

PERSONAL DETAILS

Name: Dennis G. Wilson

Personal website: <https://d9w.github.io/>

Date of birth: April 17, 1991

Email: dennis.wilson@isae.fr

ORCID: 0000-0003-2414-0051

Nationality: American

EDUCATION

HDR in Artificial Intelligence

2025

“Methods in Exploration and Interpretability for Automating Discovery”

ISAE-Supaero and Université Toulouse Capitole, Toulouse, France

PhD in Computer Science, “Evolving Principles of Artificial Neural Design”

2016 - 2019

Institut de Recherche en Informatique de Toulouse (IRIT)

Université Toulouse III - Paul Sabatier, France

Director: Prof. Hervé Luga, Université Toulouse - Jean Jaurès, IRIT

Co-supervisor: Prof. Sylvain Cussat-Blanc, Université Toulouse Capitole, IRIT

Bachelor of Science in Electrical Engineering and Computer Science

2010 - 2014

Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts, USA

PROFESSIONAL POSITIONS

Associate Professor (*Enseignant-chercheur*)

2019 - present

Department of Complex Systems Engineering, ISAE-Supaero, Toulouse, France

Co-founder and CTO

2019 - 2021

Nautilus Computing, Toulouse, France

Postdoctoral researcher

2019 - 2019

IRIT, Toulouse, France

Computer Science Lecturer

2016 - 2019

Université Toulouse 1 Capitole, Toulouse, France

Software engineer

2014 - 2016

Infinidat LTD, Israel

RESEARCH

This overview of my research activity gives a view of my central interests over my career. The selected publications featured below are works in which I had a leading role or significant contribution. Out of the 10 publications, 4 were with either of my PhD supervisors (S. Cussat-Blanc, H. Luga), and 5 are from PhDs which I supervised. My work spans evolutionary algorithms, machine learning, and the application of AI to climate science. In the following works, I have pursued the following ideas. Neural network development provides insights into learning. Exploration in search and learning can improve robustness. Genetic programming offers an interpretable and competitive alternative to deep learning. Finally, machine learning can help us understand climate change.

Graph-based Genetic Programming

1. **Wilson, D. G.**, Cussat-Blanc, S., Luga, H. & Miller, J. F. *Evolving Simple Programs for Playing Atari Games* in *Proceedings of the Genetic and Evolutionary Computation Conference* (ACM, 2018). This conference paper demonstrated the competitiveness of Graph-based Genetic Programming to state-of-the-art deep reinforcement learning methods on the Atari benchmark. It laid the foundation for subsequent advancements in interpretable genetic programming.

2. Nadizar, G., Medvet, E. & **Wilson, D. G.** *Naturally Interpretable Control Policies via Graph-Based Genetic Programming* in *European Conference on Genetic Programming* (2024). This conference paper showed that GraphGP creates interpretable control policies that rival deep reinforcement learning for standard robotic tasks. (Best Paper Award)
3. Cortacero, K., ..., **Wilson, D. G.**, *et al.* Evolutionary Design of Explainable Algorithms for Biomedical Image Segmentation. *Nature Communications*, 7112 (2023). This Nature Communications article presents a GraphGP method for optimizing interpretable analysis pipelines for biomedical image segmentation, addressing critical needs for explainable AI in healthcare and achieving performance competitive with state-of-the-art neural networks. (Humies Gold Award)

Developmental Neural Networks

1. Miller, J. F., **Wilson, D. G.** & Cussat-Blanc, S. Evolving Developmental Programs That Build Neural Networks for Solving Multiple Problems. *Genetic Programming Theory and Practice XVI* (2019). This book chapter explores the use of genetic programming to evolve rules of neural development to create flexible networks capable of solving multiple problems.
2. Maile, K., Rachelson, E., Luga, H. & **Wilson, D. G.** *When, Where, and How to Add New Neurons to ANNs* in *International Conference on Automated Machine Learning* (PMLR, 2022). This conference paper builds on the previous work of developmental neural networks, presenting strategies for dynamically expanding neural network architectures by determining precise measures for when to trigger artificial neurogenesis.

