Akash Saha

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Profile

A research scientist with over 7 years of experience in developing and analyzing machine learning models, with a focus on designing efficient optimization methods and algorithms for complex machine learning problems. My expertise spans both theoretical foundations and practical implementation of machine learning models and the relevant optimization techniques involved. Additional interests include exploring novel applications of machine learning and deep learning in emerging and under-explored areas. Skilled in contributing resourceful, innovative, and analytical solutions within collaborative research environments.

Work Experience

Research Scientist — Bengaluru, India
Sony Research India — *November 2023 – Till date*

- Developing a retraining-free merging approach for multi-lingual translation using pre-trained Sparse Mixture of Experts models.
- Working on domain adaptation approaches for improving capabilities of translation models focusing on low-resource languages.

Education

- **PhD** — Mumbai, India
  Industrial Engineering and Operations Research (IEOR), IIT Bombay — *January 2018 – August 2024*
- **Master of Science** — Roorkee, India
  Industrial Mathematics & Informatics, IIT Roorkee; CGPA: 9.104/10 — *July 2012 – May 2014*
- **Bachelor of Science** — Kolkata, India
  Mathematics Honours, Jadavpur University; Percentage: 78.25% — *July 2009 – June 2012*
- **Higher Secondary Examination (10+2)** — West Bengal, India
  Julien Day School, ISC Examination, New Delhi; Percentage: 91.14% — *June 2007 – May 2009*
- **Secondary Examination (10)** — West Bengal, India
  Julien Day School, ICSE Examination, New Delhi; Percentage: 94.71% — *May 2007*

Research Interests

- Deep Learning, Machine Learning, Explainability of learning models, Optimization Techniques.

PhD Research

Learning with Functional Data via Operator-valued Kernel Methods, Deep Neural Network Models: Theory, Techniques and Algorithms. **Supervisor** : Prof. P. Balamurugan

- **Generalized Operator-Valued Kernels (OVKs) and RKKS Framework:** Developed generalized (possibly indefinite) operator-valued kernels and a function-valued reproducing kernel Krein space (RKKS) framework for functional regression problems, including theoretical guarantees, a representer theorem, and the OpMINRES algorithm for practical optimization.
- **Graph-induced OVKs for Function-to-Function Regression:** Proposed graph-induced operator-valued kernels to model interactions among multiple input functions, combined with a sparsity-inducing framework to jointly learn regression functions and underlying graphical structures, supported by scalable optimization algorithms and generalization analysis.
- **Transformer-Based Deep Learning Approach for Domain Adaptation:** Designed a functional probabilistic transformer and an adaptive transfer framework to address source-free domain adaptation in functional regression, using transformer architectures with generative modeling to handle data scarcity and enable effective adaptation across domains.

Publications

- Saha, A. and Balamurugan, P., "*Learning Sparse Graphs for Functional Regression using Graph-induced Operator-valued Kernels.*" Transactions on Machine Learning Research (TMLR), 2024.
- Saha, A. and Balamurugan, P., "*Learning with Operator-valued Kernels in Reproducing Kernel Krein Spaces.*" Advances in Neural Information Processing Systems (NeurIPS), vol. 33, 2020. Accepted for Oral Presentation with acceptance rate: 1.1% (105/9454).

Reviewing Responsibility

- Serving as a reviewer for the Transactions on Machine Learning Research (TMLR) journal since January 2025.

Summer School/Workshops

- Attended "Research Week with Google 2023" organized by Google Research India in Bengaluru from January 29 -31, 2023.
- Participated in the LinkedIn-MSR-IISc Workshop on "Fairness, Accountability, Transparency and Ethics in Machine Learning" at IISc, Bangalore from January 9 - 10, 2020.
- Attended International Centre for Theoretical Sciences (ICTS) program on "Statistical Physics of Machine Learning" held in ICTS, Bangalore from January 6 - 10, 2020.
- Attended "Indo-French Centre for Applied Mathematics (IFCAM) summer school workshop on Mathematics for Data Science" at IISc, Bangalore from July 15 - 27, 2019.

Research Internship

Research Intern Bengaluru, India

Computational and Statistical Physics Lab, Indian Institute of Science *May 2013 – July 2013*

- Worked on spectral distribution of random matrices under the supervision of Prof. V. Murugesan

Key Courses

Machine Learning, Optimization Techniques, Stochastic Models, Deep Learning, Decision Analysis and Game Theory, IEOR for Health Care, Integer Programming, OR Applications in Infrastructural and Service Sectors, Real & Complex Analysis..

Teaching Experience

Teaching Assistant IIT Bombay

IEOR Department Courses *January 2018 – December 2023*

- IE 663: Advanced Topics in Deep Learning.
- IE 643: Deep Learning - Theory and Practice.
- IE 614: Linear Systems.
- IE 503: Operation Analysis.

Assistant Professor Telangana, India

Rajiv Gandhi University of Knowledge Technologies, Basar *July 2014 – December 2017*

- Courses taught: Discrete Mathematics, Numerical Methods, Probability & Statistics, Probability and Stochastic Processes, Engineering Mathematics.

MOOC Certifications

NPTEL Online Certification:

- Introduction to Data Analytics
- Introduction to Cryptology

Extra Curricular Activities

- Won Table Tennis PG General Championship for IEOR Department [2019 - 20].
- Placement Representative of Mathematics Department, IIT Roorkee [2013 - 14].

References

Prof. P. Balamurugan IEOR, IIT Bombay
balamurugan.palaniappan@iitb.ac.in
Dr. Pankaj Wasnik Principal Director, Sony Research India
pankaj.wasnik@sony.com
(More references can be provided on request.)