

# Théo Guyard

## Contact

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## Summary

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I am a **Postdoctoral Researcher** at Polytechnique Montréal, affiliated to the MAGI Department and the Scale-AI Chair held by Professor Thibaut Vidal. I have completed a PhD at INRIA and INSA Rennes under the supervision of Cédric Herzet, Clément Elvira and Ayşe-Nur Arslan. My research mainly focuses on **mixed-integer and convex optimization problems** related to Machine Learning and Signal Processing applications. My PhD was related to the development of efficient algorithms to address  $\ell_0$ -norm problems and my Postdoc is interests in interplays between Operation Research and Machine Learning.

## Education and Positions

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2025 - Now	<b>Postdoctoral Researcher</b> Institute : Polytechnique Montréal (Scale-AI Chair), Canada Topic : Interplays between Operation Research and Machine Learning Advisor : Thibaut Vidal
2021 - 2024	<b>PhD Student</b> Institute : INRIA (SimSMART) and INSA Rennes (MA Department), France Topic : Branch-and-bound algorithms for $\ell_0$ -regularized problems Advisors : Cédric Herzet, Clément Elvira, Ayşe-Nur Arslan Examiners : Jérôme Malick, Nicolas Gillis, Joseph Salmon, Amélie Lambert
2020 - 2021	<b>Research Program Student</b> Institute : IRMAR, France Topic : Stochastic models for Kidney Exchange Programs Advisor : Jérémy Omer
2019 - 2020	<b>Research Program Student</b> Institute : IRMAR, France Topic : Screening methods for $\ell_1$ -regularized problems Advisor : Cédric Herzet
2016 - 2021	<b>Engineering Student (MSc equivalent)</b> Institute : INSA Rennes, France Specialty : Applied Mathematics

## Awards

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- ROADEF 2023     **Best student paper.** This prize is awarded at the [ROADEF](#) annual congress and rewards a doctoral student for an original academic or industrial contribution. The evaluation covers both the content of the paper and the oral during the congress. The jury was composed of Come Bissuel (EDF), Julien Darlay (Local solver), Alexandre Gondran (ENAC), Nacima Labadie (UTT), Amélie Lambert (CNAM), Sébastien Martin (Huawei), Dimitri Watel (EN-SIIE), Sandra Nguereu (LAAS) and Odile Bellenguez (IMT).
- SMAI-MODE 2022     **Best poster award.** This prize is awarded by the [SMAI-MODE](#) group and rewards the best poster during the SMAI-MODE days. The jury was composed of Jean-Bernard Lasserre (CNRS), Noureddine Igbida (XLIM), Thibault Liard (XLIM), Simone Naldi (XLIM) and Olivier Prot (XLIM).

## Publications

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### In Preparation

- Théo Guyard, Cédric Herzet, and Clément Elvira. “A generic Branch-and-Bound framework for  $\ell_0$ -regularized problems”. To be submitted soon.

### International Conference Papers

- Théo Guyard, Cédric Herzet, Clément Elvira, and Ayşe-Nur Arslan. “A new Branch-and-Bound pruning framework for  $\ell_0$ -regularized problems”. In *Forty-first International Conference on Machine Learning (ICML)*. PMLR. 2024.
- Théo Guyard, Gilles Monnoyer, Cédric Herzet, and Clément Elvira. “Safe peeling for  $\ell_0$ -regularized least-squares”. In *European Conference on Signal Processing (EUSIPCO)*. IEEE. 2023.
- Théo Guyard, Cédric Herzet, and Clément Elvira. “Node-screening tests for  $\ell_0$ -penalized least-squares problem”. In *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*. IEEE. 2022.
- Théo Guyard, Cédric Herzet, and Clément Elvira. “Screen & Relax: Accelerating the resolution of Elastic-net by safe identification of the solution support”. In *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*. IEEE. 2022.

### National Conference Papers

- Théo Guyard, Gilles Monnoyer, Cédric Herzet, and Clément Elvira. “Peeling pour le problème des moindres carrés avec régularisation  $\ell_0$ ”. In *Groupe de Recherche et d’Etudes de Traitement du Signal et des Images (GRETSI)*. 2023.
- Théo Guyard. “An efficient solver for  $\ell_0$ -penalized sparse problems”. In *Congrès de la Société Française de Recherche Opérationnelle et d’Aide à la Décision (ROADEF)*. 2023.
- Théo Guyard, Cédric Herzet, Clément Elvira, and Ayşe-Nur Arslan. “Node-screening pour le problème des moindres carrés avec pénalité  $\ell_0$ ”. In *Groupe de Recherche et d’Etudes de Traitement du Signal et des Images (GRETSI)*. 2022.
- Théo Guyard, Cédric Herzet, and Clément Elvira. “Screen & Relax: Accélérer la résolution du problème "Elastic-Net" par identification du support de la solution”. In *Groupe de Recherche et d’Etudes de Traitement du Signal et des Images (GRETSI)*. 2022.

### Theses and Technical Reports

- Théo Guyard. “Branch-and-Bound algorithms for  $\ell_0$ -regularized problems”. *PhD thesis*. 2024.
- Théo Guyard. “Acceleration methods for  $\ell_0$  and  $\ell_1$  problems”. *Engineering thesis*. 2021.
- Théo Guyard. “Stochastic models for kidney exchange programs”. *Research thesis*. 2020.