Exploration in Search and Learning

1. Templier, P., Grillotti, L., Rachelson, E., **Wilson, D. G.** & Cully, A. *Quality with Just Enough Diversity in Evolutionary Policy Search* in *Proceedings of the Genetic and Evolutionary Computation Conference* (2024). This work introduces a novel evolutionary policy search algorithm that balances exploration and exploitation, leading to more robust and diverse policy generation in complex environments. (Best Paper Award)
2. Le Tolguenec, P.-A., Teichteil-Koenigsbuch, F., Besse, Y., **Wilson, D. G.** & Rachelson, E. *Exploration by Learning Diverse Skills through Successor State Measures* in *The Thirty-eighth Annual Conference on Neural Information Processing Systems* (2024). Accepted at NeurIPS 2024, this paper presents LEADS, an exploration algorithm that leverages successor state measures to learn diverse skills, enhancing the exploration capabilities of reinforcement learning agents in multi-task environments.

Machine Learning for Climate Science

1. Al Najar, M., Thoumyre, G., Bergsma, E., Almar, R., Benshila, R. & **Wilson, D. G.** Satellite Derived Bathymetry Using Deep Learning. *Machine Learning* (2021). This journal publication introduces a deep learning model for estimating bathymetry from satellite data, significantly improving coastal geography analysis and supporting environmental monitoring efforts.
2. Disdier, E., Almar, R., Benshila, R., Al Najar, M., Chassagne, R., Mukherjee, D. & **Wilson, D. G.** Predicting beach profiles with machine learning from offshore wave reflection spectra. *Environmental Modelling & Software*, 106221 (2024). This journal publication details a machine learning approach to forecasting beach profiles using wave reflection data, demonstrating a new data source for coastal monitoring and management.
3. Al Najar, M., Almar, R., Bergsma, E. W., Delvit, J.-M. & **Wilson, D. G.** *Improving a Shoreline Forecasting Model with Symbolic Regression* in *Tackling Climate Change with Machine Learning*, ICLR 2023 (2023). Presented at the CCAI Workshop at ICLR 2023, this article uses genetic programming to improve existing shoreline models, demonstrating significant improvements in forecasting accuracy for climate-related coastal changes.

PEER RECOGNITION

- **ACM SIGEVO Human Competitive Competition Gold Award** 2024
First place in the [“Humies” Competition](#) at GECCO 2024 for our work on interpretable image analysis. This prestigious award recognizes results that are competitive with human performance.
- **Best Paper Award - GECCO Complex Systems Track** 2024
For “Quality with Just Enough Diversity in Evolutionary Policy Search.”
- **ACM SIGSOFT Distinguished Paper Award** 2024
Awarded at the [International Symposium on Software Testing and Analysis](#) for “Exploration-Driven Reinforcement Learning for Avionic System Fault Detection.”
- **Best Paper Award - EuroGP** 2024
For “Naturally Interpretable Control Policies via Graph-Based Genetic Programming.”
- **ANITI Affiliate Member** 2024 - present
I am associated with the [Artificial and Natural Intelligence Toulouse Institute](#) (ANITI), being awarded the status of Affiliate Member for my contributions on interpretable machine learning.
- **CIFRE thesis grants** 2021-2025
Two industrial grants for collaborations with Airbus on AI research applied to aerospace engineering.
- **Région Occitanie grants** 2019-2023
Two thesis grants for research on combining evolutionary algorithms and machine learning, and on applying machine learning to coastal science.
- **Invited Speaker on Evolutionary Reinforcement Learning** 2021 - 2023
Invited to present my work on interpretable reinforcement learning at the [Evolutionary Reinforcement Learning Workshop](#), 2023, and the [Reinforcement Learning Virtual School](#), 2021.
- **ACM SIGEVO Best Dissertation Award** 2020
This [yearly award](#) recognizes the best doctoral dissertation in the field of evolutionary computation.
- **SIGAI Essay Contest on Ethics and AI** 2017
I won the [ACM SIGAI Essay Contest](#) for my essay on “The ethics of automated behavioral micro-targeting” where I identified the ethical problems of using AI for targeted advertising.
- **CIMI Doctoral Fellowship recipient** 2015
My thesis was financed through a competitive fellowship from [CIMI](#) at the University of Toulouse.

