RITESH KHAN

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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
  - ***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*** *(accepted & in press)*, `Arxiv:https://arxiv.org/abs/2408.04080`.
2. Ritesh Khan, Sivaram Ambikasaran. *New Algebraic Fast Algorithms for N-body Problems in Two and Three Dimensions*, ***Communications in Computational Physics*** *(accepted & in press)*, `Arxiv:https://arxiv.org/abs/2309.14085`.
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

- Recipient of the **Institute Research Award** (2025), IIT Madras, India.
- Qualified Joint **CSIR-UGC** Fellowship (JRF) with AIR-50 in Dec 2018 & AIR-66 in June 2019.
- Qualified **GATE** (Mathematics) with AIR-133 in March 2019.
- Qualified **NBHM** written test in March 2019.
- Qualified **JAM** (Joint Admission test for M.Sc. in IITs) 2017 with AIR-250.
- Recipient of the **INSPIRE** Scholarship (DST SHE) 2014-2019.
- Secured 3^{rd} rank in the district in the Secondary Examination (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.