# RITESH KHAN

IIT Madras, Chennai, INDIA

✉ khanritesh28@gmail.com  |  🌐 Web  |  ⚕ GS  |  ⊙ GitHub  |  in LinkedIn  |  ⓘD Orcid

## EDUCATION

**Indian Institute of Technology Madras (IIT Madras), Chennai**          *July 2019 - Dec. 2024*
Doctor of Philosophy (PhD), Department of Mathematics                          CGPA: 8.87/10

- ***Thesis Title***: New fast algorithms for $N$-body problems and their applications.

- ***Advisor***: Dr. Sivaram Ambikasaran

**Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI), Belur Math, Howrah**          *July 2017 - June 2019*
Master of Science, Mathematics                                            CGPA: 9.43/10

**Midnapore College (Autonomous), Midnapore**          *July 2014 - June 2017*
Bachelor of Science (B.Sc. Hons.), Mathematics          Overall 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

- <u>Ritesh Khan</u>, V.A. Kandappan, Sivaram Ambikasaran. HODLR$d$D: 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`.

- <u>Ritesh Khan</u>, 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`.

## PREPRINTS

- Sivaram Ambikasaran, <u>Ritesh Khan</u>, Johannes Tausch, Sihao Wang. A hybrid interpolation ACA accelerated method for parabolic boundary integral operators *(under review)*, `https://arxiv.org/abs/2408.04080`.

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

## TECHNICAL SKILLS

| | |
|---|---|
| **Computer Languages** | `C`, `C++`, `MATLAB`, `Python3`, `MySQL` |
| **Software & Tools** | `LaTeX`, `git` |
| **OS** | Linux/Unix, Windows |
| **Libraries** | `Eigen`, `LAPACK`, `OpenMP`, `Numpy`, `Scipy`, `TesnorFlow` |

## MATHEMATICAL PACKAGES

| **HODLR$d$D** | 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. |

## RELEVANT PhD COURSEWORK

Applied Statistics, Numerical Analysis, Numerical solutions of PDE(s), Numerical Linear Algebra, Advanced Differential Equations.

## ONLINE CERTIFICATIONS

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

## 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

- 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.

**REFERENCES**

References would be available on request.