

# RITESH KHAN

IIT Madras, Chennai, 600036, INDIA

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## RESEARCH EXPERIENCE

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- **Indian Institute of Technology Madras, Chennai, India** Jan. 2025 - May 2025  
*Project Associate, Department of Data Science & AI*

## EDUCATION

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- **Indian Institute of Technology Madras, Chennai, India** July 2019 - Dec. 2024  
*Ph.D. in Computational Mathematics, Department of Mathematics* CGPA: 9.54/10
  - **Thesis title:** New Fast Algorithms for  $N$ -body Problems and their Applications.
  - **Thesis advisor:** Dr. Sivaram Ambikasaran
  - **Date of defense:** 25-March-2025
  - **Relevant coursework:** Applied Statistics, Numerical Analysis, Numerical solutions of PDE(s), Numerical Linear Algebra, Advanced Differential Equations, etc.
- **Ramakrishna Mission Vivekananda Educational and Research Institute, Belur Math, Howrah, India** 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, etc.
- **Midnapore College (Autonomous), Midnapore, India** July 2014 - June 2017  
*Bachelor of Science (Hons.) in Mathematics, Department of Mathematics* Percentage: 81.25%

## RESEARCH INTERESTS

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

## PUBLICATIONS

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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.0A-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

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

## TEACHING EXPERIENCE

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

## AWARDS AND ACHIEVEMENTS

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- Awarded the *Smt Lakshmikutty Amma and Shri A Krishnankutty Nair Prize for the best Ph.D. thesis in Mathematics* at the 62<sup>nd</sup> Convocation of IIT Madras, India, 2025.
- Awarded the *Institute Research (IR) Award* in recognition of excellent Ph.D. work, IIT Madras, India, 2025.
- Awarded a *Half Time Research Assistantship (HTRA)* fellowship, IIT Madras, 2019-2024.
- Qualified Joint **CSIR-UGC Junior Research Fellowship (JRF)** with AIR (All India Rank)-50, Dec 2018 & AIR (All India Rank)-66, June 2019. (not availed)
- Qualified **Graduate Aptitude Test in Engineering (GATE)** Mathematics with AIR-133, 2019.
- Qualified **National Board for Higher Mathematics (NBHM)** Ph.D. fellowship written test, 2019.
- Qualified **Joint Admission test for M.Sc. in IITs (JAM)** with AIR-250, 2017. (not availed)
- Awarded the **DST INSPIRE Scholarship for Higher Education** (top 1% students in Class XII Board Exam across India), 2014-2019.
- Secured 3<sup>rd</sup> rank in the district in the Class X (Secondary) Board Exam, **WBBSE**, 2012.

## TECHNICAL SKILLS

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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

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<b>HODLR<math>d</math>D</b>	A new $\mathcal{H}$ matrix algorithm for fast kernel matrix-vector product in $d$ dimensions. This code works for any user-given dimension $d$ .
<b><math>\mathcal{H}^2</math> weak</b>	A new $\mathcal{H}^2$ matrix algorithm for fast kernel matrix-vector product.
<b><math>\mathcal{H}^2</math> hybrid</b>	A new hybrid hierarchical matrix algorithm in three dimensions.

## CONFERENCES/TALKS

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- *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

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

## WORKSHOPS

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- 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

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

## REFERENCES

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References would be available on request.