JOURNAL PUBLICATIONS

1. Wilson, D. G. *et al.* Evolutionary Computation for Wind Farm Layout Optimization. *Renewable Energy*, 681–691 (2018).
2. Benschila, R. *et al.* A Deep Learning Approach for Estimation of the Nearshore Bathymetry. *Journal of Coastal Research*, 1011–1015 (SI 2020).
3. Al Najar, M. *et al.* Satellite Derived Bathymetry Using Deep Learning. *Machine Learning* (ML for Earth Observation Data 2021).
4. Hammouamri, I., Masquelier, T. & Wilson, D. G. Mitigating Catastrophic Forgetting in Spiking Neural Networks through Threshold Modulation. *Transactions on Machine Learning Research* (2022).
5. Le Tolguenec, P.-A., Rachelson, E., Besse, Y. & Wilson, D. G. Curiosity Creates Diversity in Policy Search. *ACM Transactions on Evolutionary Learning and Optimization* (2022).
6. Maile, K., Luga, H. & Wilson, D. G. Structural Learning in Artificial Neural Networks: A Neural Operator Perspective. *Transactions of Machine Learning Research* (2022).
7. Najar, M. A. *et al.* Coastal Bathymetry Estimation from Sentinel-2 Satellite Imagery: Comparing Deep Learning and Physics-Based Approaches. *Remote Sensing*, 1196 (2022).
8. Cortacero, K. *et al.* Evolutionary Design of Explainable Algorithms for Biomedical Image Segmentation. *Nature Communications*, 7112 (2023).
9. Chigot, E., Wilson, D. G., Ghrib, M., Jimenez, F. & Oberlin, T. Synthetic data for robust runway detection. *Pattern Recognition Letters (under submission)* (2024).

10. Disdier, E. *et al.* Predicting beach profiles with machine learning from offshore wave reflection spectra. *Environmental Modelling & Software*, 106221 (2024).

