

Antoine Dedieu

Senior Research Scientist at Google DeepMind

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📁 [antoine-dedieu.github.io](https://github.com/antoine-dedieu)

Education

2016–2018 **Massachusetts Institute of Technology.**

Master of Science in *Operations Research*. Advised by Prof. Rahul Mazumder. Research areas: *Optimization, Machine Learning, Statistics*. Coursework includes: *Linear Optimization, Statistical Learning, Dynamic Programming* and *Bayesian Modeling*. GPA: 5.0/5.0.

2013–2016 **École Polytechnique.**

France's premiere university for science and engineering. Master in *Probability, Statistics and Finance*. Coursework includes: *CS* and *Economics*. Ranked in the top 5% of the class. GPA: 3.96/4.

2011–2013 **Lycée Sainte-Geneviève, Preparatory program.**

Intensive two-year preparation program. *Maths, CS and Physics* track. GPA: 3.98/4.

Publications

Conference Articles

21. DMC-VB: A Benchmark for Representation Learning for Control with Visual Distractors [\[PDF\]](#)
Neural Information Processing Systems (Neurips), 2024, to appear.
A. Dedieu, J. Ortiz, W. Lehrach, S. Guntupalli, C. Wendelken, A. Humayun, S. Swaminathan, G. Zhou et al.
20. Learning Cognitive Maps from Transformer Representations for Efficient Planning in Partially Observed Environments
International Conference on Machine Learning (ICML), 2024.
A. Dedieu, W. Lehrach, G. Zhou, D. George, M. Lázaro-Gredilla [\[PDF\]](#)
19. Schema-learning and rebinding as mechanisms of in-context learning and emergence [\[PDF\]](#)
Neurips spotlight, 2023. S. Swaminathan, **A. Dedieu**, R. V. Raju, M. Shanahan, M. Lázaro-Gredilla, D. George
18. Learning noisy-OR Bayesian Networks with Max-Product Belief Propagation [\[PDF\]](#)
ICML, 2023. **A. Dedieu**, G. Zhou, M. Lázaro-Gredilla, D. George
17. Graphical Models with Attention for Context-Specific Independence and an Application to Perceptual Grouping.
ArXiv, 2021. G. Zhou, W. Lehrach, **A. Dedieu**, M. Lázaro-Gredilla. [\[PDF\]](#)
16. Perturb-and-max-product: Sampling and learning in discrete energy-based models. [\[PDF\]](#)
Neurips, 2021. M. Lázaro-Gredilla, **A. Dedieu**, D. George
15. Sample-Efficient L0-L2 Constrained Structure Learning of Sparse Ising Models. [\[PDF\]](#)
Association for the Advancement of Artificial Intelligence (AAAI), 2021. **A. Dedieu**, M. Lázaro-Gredilla, D. George
14. Query Training: Learning a Worse Model to Infer Better Marginals in Undirected Graphical Models with Hidden Variables. [\[PDF\]](#)
AAAI, 2021. M. Lázaro-Gredilla, W. Lehrach, N. Gothoskar, G. Zhou, **A. Dedieu**, D. George.
13. Improved error rates for sparse (group) learning with Lipschitz loss functions. [\[PDF\]](#)
ArXiv, 2021. **A. Dedieu**.
12. An error bound for Lasso and Group Lasso in high dimensions. [\[PDF\]](#)
ArXiv, 2019. **A. Dedieu**.
11. Learning higher-order sequential structure with cloned HMMs. [\[PDF\]](#)
ArXiv, 2019. **A. Dedieu**, N. Gothoskar, S. Swingle, W. Lehrach, M. Lázaro-Gredilla, D. George.
10. Error bounds for sparse classifiers in high-dimensions. [\[PDF\]](#)
Artificial Intelligence and Statistics, 2019. **A. Dedieu**.
9. Hierarchical Modeling and Shrinkage for User Session Length Prediction in Media Streaming. [\[PDF\]](#)
Conference on Information and Knowledge Management, 2018. **A. Dedieu**, R. Mazumder, Z. Zhu, H. Vahabi.