## Presentations

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- 2024, December 9. “Solving L0-norm problems via mixed-integer optimization”, *IMAG team seminar*, Montpellier, France.
- 2024, November 27. “Branch-and-Bound algorithms for L0-regularized problems”, *PhD Defense*, Rennes, France.
- 2024, September 16. “Toward stronger relaxations for L0-regularized problems”, *GdR IASIS Workshop*, Institut Henri Poincaré, France.
- 2024, July 24. “A new Branch-and-Bound pruning framework for L0-regularized problems”, *ICML*, Vienna, Austria.
- 2024, March 28. “A generic Branch-and-Bound for L0-penalized problems”, *SMAI-MODE days*, Lyon, France.
- 2024, March 28. “Screen-and-Relax for sparse support identification”, *SMAI-MODE days*, Lyon, France.
- 2024, March 18. “Discrete optimization methods for L0-norm problems”, *Journées Doctorants en Statistiques*, Rennes, France.
- 2024, March 7. “Mixed-integer optimization methods for sparse problems”, *LS2N seminar*, Nantes, France.
- 2023, November 29. “Screen & Relax for sparse support identification”, *PGMO days*, Paris-Saclay, France.
- 2023, November 29. “Safe peeling for L0-penalized problems”, *PGMO days*, Paris-Saclay, France.
- 2023, October 19. “Solving L0-norm problems via mixed-integer optimization”, *INRIA EDGE team seminar*, Bordeaux, France.
- 2023, October 10. “Solving L0-norm problems via mixed-integer optimization”, *INRIA SODA and MIND team seminar*, Paris-Saclay, France.
- 2023, September 9. “Peeling for L0-regularized least-squares”, *EUSIPCO*, Helsinki, Finland.
- 2023, August 30. “Peeling for L0-regularized least-squares”, *GRETSI*, Grenoble, France.
- 2023, May 2. “Unifying Branch-and-Bound approaches to solve L0-penalized problems”, *SIAM Conference on Optimization*, Seattle, USA.
- 2023, February 21. “An efficient solver for L0-penalized sparse problems”, *ROADEF*, Rennes, France.
- 2023, February 17. “The latest report from the CNRS ethics committee: Integrating environmental issues into the conduct of research”, *IRMAR Science and Ethic seminar*, Rennes, France.
- 2022, November 30. “Discrete optimization methods for L0-penalized sparse problems”, *PGMO days*, Paris-Saclay, France.
- 2022, September 30. “Resilience in signal processing and AI”, *IRMAR Science and Ethic seminar*, Rennes, France.
- 2022, September 8. “Node-screening pour le problème des moindres carrés avec pénalité L0”, *GRETSI*, Nancy, France.
- 2022, September 8. “Accélérer la résolution de l'Elastic-Net par identification du support de la solution”, *GRETSI*, Nancy, France.

- 2022, June 1. “Node-screening tests for the L0-penalized least-squares problem”, *SMAI-MODE days*, Limoges, France.
- 2022, May 8. “Node-screening tests for the L0-penalized least-squares problem”, *ICASSP*, Singapore.
- 2022, May 8. “Screen & Relax: Accelerating the resolution of Elastic-Net by safe identification of the solution support”, *ICASSP*, Singapore.

## Softwares

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### Projects as Maintainer

<code>exprun</code>	Python toolbox to automatize pipelines for reproducible experiments. The package is available on <code>pypi</code> under MIT license.
<code>el0ps</code>	Python toolbox to solve L0-regularized problems via flexible and numerically efficient methods. The package is available on <code>pypi</code> under AGPL-v3 license.
<code>libsvmdata</code>	Simple tool to fetch <code>libsvm</code> datasets to Julia. The package is available on <code>juliapackages</code> under MIT license.

### Projects as Contributor

<code>benchopt</code>	Benchmarking suite for optimization algorithms built for simplicity, transparency, and reproducibility. The package is available on <code>pypi</code> under BSD-3 license.
<code>l0learn</code>	Efficient algorithms for L0-regularized learning. It is built for simplicity, transparency, and reproducibility. The package is available on <code>cran</code> and <code>pypi</code> .
<code>libsvmdata</code>	A python util to fetch datasets from the <code>libsvm</code> website. The package is available on <code>pypi</code> under BSD-3 license.

## Scientific Duties

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### Teaching

2023 - 2024	ENSAI, Computer Science Department. <i>UE 1-07: Optimization and numerical methods</i> . Service: TP (12h equivalent TD) for MSc students.
2023 - 2024	INSA Rennes, Applied Mathematics Department. <i>DMA06-OD: Discrete optimization</i> . Service: TP/TD/Project (10h equivalent TD) for MSc students.
2023 - 2024	INSA Rennes, Applied Mathematics Department. <i>DMA09-PARCI: Sparse models and methods</i> . Service: CM/TP/TD (13h equivalent TD) for MSc students.
2022 - 2023	INSA Rennes, Applied Mathematics Department. <i>DMA06-OD: Discrete optimization</i> . Service: TP/TD/Project (10h equivalent TD) for MSc students.
2022 - 2023	INSA Rennes, Applied Mathematics Department. <i>DMA09-PARCI: Sparse models and methods</i> . Service: CM/TP/TD (11h equivalent TD) for MSc students.
2021 - 2022	INSA Rennes, Engineering Department. <i>STP-03: Linear Algebra</i> . Service: TD (36h equivalent TD) for BSc students.

### Dissemination

2022	MathC2+ masterclasses lecturer for high-school students (12h equivalent TD).
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