review.* https://arxiv.org/abs/2404.02747
- M. Zhuge*, H. Liu*, **F. Faccio***, D. R. Ashley*, et al. Mindstorms in Natural Language-Based Societies of Mind (2023). *NeurIPS Workshop on Robustness of Few-shot and Zero-shot Learning in Foundation Models.* **Best Paper Award**. https://arxiv.org/abs/2305.17066
- A. Stanić, D. R. Ashley, O. Serikov, L. Kirsch, **F. Faccio**, J. Schmidhuber, T. Hofmann, and I. Schlag. The Languini Kitchen: Enabling Language Modelling Research at Different Scales of Compute (2023). *Preprint*. https://arxiv.org/abs/2309.11197
- P. Piekos, A. Ramesh, **F. Faccio**, and J. Schmidhuber. Efficient Value Propagation with the Compositional Optimality Equation (2023). *NeurIPS Workshop on Goal-Conditioned Reinforcement Learning*. https://openreview.net/forum?id=UyNjQ3UKO2
- W. Wang, L. Kirsch, **F. Faccio**, M. Zhuge, and J. Schmidhuber. Continually Adapting Optimizers Improve Meta-Generalization (2023). *NeurIPS Workshops on Optimization and Distribution Shift*. https://openreview.net/forum?id=Aw8GuIevIa
- **F. Faccio**, A. Ramesh, V. Herrmann, J. Harb, L. Kirsch, and J. Schmidhuber. General Policy Evaluation and Improvement by Learning to Identify Few But Crucial States (2022). *ICML 2022 Decision Awareness in Reinforcement Learning*. https://arxiv.org/abs/2207.01566

* equal contribution

COMMUNITY SERVICE

Maintainer of the Neural Networks Package 2016 – 2017
GNU Octave
- Implemented and documented several Neural Network functionalities for Octave.

Google Summer of Code (GSoC) Mentor 2017
GNU Octave
- Proposed and mentored a GSoC project on Convolutional Neural Networks.

President 2015 – 2017
Polimi Student Chapter of SIAM
- Organized academic and cultural events.

Board of Directors 2014 – 2016
Associazione Ingegneri Matematici (Mathematical Engineering Association)
- Organized 40+ events in collaboration with industrial partners, mainly focused on soft skills development, careers orientation, programming challenges, and interview training.

HONORS AND AWARDS

Best paper award, NeurIPS 2023 workshop on Ro-FoMo 2023
Rising Star in AI, KAUST 2022
Outstanding service to SIAM Student Chapters, Politecnico di Milano 2016

INVITED SPEAKER

SDAIA National Center for AI, 2024
Microsoft Research Asia Beijing, Learning to extract information from Neural Networks 2024
CUHKSZ, Recent Advances in LLM and CV 2023
TU Dresden, Conference on Reinforcement Learning 2022
KAUST, Rising Stars in AI Symposium 2022
CERN, OctConf 17 2017
New York University, Advanced Risk and Portfolio Management Bootcamp 2017
Google Tech Corner, GSoC 2017 Mentor Summit 2017
SISSA, A day in Applied Mathematics 2016

REVIEWING

Reviewer, Neural Information Processing Systems 2024
Reviewer, International Conference on Learning Representations 2024
Reviewer, International Conference on Machine Learning 2024
Reviewer, European Workshop on Reinforcement Learning 2024
Reviewer, ARLET Workshop ICML 2024
Emergency Reviewer, International Conference on Artificial Neural Networks 2024
Reviewer, International Conference on Learning Representations 2023
Reviewer, Neural Information Processing Systems 2022

Program Committee, Offline RL Workshop NeurIPS 2022
Reviewer, European Workshop on Reinforcement Learning 2022
Reviewer, International Conference on Machine Learning 2022
Reviewer, International Conference on Learning Representations 2022
Program Committee, Offline RL Workshop NeurIPS 2021
Reviewer, Neural Information Processing Systems 2021

TEACHING

Teaching Assistant, Machine Learning, Prof. Jürgen Schmidhuber 2021
Teaching Assistant, Machine Learning, Prof. Jürgen Schmidhuber 2020
Teaching Assistant, Machine Learning, Prof. Jürgen Schmidhuber 2019
Teaching Assistant, Machine Learning, Prof. Jürgen Schmidhuber 2018

CITIZENSHIP AND RESIDENCE

Italy: Citizen
Switzerland: B Permit

LANGUAGES

Italian: Native Speaker
English: Fluency