# NGUYEN CUNG THANH

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## Education

- **Junior in VinUniversity** *September 2024 - Present*
  *Bachelor of Science in Computer Science*
  - CPGA: 3.60/4.00, Dean's List.
- **Hanoi University of Science High School for Gifted Students** *July 2021 - May 2024*
  *Best high school for gifted student in natural science of Vietnam; Specialized in Mathematics*

## Publications and Preprints

- **How Finite-Rank Bottleneck Shape the Low-Rank Adaptation Landscape** *2026*
  Long Nguyen-Chi, Quynh Nguyen, **Thanh Nguyen-Cung**, Binh T. Nguyen • **Published**, *NeurIPS 2026* [Paper, Summary]
  - Surveyed related work on low-rank adaptation and finite-rank bottlenecks.
  - Proved the concentration inequalities, verified proofs of paper and revised the manuscript.
- **Gaussian Sharp Mean Estimation under Finite Covariance in Fixed Dimension** *2026*
  **Thanh Nguyen-Cung**, Binh T. Nguyen • **Under review**, *AISTATS 2027* [Summary]
  - Established first-order optimal robust multivariate mean estimation under finite, unknown covariance, matching the Gaussian confidence radius up to a $1 + o(1)$ factor in the fixed-dimensional, high-confidence regime, with a matching lower bound.
  - Developed a theoretically polynomial-time estimator using quadratic-likelihood, reverse-KL duality, and geometric intersection arguments (Helly's theorem), with provable complexity $n^{O(d^5)}$ for fixed dimension $d$.
- **Logarithmic-Free Moment and Generalization Bounds for Uniformly Stable Algorithms** *2026*
  **Thanh Nguyen-Cung**, Binh T. Nguyen • **Preprint**, Plan submit to *COLT 2027* [arXiv, Summary]
  - Resolved an open problem in statistical learning theory by eliminating the unnecessary $\log n$ factor in moment bounds for weakly interacting random variables, establishing sharp bounds matching known lower bounds up to universal constants in the applicable regime.
  - Developed a novel concentration analysis combining double centering, exponential moment estimates, fixed point counting on the Rademacher cube, and two copy randomization to establish logarithmic-free moment inequalities for general product distributions.
- **Inertia-Sensitive Kreiss Bounds for $J$–Selfadjoint Matrices** *2026*
  **Thanh Nguyen-Cung**, Binh T. Nguyen • **Under review**, *Linear Algebra and Its Applications* [arXiv, Summary]
  - Proved a sharper Kreiss bound for $J$-selfadjoint matrices, showing that transient growth can be controlled by the metric's inertia rather than the full matrix dimension.
  - Developed a proof using finite-rank Hankel operators and constructed examples showing that the dependence on metric inertia is asymptotically optimal.
- **Some Generalizations of a Geometric Problem from USA TSTST** *2024*
  Tran Quang Hung (Author of P5 IMO 2025), **Nguyen Cung Thanh** *(co-first authors)* • **Published**, *Mathematical Reflections* [Paper]
  - Generalized the original USA TSTST geometry problem, established complete proofs, and drafted the manuscript.

## Conference Presentations & Scholarly Activities

- **Maximum Sustainable Yield in the Generalized Logistic Growth Model** *Aug 2025*
  *First Author; **Presented** at International Statistical Conference (ISM VII), Malaysia* [Abstract pg.110, Slides]
  - Proved the main theorem about maximum sustainable yield in a generalized logistic growth model.
  - Conducted Maple simulations to support theoretical findings.
- **Problem 790, Pi Journal Math Challenge** *Mar 2024*
  ***Mathematical Problem Author**; Topic: Analytic Number Theory* [Problem]
  - Applied Mertens' theorem and analytic number theory techniques to create an original Olympic problem.

## Achievements

- Silver medal in Algebra (Group A) at the Vietnam Mathematics Olympiad for Undergraduate Student *April 2026*
- Silver medal in Calculus (Group A) at the Vietnam Mathematics Olympiad for Undergraduate Student *April 2025*
- Consolation prize in the Vietnam National ICPC 2025 *November 2025*
- Participant of Vietnam Mathematics Olympiad *February 2023*

## Research Experience

- **Research Assistant at BAIL Lab, VinUniversity** *September 2025 - Present*

  *Research Areas: Statistical Learning Theory, High-Dimensional Probability, Optimization, Matrix Analysis; Supervisors: Asst. Prof. Nguyen Tuan Binh and Professor Laurent El Ghaoui*

  - Conducted theoretical research in statistical learning theory and matrix analysis, developing rigorous proofs involving concentration inequalities, randomized arguments, and finite-rank operator techniques.
  - Derived new results on generalization bounds for stable algorithms and transient growth bounds for structured matrices, leading to two first-author preprints.
  - Contributed to proof verification and literature synthesis for a NeurIPS 2026 paper on low-rank adaptation; presented weekly seminars on high-dimensional probability and learning theory.

- **Research Assistant at Cosmos Lab** *September 2024 - Present*

  *Research Areas: mathematical modeling, dynamical system; Supervisor: Assoc. Prof. Nguyen Ngoc Doanh, Professor Pierre Auger (IRD, Sorbonne Université)*

  - Analyzed equilibrium structures, stability conditions of differential equation models.
  - Developed theoretical frameworks for maximum sustainable yield (MSY) using aggregation methods.
  - Proficient in using Maple for visualization and computation.

## Activities

- **Teaching Assistant - Cmath Education (Specialized mathematics education center for secondary school students)** *March 2024 - March 2025*
  - Teaching assistant of Teacher Vo Quoc Ba Can (Instructor of Vietnam IMO Team) in the top-performing classes.
  - Tutored 10 students who passed the entrance examination for specialized mathematics high schools in Vietnam.
- **President of Vin Pioneers Club Gen 5 - Math Club at VinUniversity** *August 2025 - Present*
  - Organized activities including Mentoring Sessions (attracting approximately 100 students), Mocktest Exams, Integration Pi, and VinUni Mathematics Olympiad team selection (winning 5 medals: 2 Silvers, 2 Bronzes, and 1 Consolation Prize).
  - **Champion of Integration Pi Competition** - An integration-solving competition inspired by MIT and organized by Vin Pioneers Gen 4.

## Technical Skills

- Programming Language: Python, C++, Java, HTML,CSS, JavaScript, Markdown, Latex, Matlab, Maple.

## References


- **Associate Professor Nguyen Ngoc Doanh**
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- **Assistant Professor Nguyen Tuan Binh**
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