Antoine Dedieu

Senior Researcher Scientist at Vicarious AI

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Research interest

My research interests lie primarily (a) at the interface between probabilistic graphical models and cognitive sciences (b) at the intersection of optimization, machine learning and statistics.

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

15. Learning attention-controllable border-ownership for objectness inference and binding. [PDF]
Submited, 2021. **A. Dedieu**, R. Rikhye, M. Lázaro-Gredilla, D. George.

14. A detailed mathematical theory of thalamic and cortical microcircuits based on inference in a generative vision model. [PDF]
Submited, 2021. D. George, M. Lázaro-Gredilla, W. Lehrach, **A. Dedieu**, G. Zhou.

13. Learning Sparse Classifiers: Continuous and Mixed Integer Optimization Perspectives. [PDF]
Journal of Machine Learning Research (JMLR), 2021. **A. Dedieu**, H. Hazimeh, R. Mazumder.

12. 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.

11. Solving L1-regularized SVMs and related linear programs: Revisiting the effectiveness of Column and Constraint Generation. [PDF]
JMLR (accepted with minor revisions, 2021). **A. Dedieu**, R. Mazumder, H. Wang.

10. Subset Selection with Shrinkage: Sparse Linear Modeling when the SNR is low. [PDF]
Operations Research (to appear, 2021). R. Mazumder, P. Radchenko, **A. Dedieu**.

Thesis

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

Conference Articles

8. Perturb-and-max-product: Sampling and learning in discrete energy-based models. [PDF]
Neural Information Processing Systems, 2021. M. Lázaro-Gredilla, **A. Dedieu**, D. George

7. Symbolic Recurrent Computations with Markov Attention Models.
Submitted, 2021. G. Zhou, **A. Dedieu**, W. Lehrach, M. Lázaro-Gredilla.

6. Improved error rates for sparse (group) learning with Lipschitz loss functions. [PDF]
Submitted, 2021. **A. Dedieu**.

5. 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

4. 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.

3. Learning higher-order sequential structure with cloned HMMs. [PDF]
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

2021– **Senior Research Scientist**, *Vicarious AI*, San Francisco.

2018–2021 **Researcher**, *Vicarious AI*, San Francisco.
- 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.
- 6-month internship. Built a machine learning pricer for structured products. Reached 0.2% MAE.

2013–2014 **Teacher Assistant and Examiner**, *Jiao Tong University*, Shanghai.
- 6-month internship. Mentored top Chinese undergraduate students enrolled in a French Preparatory program.

Google scholar

Number of citations (as of December 2, 2021): 98. H index: 5. [Profile]

Presentations

Feb. 2021 Sample-Efficient L0-L2 Constrained Structure Learning of Sparse Ising Models. [Talk] .
Association for the Advancement of Artificial Intelligence

April 2019 Error bounds for sparse classifiers in high-dimensions.
Artificial Intelligence and Statistics

Sept. 2018 Hierarchical Modeling and Shrinkage for User Session Length Prediction in Media Streaming .
Conference on Information and Knowledge Management

May 2018 Sparse learning: statistical and optimization perspectives.
Massachusetts Institute of Technology

April 2018 Hybrid Column-and-Constraint Generation for large-scale sparse Support Vector Machines.
Vicarious AI

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.

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.