CONFERENCE PUBLICATION

1. Wilson, D. G., Awa, E., Cussat-Blanc, S., Veeramachaneni, K. & O'Reilly, U.-M. *On Learning to Generate Wind Farm Layouts in Proceedings of the 15th Annual Conference on Genetic and Evolutionary Computation* (ACM, 2013), 767–774.
2. Wilson, D. G., Veeramachaneni, K. & O'Reilly, U.-M. *Cloud Scale Distributed Evolutionary Strategies for High Dimensional Problems in European Conference on the Applications of Evolutionary Computation* (Springer Berlin Heidelberg Berlin, Heidelberg, 2013), 519–528.
3. Wilson, D. G., Cussat-Blanc, S., Veeramachaneni, K., O'Reilly, U.-M. & Luga, H. *A Continuous Developmental Model for Wind Farm Layout Optimization in Proceedings of the 2014 Annual Conference on Genetic and Evolutionary Computation* (ACM, 2014), 745–752.
4. Disset, J. *et al.* *A Comparison of Genetic Regulatory Network Dynamics and Encoding in Proceedings of the Genetic and Evolutionary Computation Conference* (ACM, 2017), 91–98.
5. Wilson, D. G., Disset, J., Cussat-Blanc, S., Duthen, Y. & Luga, H. *Learning Aquatic Locomotion with Animats in Artificial Life Conference Proceedings* (MIT Press, 2017), 585–592.
6. Wilson, D. G., Cussat-Blanc, S., Luga, H. & Miller, J. F. *Evolving Simple Programs for Playing Atari Games in Proceedings of the Genetic and Evolutionary Computation Conference* (ACM, 2018), 229–236.
7. Biau, J., Wilson, D. G., Cussat-Blanc, S. & Luga, H. *Improving Image Filters with Cartesian Genetic Programming. in Proceedings of the 13th International Joint Conference on Computational Intelligence (IJCCI 2021)* (2021), 17–27.
8. Templier, P., Rachelson, E. & Wilson, D. G. *A Geometric Encoding for Neural Network Evolution in Proceedings of the Genetic and Evolutionary Computation Conference* (2021), 919–927.
9. Al Najar, M. *et al.* A Combined Color and Wave-Based Approach to Satellite Dervied Bathymetry Using Deep Learning. *The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences*, 9–16 (2022).
10. Guillet, V., Wilson, D. G., Aguilar-Melchor, C. & Rachelson, E. *On Neural Consolidation for Transfer in Reinforcement Learning in 2022 IEEE Symposium Series on Computational Intelligence (SSCI)* (IEEE, 2022), 867–874.
11. Guillet, V., Wilson, D. G. & Rachelson, E. *Neural Distillation as a State Representation Bottleneck in Reinforcement Learning in Conference on Lifelong Learning Agents* (PMLR, 2022), 798–818.
12. Lecarpentier, E., Templier, P., Rachelson, E. & Wilson, D. G. *LUCIE: An Evaluation and Selection Method for Stochastic Problems in Proceedings of the Genetic and Evolutionary Computation Conference* (2022), 730–738.
13. Maile, K., Rachelson, E., Luga, H. & Wilson, D. G. *When, Where, and How to Add New Neurons to ANNs in International Conference on Automated Machine Learning* (PMLR, 2022), 18–1.
14. Maile, K., Wilson, D. G. & Forré, P. *Equivariance-Aware Architectural Optimization of Neural Networks in The Eleventh International Conference on Learning Representations* (2023).
15. De La Torre, C. *et al.* *Multimodal Adaptive Graph Evolution for Program Synthesis in International Conference on Parallel Problem Solving from Nature* (2024), 306–321.
16. Kunze, T., Templier, P. & Wilson, D. G. *Searching Search Spaces: Meta-evolving a Geometric Encoding for Neural Networks in IEEE Congress on Evolutionary Computation* (2024).
17. Le Tolguenec, P.-A., Teichteil-Koenigsbuch, F., Besse, Y., Wilson, D. G. & Rachelson, E. *Exploration by Learning Diverse Skills through Successor State Measures in The Thirty-eighth Annual Conference on Neural Information Processing Systems* (2024). <https://openreview.net/forum?id=oyiBLfNJvY>.

18. Le Tolguenec, P.-A. *et al.* *Exploration-Driven Reinforcement Learning for Avionic System Fault Detection (Experience Paper)* in *Proceedings of the 33rd ACM SIGSOFT International Symposium on Software Testing and Analysis* (Association for Computing Machinery, Vienna, Austria, 2024), 920–931. ISBN: 9798400706127. <https://doi.org/10.1145/3650212.3680331>.
19. Nadizar, G., Medvet, E. & Wilson, D. G. *Naturally Interpretable Control Policies via Graph-Based Genetic Programming* in *European Conference on Genetic Programming (Part of EvoStar)* (2024), 73–89.
20. Nadizar, G., Medvet, E. & Wilson, D. G. *Searching for a Diversity of Interpretable Graph Control Policies* in *Proceedings of the Genetic and Evolutionary Computation Conference* (2024).
21. Templier, P., Grillotti, L., Rachelson, E., Wilson, D. G. & Cully, A. *Quality with Just Enough Diversity in Evolutionary Policy Search* in *Proceedings of the Genetic and Evolutionary Computation Conference* (2024).
22. Templier, P., Rachelson, E., Cully, A. & Wilson, D. G. *Genetic Drift Regularization: on preventing Actor Injection from breaking Evolution Strategies* in *IEEE Congress on Evolutionary Computation* (2024).

