Thu-Le Tran

PhD in Applied Mathematics
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Research Interests

Fields **Convex Optimization, Location Theory, Optimal Transport, Large-scale Machine Learning, Signal/Image Processing, Statistics**

Tools **Convexity, non-smoothness, sparsity**
Safe Screening for reducing dimensionality/constraints/features/samples
First-order methods & Fenchel-Rockafellar/Lagrange/Toland duality

Education

2020-2023 **PhD in Applied Mathematics**, *Université de Rennes*, France
2019-2020 **Master 2 in Fundamental Mathematics**, *Université de Rennes 1*, France
2018-2019 **Master 1 in Mathematical Analysis**, *Can Tho University*, Vietnam
2014-2018 **Bachelor in Mathematics**, *Can Tho University*, Vietnam

Teaching Experience

10/2024-now Lecturer at Can Tho University, Vietnam
01-09/2024 Lecturer at Cantho University of Technology, Vietnam
2021-2022 Teaching assistant at ENSAI, France

Awards and Honors

2019 **Lebesgue Master Scholarship** of Henri Lebesgue Center for outstanding students
2014-2018 03 bronze & 04 silver medals of **National Mathematics Olympiad** for students

Selected Publications

2024 Van-Huy Pham, Ngan Nguyen, Minh-Quang Cao, Hong-Phuong Dang, Thu-Le Tran, *Stability Radius and an Upgrading Model of Median Location on Trees*, (under review)

2023 Thu-Le Tran, Clément Elvira, Hong-Phuong Dang, Cédric Herzet, *One to beat them all: "RYU" – A unifying framework for the construction of safe balls*, (under review)

2023 Thu-Le Tran, Clément Elvira, Hong-Phuong Dang, Cédric Herzet, *Dimensionality reduction for convex optimization based on safe regions: A unified approach*, **10th Vietnam Mathematical Congress** (abstract submission)

2022 Thu-Le Tran, Clément Elvira, Hong-Phuong Dang, Cédric Herzet, *Beyond GAP screening for Lasso by exploiting new dual cutting half-spaces*, **30th European Signal Processing Conference (EUSIPCO)**

2022 Thu-Le Tran, Clément Elvira, Hong-Phuong Dang, Cédric Herzet, *Une nouvelle méthode d'accélération pour LASSO par élimination sûre de variables*, **CAP 2022-Conférence sur l'Apprentissage automatique**

2021 Van Huy Pham, Kien Trung Nguyen, and Tran Thu Le, *Inverse stable point problem on trees under an extension of Chebyshev norm and bottleneck Hamming distance*, **Optimization Methods and Software**

2019 Kien Trung Nguyen, Nguyen Thanh Hung, Huong Nguyen-Thu, Tran Thu Le, and Van Huy Pham, *On some inverse 1-center location problems*, **Optimization**

2019 Kien Trung Nguyen and Tran Thu Le, *A linear time algorithm for balance vertices on trees*, **Discrete Optimization**

2018 Tran Thu Le and Kien Trung Nguyen, *A Generalization of Inverse Single Facility Location Problems on Trees under an Extension of Chebyshev Norm and Bottleneck Hamming Distance*, **9th Vietnam Mathematical Congress** (abstract submission)

Computer Skills

Programming	Python, Julia, R
Markup lang.	Latex, Markdown, Typst, Quarto
System	Linux

Languages

Vietnamese	Native
English	Fluent
French	Basic

PhD Thesis

My PhD thesis, titled "Some Contributions on Safe Regions and Safe Screening in Convex Optimization", focuses on addressing the following convex optimization problem:

$$\min_{\mathbf{x}\in\mathcal{X}} \quad f(\mathbf{A}\mathbf{x}) + g(\mathbf{x}).$$

This problem finds significant applications across various disciplines, including:

- **Machine Learning:** sparse SVM, regularized optimal transport, neural networks, ...
- **Signal/Image Processing:** basis pursuit denoising, sparse spike deconvolution, ...
- **Statistics:** LASSO, Ridge, Elastic-net, sparse logistic regression, ...

Solving these problems in high dimensions is challenging due to computational and memory constraints. In recent years, "safe screening" methods have emerged as powerful tools to address this issue, operating by utilizing a "safe region" which contains a dual optimal solution.

The first contribution of the thesis is a mathematical framework for creating new safe regions while demonstrating their superiority over the state-of-the-art. Our framework also provides an elegant way to **unify** existing safe regions. This contribution establishes a theoretical foundation for future advances in the study of safe regions and safe screening.

The second contribution **extends** the safe screening methodology to problems in infinite dimensions. We show, in particular, that integrating this method into a state-of-the-art algorithm significantly reduces its numerical complexity while preserving its convergence properties. This contribution highlights the potential of safe screening to effectively address computational challenges in infinite-dimensional contexts.