

Antoine Dedieu

Researcher Scientist at Google DeepMind

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

Research interest

My current research interests lie primarily in solving challenging (a) object-centric vision problems and (b) planning problems, which current AI models struggle with; and in addressing the associated learning and inference problems.

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

Journal Articles

19. 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, 2022. G. Zhou, N. Kumar, **A. Dedieu**, M. Lázaro-Gredilla, S. Kushagra, D. George.
18. Solving L1-regularized SVMs and related linear programs: Revisiting the Effectiveness of Column and Constraint Generation. [PDF] *Journal of Machine Learning Research (JMLR)*, 2022. **A. Dedieu**, R. Mazumder, H. Wang.
17. Subset Selection with Shrinkage: Sparse Linear Modeling when the SNR is low. [PDF] *Operations Research*, 2022. R. Mazumder, P. Radchenko, **A. Dedieu**.
16. Learning Sparse Classifiers: Continuous and Mixed Integer Optimization Perspectives. [PDF] *JMLR*, 2021. **A. Dedieu**, H. Hazimeh, R. Mazumder.
15. 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.
14. Learning attention-controllable border-ownership for objectness inference and binding. [PDF] *ArXiv*, 2020. **A. Dedieu**, R. Rikhye, M. Lázaro-Gredilla, D. George.
13. 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

12. Sparse learning: statistical and optimization perspectives. [PDF] *Massachusetts Institute of Technology*, 2018. **A. Dedieu**.

Conference Articles

11. Schema-learning and rebinding as mechanisms of in-context learning and emergence [PDF] *Neural Information Processing Systems (NeurIPS)*, to appear, 2023. S. Swaminathan, **A. Dedieu**, R. V. Raju, M. Shanahan, M. Lázaro-Gredilla, D. George
10. Learning noisy-OR Bayesian Networks with Max-Product Belief Propagation [PDF] *International Conference on Machine Learning*, 2023. **A. Dedieu**, G. Zhou, M. Lázaro-Gredilla, D. George
9. 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]

8. Perturb-and-max-product: Sampling and learning in discrete energy-based models. [\[PDF\]](#)
Neurips, 2021. M. Lázaro-Gredilla, **A. Dedieu**, D. George
7. 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
6. 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.
5. Improved error rates for sparse (group) learning with Lipschitz loss functions. [\[PDF\]](#)
ArXiv, 2021. **A. Dedieu**.
4. An error bound for Lasso and Group Lasso in high dimensions. [\[PDF\]](#)
ArXiv, 2019. **A. Dedieu**.
3. Learning higher-order sequential structure with cloned HMMs. [\[PDF\]](#)
ArXiv, 2019. **A. Dedieu**, N. Gothoskar, S. Swingle, W. Lehrach, M. Lázaro-Gredilla, D. George.
2. Error bounds for sparse classifiers in high-dimensions. [\[PDF\]](#)
Artificial Intelligence and Statistics, 2019. **A. Dedieu**.
1. 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.

Work Experience

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

- Addressing challenging object-centric vision and planning 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.
- Creating novel computational algorithms to improve the internal cutting-edge RCN vision model performance. Findings led to 40% gains in speed and accuracy on robots.
- Building new biologically-inspired probabilistic graphical models for central machine learning problems. Findings published in top journals/conferences.

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

- 9-month research project, advised by Prof. Mazumder (MIT) and Zhu (Pandora).
- 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

Number of citations (as of Nov 26, 2023): **378**. H index: 8. [\[Profile\]](#)

Selected open source projects

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. 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. Levrach, N. Gothoskar, G. Zhou, **A. Dedieu**, D. George.

External panel

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

Personal interests

Sports Tennis ten years (captain of a Ecole Polytechnique team), rugby and football (competitions).

Travel China, Russia, Japan, Indonesia, Bolivia, Peru, Cuba, Mexico, Eastern and Southern Europe.