WORKSHOP PUBLICATIONS

1. Wilson, D. G., Cussat-Blanc, S. & Luga, H. *Evolving Genetic Regulatory Networks for Online Neurogenesis* in *6th Morphogenetic Engineering Workshop (MEW 2016) at ALife XV: Artificial Life Conference* (2016), pp–14.
2. Wilson, D. G., Cussat-Blanc, S. & Luga, H. *The Evolution of Artificial Neurogenesis* in *Proceedings of the 2016 on Genetic and Evolutionary Computation Conference Companion* (ACM, 2016), 1047–1048.
3. Miller, J. F., Wilson, D. G. & Cussat-Blanc, S. *Evolving Programs That Build Neural Networks for Multiple Problems* in *Parallel Problem Solving from Nature – PPSN Workshop on Developmental Neural Networks* (2018).
4. Wilson, D. G., Cussat-Blanc, S. & Luga, H. *A Gene Regulatory Network Model for Axon Guidance* in *Parallel Problem Solving from Nature – PPSN Workshop on Developmental Neural Networks* (2018).
5. Chigot, E. & Wilson, D. G. *Coevolution of Neural Networks for Agents and Environments* in *Proceedings of the Genetic and Evolutionary Computation Conference Companion* (2022), 2306–2309.
6. Najar, M. A., Almar, R., Bergsma, E. W., Delvit, J.-M. & Wilson, D. G. *Genetic Improvement of Shoreline Evolution Forecasting Models* in *Proceedings of the Genetic and Evolutionary Computation Conference Companion* (2022), 1916–1923.
7. Al Najar, M., Almar, R., Bergsma, E. W., Delvit, J.-M. & Wilson, D. G. *Improving a Shoreline Forecasting Model with Symbolic Regression* in *Tackling Climate Change with Machine Learning, ICLR 2023* (2023).
8. Du Baret, B., Finos, S., Guiglion, H. & Wilson, D. G. *Methane Plume Detection with U-net Segmentation on Sentinel-2 Image Data* in *NeurIPS 2023 Workshop on Tackling Climate Change with Machine Learning* (2023).
9. Maile, K., Hervé, L. & Wilson, D. G. *Neural Growth and Pruning in Dynamic Learning Environments* in *AutoML Conference 2023 (Workshop)* (2023).
10. Riu, G., Al Najar, M., Thoumyre, G., Almar, R. & Wilson, D. G. *Global Coastline Evolution Forecasting from Satellite Imagery Using Deep Learning* in *NeurIPS 2023 Workshop on Tackling Climate Change with Machine Learning* (2023).
11. De La Torre, C., Cussat-Blanc, S., Wilson, D. G. & Lavinas, Y. *On Search Trajectory Networks for Graph Genetic Programming* in *Proceedings of the Genetic and Evolutionary Computation Conference Companion* (2024).

12. Reil, M., Spreen, G., Huntemann, M., Buth, L. & Wilson, D. G. *Machine Learning for the Detection of Arctic Melt Ponds from Infrared Imagery* in *Tackling Climate Change with Machine Learning, ICLR 2024* (2024).

BOOK PUBLICATIONS

1. Miller, J. F., Wilson, D. G. & Cussat-Blanc, S. Evolving Developmental Programs That Build Neural Networks for Solving Multiple Problems. *Genetic Programming Theory and Practice XVI*, 137–178 (2019).
2. Wilson, D. G. *Evolving Principles of Artificial Neural Design* PhD thesis (Université de Toulouse, Université Toulouse III-Paul Sabatier, 2019).
3. Miller, J. F., Wilson, D. G. & Cussat-Blanc, S. Evolving Programs to Build Artificial Neural Networks. *From Astrophysics to Unconventional Computation: Essays Presented to Susan Stepney on the Occasion of her 60th Birthday*, 23–71 (2020).

Advising

I have co-advised 6 PhD students, 3 of which have now successfully defended. I have also supervised one postdoctoral researcher and assisted in the supervision of another, and I have supervised 8 Master's students for their thesis projects.

KAITLIN MAILE

- Title: [Dynamic Architectural Optimization of Artificial Neural Networks](#)
- Financing: EDMITT Scholarship
- Advisors: Hervé Luga, Sylvain Cussat-Blanc, Dennis G. Wilson
- Dates: 01/11/2020 - 04/10/2023

MAHMOUD AL-NAJAR

- Title: [Modelling coastal evolution with machine learning](#)
- Financing: Half-scholarships from CNES and Région Midi-Pyrénées
- Advisors: Rafael Almar, Jean-Marc Delvit, Dennis G. Wilson
- Dates: 09/11/2020 - 30/11/2023

