RITESH KHAN

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RESEARCH EXPERIENCE

- **Charles University, Prague, Czech Republic (Czechia)** *Aug. 2025 – present*
  Post-doctoral Researcher, Department of Numerical Mathematics, Faculty of Mathematics and Physics.
  - **Mentor**: Dr. Erin Claire Carson
  - Supported by the European Union (ERC Grant) and the Charles University Research Centre for the project *"Analyzing and Exploiting Inexactness in Exascale Matrix Computations"*
- **Indian Institute of Technology Madras, Chennai, India** *Jan. 2025 – May 2025*
  Project Associate, Department of Data Science & AI (WSAI)

EDUCATION

- **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 PDEs, Numerical Linear Algebra, Advanced Differential Equations, etc.
- **Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI, formerly RKMVU), 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%
  - **Minors**: Physics, Chemistry.

RESEARCH INTERESTS

My research is interdisciplinary in nature and lies at the intersection of Mathematics and Computing. My broad research interests include numerical linear algebra, mixed-precision algorithms, hierarchical matrices, fast matrix computations, fast solvers, Krylov subspace methods, preconditioning, randomized algorithms, approximation techniques, high-performance computing, and boundary element methods.

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

2. Ritesh Khan, Erin Carson. *Hybrid hierarchical matrices with adaptive mixed precision storage*, https://arxiv.org/pdf/2604.09147.

1. Ritesh Khan, Sivaram Ambikasaran. *New hierarchical matrices for fast kernel matrix-vector products with applications: Applications to Gaussian Processes and Kernel Ridge Regression.*

TEACHING EXPERIENCE

Teaching Assistant at IIT Madras (2019-2024)

- Data Analysis & Visualization (Jan-May 2024).
- Numerical Linear Algebra (Jan-May 2022, July-Nov 2023).
- Series and Matrices (July-Nov 2020, Jan-May 2023).
- Applied Statistics (July-Nov 2022).
- Multi-variable Calculus (July-Nov 2021, Jan-May 2022).
- Numerical Methods and Scientific Computing (Jan-May 2021).

AWARDS AND ACHIEVEMENTS

- Awarded ***Smt Lakshmikutty Amma and Shri A Krishnankutty Nair Prize*** **for the Best Ph.D. thesis in Mathematics** at the 62^{nd} Convocation of IIT Madras, India, 2025.
- Awarded ***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 All India Rank (AIR)-50, Dec 2018 and All India Rank (AIR)-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 exam, 2019.
- Achieved 2^{nd} **rank** in the class in Master of Science (CGPA: 9.43/10), RKMVERI, 2017-2019.
- Qualified **Joint Admission test for M.Sc. in IITs (JAM)** with AIR-250, 2017 (not availed).
- Awarded ***INSPIRE Scholarship for Higher Education*** (among top 1% students nationwide in Class XII Board Exam), Department of Science & Technology, Govt. of India, 2014-2019.
- Achieved 3^{rd} **rank** (score Math + Science: 100% & overall score: 94%) in the Paschim Medinipur district of West Bengal, India in Class X Board Exam (Secondary Exam), WBBSE, 2012.

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

Name	Description of the package	Language
HODLRdD	A new $\mathcal{H}$ matrix algorithm for fast matrix-vector product in d dimensions. This code works for any user-given dimension d.	`C++`
$\mathcal{H}^2$ weak	A new $\mathcal{H}^2$ matrix algorithm for fast matrix-vector product.	`C++`
$\mathcal{H}$ hybrid	A new hybrid hierarchical matrix algorithm in d dimensions.	`C++`
amp$\mathcal{H}$	Adaptive mixed precision hybrid hierarchical matrix algorithm in d dimensions. This code works for any user-given dimension.	`MATLAB`

PRESENTATIONS

Minisymposium Talks

- *Hybrid hierarchical matrices with adaptive precision storage* (Topic: Numerical algorithms for PDE solvers on modern HPC architectures), The 16^{th} Czechoslovak Equadiff, June 29-July 3, 2026, Prague, Czech Republic.
- *Adaptive mixed precision hierarchical matrices* (Topic: Approximate Computing in Numerical Linear Algebra), International Linear Algebra Society (ILAS 2026), May 18-22, 2026, Virginia Tech, Blacksburg, Virginia, USA.

Invited/Contributed Talks

- *A new hierarchical matrix algorithm for accelerating kernel support vector machines*, Conference on Modern Kernel Methods and Applications, January 5-9, 2026, Hong Kong Baptist University, Kowloon, Hong Kong SAR.
- *Accelerating dense matrix computations using hierarchical matrices*, November 13 & 19, 2025, Charles University, Department of Numerical Mathematics, Prague, Czech Republic.
- *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, Charles University, Department of Numerical Mathematics, Prague, Czech Republic.
- *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, Robert Bosch Centre for Data Science and AI (RBCDSAI), IIT Madras, Chennai, India.

WORKSHOPS

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

CONFERENCE TRAVEL GRANTS

- Travel grant ($\approx 1,70,000$ INR) from Hong Kong Baptist University to attend the Conference on Modern Kernel Methods and Applications, Hong Kong, 2026.
- Travel grant ($\approx 2,00,000$ INR) from IIT Madras to attend the ICIAM 23, Tokyo, Japan, 2023.
- Travel grant ($\approx 50,000$ INR) from Charles University to attend Prague Workshop on Numerical Mathematics, Prague, Czech Republic, 2023.

MEMBERSHIPS

- International Linear Algebra Society (ILAS).

ONLINE CERTIFICATIONS

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

REFERENCES

References would be available on request.