Journal Articles

8. PGMax: Factor Graphs for Discrete Probabilistic Graphical Models and Loopy Belief Propagation in JAX. [\[PDF\]](#)
Journal of Machine Learning Research (JMLR), accepted with minor revisions, 2023.
G. Zhou, N. Kumar, **A. Dedieu**, M. Lázaro-Gredilla, S. Kushagra, D. George.
7. Solving L1-regularized SVMs and related linear programs: Revisiting the Effectiveness of Column and Constraint Generation. [\[PDF\]](#)
JMLR, 2022. **A. Dedieu**, R. Mazumder, H. Wang.
6. Subset Selection with Shrinkage: Sparse Linear Modeling when the SNR is low. [\[PDF\]](#)
Operations Research, 2022. R. Mazumder, P. Radchenko, **A. Dedieu**.
5. Learning Sparse Classifiers: Continuous and Mixed Integer Optimization Perspectives. [\[PDF\]](#)
JMLR, 2021. **A. Dedieu**, H. Hazimeh, R. Mazumder.
4. Clone-structured graph representations enable flexible learning and vicarious evaluation of cognitive maps. [\[PDF\]](#)
Nature Communications, 2021. D. George, R. Rikhye, N. Gothoskar, J. Guntupalli, **A. Dedieu**, M. Lázaro-Gredilla.
3. Learning attention-controllable border-ownership for objectness inference and binding. [\[PDF\]](#)
ArXiv, 2020. **A. Dedieu**, R. Rikhye, M. Lázaro-Gredilla, D. George.
2. A detailed mathematical theory of thalamic and cortical microcircuits based on inference in a generative vision model. [\[PDF\]](#)
ArXiv, 2021. D. George, M. Lázaro-Gredilla, W. Lehrach, **A. Dedieu**, G. Zhou.

Thesis

1. Sparse learning: statistical and optimization perspectives. [\[PDF\]](#)
Massachusetts Institute of Technology, 2018. **A. Dedieu**.

Work Experience

2024– **Senior Research Scientist**, *Google DeepMind*, SAN FRANCISCO AREA.

2022–2024 **Research Scientist**, *Google DeepMind*, SAN FRANCISCO AREA.

- Building sample-efficient agents which leverage on generative models of the world
- Addressing challenging planning and object-centric vision problems, which current AI models struggle with.
- Building novel generative probabilistic models and solving the associated learning and inference problems.
- Building novel transformers architecture to address inherent limitations of vanilla transformers.

2021–2022 **Senior Research Scientist**, *Vicarious AI*, SAN FRANCISCO AREA.

2018–2021 **Researcher**, *Vicarious AI*, SAN FRANCISCO AREA.

- Created a pipeline for box detection with Recursive Cortical Networks (RCNs), used 1M+ times in production.
- Created novel computational algorithms to improve the internal cutting-edge RCN vision model performance. Findings led to 40% gains in speed and accuracy on robots.
- Built new biologically-inspired probabilistic graphical models for central machine learning problems.

2017–2018 **Graduate Student Researcher**, *Pandora - MIT*, BOSTON.

- Predicted user session length through a new hierarchical Bayesian modeling framework.

2016 **Equity Derivative Structurer**, *Société Générale*, PARIS.

2013–2014 **Teacher Assistant and Examiner**, *Jiao Tong University*, SHANGHAI.

Google Scholar

As of Sept. 27, 2023. Number of citations: **536**. h-index: 9. i10-index: 9. [\[Profile\]](#)

Selected open source projects

DMC-VB: A Benchmark for Representation Learning for Control with Visual Distractors [\[GitHub\]](#)

PGMax: Loopy belief propagation for factor graphs on discrete variables in JAX [\[GitHub\]](#)

Max-product noisy-OR [\[GitHub\]](#)

Perturb-and-max-product: Sampling and learning in discrete energy-based models [\[GitHub\]](#)

Sample-Efficient L0-L2 Constrained Structure Learning of Sparse Ising Models [\[GitHub\]](#)

Solving large-scale L1-regularized SVM and cousins [\[GitHub\]](#)

Subset Selection with Shrinkage [\[GitHub\]](#)

Poster presentations

Dec. 2024 Neural Information Processing Systems.
July 2024 International Conference on Machine Learning.
Dec. 2023 Neural Information Processing Systems.
July 2023 International Conference on Machine Learning [\[Recorded talk\]](#) .
Dec. 2021 Neural Information Processing Systems.
Feb. 2021 Association for the Advancement of Artificial Intelligence [\[Recorded talk\]](#) .
April 2019 Artificial Intelligence and Statistics.

Patents

US patent US2021/0125030A1, issued April 29, 2021. [\[Link\]](#)

Method and system for query training. M. Lázaro-Gredilla, W. Lehrach, N. Gothoskar, G. Zhou, **A. Dedieu**, D. George.

External panel

Mar. 2024 AI unveiled: Navigating Opportunities, Risks, and Governance [\[Event\]](#) .
Sep. 2023 Unleashing the Future of Generative AI [\[Event\]](#) .

Technical skills and Languages

Computing PYTHON, R, C++, SQL, GitHub

Languages **French**: mother tongue. **English**: fluent. **Spanish**: fluent. **Chinese**: two years