PAUL TEMPLIER

- Title: [Leveraging Structure in Evolutionary Neural Policy Search](#)
- Financing: Half-scholarships from ISAE-Supaero and Région Midi-Pyrénées
- Advisors: Emmanuel Rachelson, Dennis G. Wilson
- Dates: 11/01/2021 - 22/04/2024

PAUL ANTOINE LE TOLGUENEC

- Title: Exploration Driven Reinforcement Learning For Critical Software System Fault Detection
- Financing: CIFRE ANITI with Airbus
- Advisors: Emmanuel Rachelson, Dennis G. Wilson, Yann Besse
- Dates: 11/01/2021 - 07/05/2025

ESTELLE CHIGOT

- Title: Maximizing the robustness of data-driven functions for aircraft autonomy through synthetic data generation
- Financing: CIFRE with Airbus
- Advisors: Thomas Oberlin, Dennis G. Wilson, Meriem Ghrib

- Dates: 01/04/2023 - 04/2026 (provisional)

CAMILO DE LA TORRE

- Title: Hybridization between Cartesian Genetic Programming and specialized Machine Learning
- Financing: EDMITT scholarship
- Advisors: Sylvain Cussat-Blanc, Dennis G. Wilson, Hervé Luga
- Dates: 01/10/2023 - 10/2026 (provisional)

Additional Information

OTHER CONTRIBUTIONS TO THE RESEARCH COMMUNITY

Editorial activities I am an editorial board member for the [ACM Transactions on Evolutionary Learning and Optimization](#) journal, where I led the journal's policy on the use of large language models and have organized a special issue. I served as Track Chair for Complex Systems at GECCO from 2020 to 2022 and will serve as Track Chair for the Neuroevolution Track from 2025 to 2027; this two-year mandate is similar to Area Chair. I am also a regular reviewer for top AI conferences and journals, including NeurIPS, ICLR, ICML, GECCO, and the Evolutionary Computation Journal.

Workshop organization I organized the Developmental Neural Network workshop from 2018 to 2020, and co-organize the Graph-based Genetic Programming workshop since 2023. These workshops were hosted at international conferences such as GECCO. I also organized a [local workshop](#) in Toulouse in 2024 on Evolutionary Machine Learning, bringing international researchers together to discuss the latest advances in machine learning and evolutionary computation.

Competition organization I organized a competition on [Wind Farm Layout Optimization](#) at GECCO 2014-2016, culminating in an article in *Renewable Energy*. I am currently organizing a competition on [Interpretable Control Policies](#), which was held for the first time at GECCO 2024.

AI for Climate I am involved in several initiatives to apply AI to climate problems. I am a member of the AI for the Environment Committee ([ENVIA](#)) in Toulouse, which promotes collaboration between AI researchers and environmental scientists. From 2022 to 2024, I served as a faculty representative for the Horizons committee at ISAE-Supaero, which promotes sustainable development at ISAE. I have also been involved in the [Climate Change AI](#) Mentorship program since 2021, supporting early-stage researchers in AI and climate science.

Public outreach I have been active in public outreach, giving talks on AI in the greater Toulouse region. I have been invited to speak on the impact of [generative AI on education](#) and on the general impact of [AI on society](#). I also maintain a [newsletter](#), which has over 130 subscribers, on recent trends in and the societal impacts of AI.

Diversity and inclusion I am committed to promoting diversity in the research community. I was Secretary of the Diversity, Equity, and Inclusion Committee of the [International Society of Artificial Life](#) from 2021 to 2022. I have served as co-organizer of the [ANITI Diversity Commission](#) since 2022.

Teaching activities I have taught over 100 hours of courses per year at ISAE-Supaero since 2019. From 2020 to 2024, I was in charge of the [Data and Decision Science](#) master-level program at ISAE-Supaero, which covers machine learning, data engineering, and counts 60 students over 240 hours. In this program, I have created new courses on data engineering, data privacy, and deep learning. I have also created a new 30 hour elective course on [evolutionary algorithms](#). The resources from all of these classes are available online and have been shared within the research community, especially the evolutionary algorithms course, which has been used by other researchers in the field.