RITESH KHAN

IIT Madras, Chennai, 600 036, INDIA

khanritesh28@gmail.com | Web | GS | GitHub | LinkedIn | Orcid

RESEARCH EXPERIENCE

Indian Institute of Technology Madras (IIT Madras), Chennai *Jan. 2025 - present*
Project Associate, Department of Data Science & AI

EDUCATION

- **Indian Institute of Technology Madras (IIT Madras), Chennai** *July 2019 - Dec. 2024*
  Ph.D. in Computational Mathematics, Department of Mathematics CGPA: 8.87/10
  - ***Thesis Title***: New Fast Algorithms for N-body Problems and their Applications.
  - ***Thesis Advisor***: Dr. Sivaram Ambikasaran
  - ***Date of thesis defense***: 25-March-2025
  - ***Relevant Coursework***: Applied Statistics, Numerical Analysis, Numerical solutions of PDE(s), Numerical Linear Algebra, Advanced Differential Equations.
- **Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI), Belur Math, Howrah** *July 2017 - June 2019*
  Master of Science in Mathematics, School of Mathematical Sciences CGPA: 9.43/10
  - ***Relevant Coursework***: Analysis, Algebra, Number Theory, Topology, Measure Theory, Probability & Stochastic Process.
- **Midnapore College (Autonomous), Midnapore** *July 2014 - June 2017*
  Bachelor of Science (Hons.) in Mathematics, Department of Mathematics Percentage: 81.25%

RESEARCH

My broad research areas are Numerical Linear Algebra, Fast Algorithms in Scientific Computing, Rank structured Matrices, Approximation Theory, High-Performance Computing, etc.

PUBLICATIONS

3. Sivaram Ambikasaran, Ritesh Khan, Johannes Tausch, Sihao Wang. *A Hybrid Interpolation ACA Accelerated Method for Parabolic Boundary Integral Operators*, **SIAM Journal on Scientific Computing, Volume 47(3), 2025, A1507-A1526**, DOI:https://doi.org/10.1137/24M1683809.

2. Ritesh Khan, Sivaram Ambikasaran. *New Algebraic Fast Algorithms for N-body Problems in Two and Three Dimensions*, **Communications in Computational Physics, Volume 37(4), 2025, 1157–1226**, DOI:https://doi.org/10.4208/cicp.OA-2024-0100.

1. Ritesh Khan, V.A. Kandappan, Sivaram Ambikasaran. *HODLRdD: A new black-box fast algorithm for N-body problems in d-dimensions with guaranteed error bounds: Applications to integral equations and support vector machines*, **Journal of Computational Physics, Volume 501, 2024, 112786**, DOI:https://doi.org/10.1016/j.jcp.2024.112786.

PREPRINTS

1. Ritesh Khan, Sivaram Ambikasaran. *New hybrid hierarchical matrix algorithms for fast kernel matrix-vector product* (***under review***).

TECHNICAL SKILLS

Computer Languages	`C`, `C++`, `MATLAB`, `Python`, `Julia`, `MySQL`
Software & Tools	`LaTeX`, `git`
OS	Linux, OS X
Libraries	`Eigen`, `LAPACK`, `OpenMP`, `Numpy`, `Scipy`, `TesnorFlow`

MATHEMATICAL PACKAGES

HODLRdD	A new $\mathcal{H}$ matrix algorithm for fast kernel matrix-vector product in d dimensions. This code works for any user-given dimension d.
$\mathcal{H}^2$ **weak**	A new $\mathcal{H}^2$ matrix algorithm for fast kernel matrix-vector product.
$\mathcal{H}^2$ **hybrid**	A new hybrid hierarchical matrix algorithm in three dimensions.

TEACHING ASSISTANTSHIP

- Data Analysis & Visualization (Spring 2024).
- Numerical Linear Algebra (Autumn 2023).
- Series and Matrices (Spring 2023).
- Applied Statistics (Autumn 2022).
- Multi-variable Calculus (Autumn 2021, Spring 2022).
- Numerical Methods and Scientific Computing (Spring 2021).

ACADEMIC ACHIEVEMENTS

- Awarded the **Institute Research (IR) Award** (2025) in recognition of excellent Ph.D. work, IIT Madras, India.
- Awarded the **Half Time Research Assistantship (HTRA)** fellowship (2019-2024), IIT Madras, India.
- Qualified Joint **CSIR-UGC Junior Research Fellowship (JRF)** with AIR (All India Rank)-50 in Dec 2018 & AIR (All India Rank)-66 in June 2019.
- Qualified **Graduate Aptitude Test in Engineering (GATE)** Mathematics with AIR-133 in March 2019.
- Qualified **National Board for Higher Mathematics (NBHM)** written test in March 2019.
- Qualified **Joint Admission test for M.Sc. in IITs (JAM)** with AIR-250 in June 2017.
- Awarded the DST **INSPIRE Scholarship for Higher Education** (top 1% students in Class XII Boards across India) from 2014-2019.
- Secured 3^{rd} rank in the district in the Class X (Secondary) Board Exam, WBBSE 2012.

CONFERENCES/TALKS

- *A new kernel-independent fast algorithm for N-body problems in d dimensions*, International Congress on Industrial and Applied Mathematics (ICIAM 2023), August 20-25, 2023, Waseda University, Tokyo, Japan.
- *HODLRdD: A fast black-box algorithm for N-body problems in d dimensions with application in SVM*, Prague Workshop on Numerical Mathematics, July 20-21, 2023, Prague, Czechia.

- *Numerical rank of kernel functions*, Indo-German conference on Computational Mathematics (IGCM 2023), March 27-30, 2023, IISc, Department of CDS, Bangalore, India.
- *Low-rank approximation & Hierarchical matrices*, In-House Symposium, July 29-30, 2022, IIT Madras, Department of Mathematics, Chennai, India.

POSTERS

- *Fast Kernel Methods*, May 13, 2023, RBCDSAI, IIT Madras, Chennai, India.

WORKSHOPS

- Winter School on Hierarchical Matrices, February 09-12, 2024, Kiel University (Online).
- Linear Algebra and its Applications, December 19-24, 2020, IIT Delhi, India.

ONLINE CERTIFICATIONS

- Neural Networks and Deep Learning (DeepLearning.AI), Coursera. **Link to certificate.**

REFERENCES

References would be available on request.