Thu-Le Tran

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Research Interests

Optimization **LASSO, Beurling LASSO, large-scale Machine Learning problems, 1-hidden-layer Neural Networks, . . .**

Techniques **Safe Screening (Feature Selection & Dimensionality Reduction), gradient and proximal algorithms, Fenchel-Rockafellar & Lagrange duality, . . .**

Education

2020-2023 **PhD in Optimization and Statistics**, *Université de Rennes 1*, France
member of IRMAR and SIMSMART

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
member of **National Mathematics Olympiad** team

Teaching Experience

2021-2022 Assisted in teaching a course on **Convex Optimization** for first year Bachelor students in 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

Publications

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)**

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**

2017 Kien Trung Nguyen and Tran Thu Le, *On generalizations of bundle theorem and Miquel's six circles theorem on the plane*, **International Journal of Geometry**

2017 Tran Thu Le and Kien Trung Nguyen, *The five connics problem*, **Journal of Classical Geometry**

2016 Kien Trung Nguyen and Tran Thu Le, *Problem of twelve circles*, **International Journal of Computer Discovered Mathematics**

Computer Skills

Programming	Python, Julia
Markup	Latex, Markdown
System	Linux

Languages

Vietnamese	Native
English	Fluent

Problems of Interest

Currently, my research interest lies in the field of convex optimization, particularly focusing on problems that involve sparsity and non-smoothness. The general problem I am investigating can be formulated as follows:

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

It finds applications in various fields such as *statistics* (LASSO, Ridge, Elastic-net, etc.), *machine learning* (sparse logistic regression, sparse support vector machines, etc.), *signal and image processing* (basis pursuit denoising, sparse spike deconvolution, etc.), and *neural networks* (one-hidden layer neural networks). Solving such high-dimensional problems poses significant challenges.

My research topic mainly focuses on improving and extending a method called **safe screening**.Safe screening is an emerging approach designed to reduce the dimensionality of optimization problems, leading to accelerated solving processes. What sets safe screening apart from other commonly used unsafe screening techniques in statistics is its guarantee to discard only the zero entries in the optimal solutions.

In an ongoing project, we are proposing novel safe screening methods based on a family of geometric sets known as *Hölder regions*, specifically in the form of balls and domes. Our frameworks not only unify but also outperform most of the existing state-of-the-art techniques.

Another project we are currently working on aims to extend the application of safe screening methods to Beurling LASSO problem, a class of infinite-dimensional problems defined on the space of Radon measures. A typical example is the sparse spike deconvolution problems. We demonstrate that safe screening method can effectively shrink the domain of the discrete optimal measure $\mathbf{x}^\star$, thereby significantly reducing the computational effort required for finding the locations of optimal measures.