

Sudeb Majee

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Postdoctoral Researcher
University of North Carolina at Charlotte, USA
9201 University City Blvd., Charlotte, NC 28223

✉ sudebmajee@gmail.com, smajee@uncc.edu
☎ (+1) 980-267-0947, 📞 (+91) 8116352151
<https://sudebmajee.github.io/>

Current employment

- **University of North Carolina at Charlotte**
Postdoctoral Researcher
Charlotte, USA
Nov. 2023 - July 2025
 - **Project:** Solving inverse problems with deep learning approaches
 - **Supervisor:** Prof. Taufiqar Khan

Postdoctoral experience

- **Umeå University**
Postdoctoral Researcher
Umeå, Sweden
Sep. 2021 - Aug. 2023
 - **Project:** Generalization theory for deep learning in an application-specific setting
 - **Supervisors:** Dr. Niklas L.P. Lundström and Prof. Åke Brännström

Education

- **Indian Institutes of Technology Mandi**
Ph.D. Mathematics
Mandi, India
July 2015 - Dec. 2020
 - **Thesis title:** Development and Analysis of a Class of Telegraph-Diffusion Models: Application to Image Restoration
 - **Supervisor:** Prof. Rajendra K. Ray
- **Visva-Bharati University, Siksha-Bhavana**
Master of Science in Mathematics
Santiniketan, India
Aug. 2011 - June 2013
 - Graduated with 79.5% score, Grade $\mathcal{A}+$
- **University of Burdwan, Balarampur College**
Bachelor of Science in Mathematics
Purulia, India
Aug. 2006 - June 2010
 - Graduated with 62.75% score, First Class

Fellowships

- One year postdoctoral fellowship at TIFR Centre for Applicable Mathematics, Bangalore, India (Not used)
April 2021
- Two year postdoctoral fellowship under Kempe Foundations at Umeå University, Sweden
Sept. 2021 - Aug. 2023

Current research interests

- Inverse problems in medical imaging
- Bayesian inverse problems
- Deep neural networks
- Physics-informed neural networks
- Mathematical image processing
- Numerical Methods and Analysis of PDEs

Publications

Submitted publications

1. **Sudeb Majee**, Anuj Abhishek, Thilo Strauss, and Taufiqar Khan, MCMC-Net: Accelerating Markov Chain Monte Carlo with Neural Networks for Inverse Problems. <https://arxiv.org/abs/2412.16883>
2. **Sudeb Majee**, Åke Brännström, and Niklas L.P. Lundström, Well-posedness of a Variable-Exponent Telegraph Equation Applied to Image Despeckling. <https://arxiv.org/abs/2411.08175>

Peer-reviewed journal publications

1. S. K. Jain, **S. Majee**, R. K. Ray, and A. K. Majee, On the Existence and Uniqueness of Weak Solutions of a Coupled Diffusion System Related to Image Restoration, *Inverse Problems and Imaging (IPI)*, Early access: (2023) <https://doi.org/10.3934/ipi.2023027>
2. A. Kumar, **S. Majee**, and S. K. Jain, CDM: A Coupled Deformable Model for Image Segmentation with Speckle Noise and Severe Intensity Inhomogeneity, *Chaos, Solitons & Fractals*, 172: (2023) <https://doi.org/10.1016/j.chaos.2023.113551>
3. **S. Majee**, R. K. Ray, and A. K. Majee, A New Non-Linear Hyperbolic-Parabolic Coupled PDE Model for Image Despeckling, *IEEE Transactions on Image Processing (TIP)*, 31: 1963-1977 (2022) <https://doi.org/10.1109/TIP.2022.3149230>
4. **S. Majee**, S. K. Jain, R. K. Ray, and A. K. Majee, A Fuzzy Edge Detector Driven Telegraph Total Variation Model for Image Despeckling, *Inverse Problems and Imaging (IPI)*, 16(2): 367-396 (2021) <https://doi.org/10.3934/ipi.2021054>
5. **S. Majee**, S. K. Jain, R. K. Ray, and A. K. Majee, On the Development of a Coupled Nonlinear Telegraph-Diffusion Model for Image Restoration, *Computers & Mathematics with Applications (CAMWA)*, 80(7): 1745-1766 (2020) <https://doi.org/10.1016/j.camwa.2020.08.010>
6. **S. Majee**, R. K. Ray, and A. K. Majee, A Gray Level Indicator-Based Regularized Telegraph Diffusion Model: Application to Image Despeckling, *SIAM Journal on Imaging Sciences (SIIMS)*, 13(2): 844-870 (2020) <https://doi.org/10.1137/19M1283033>

Computer programming skills

- MATLAB, Python

Teaching

- I assisted in tutorial sessions in a postgraduate level two-week workshop on Partial Differential Equations: From Theory to Computation at IIT Mandi, India. <https://www.ncmath.org/archives/atms/2019/ist/pdeftc> *June 3 - 15, 2019*
- Teaching Assistant for Mathematics, IIT Mandi, India *July 2015 - June 2020*
- Guest Lecturer at Kashipur Michael Madhusudan Mahavidyalaya, India *July 2014 - July 2015*

Awards

Best Teaching Assistant Award, IIT Mandi *2019*

Other merits

- Secured all India rank-164 in Graduate Aptitude Test in Engineering (GATE) in Mathematical Science conducted by MHRD, Govt. Of India *2015*

Seminar organizer

- Organized a Special Session on “Recent Developments in Physics Informed Machine Learning for Inverse Problems” at the AMS Fall Eastern Sectional Meeting, University at Albany, Albany, NY. Co-organized with Prof. Taufiqar Khan. <https://meetings.ams.org/math/fall2024e/meetingapp.cgi/Symposium/952> *October 19 - 20, 2024*

Talks and seminars

- Accelerating Markov Chain Monte Carlo using Convolutional Neural Networks for Inverse Problems, University at Albany, Albany, NY, USA, AMS Sectional Meeting. <https://meetings.ams.org/math/fall2024e/meetingapp.cgi/Paper/39895> *Oct. 19, 2024*
- An overview of PDE-based approach to image restoration, Umeå University, Umeå, Sweden. <https://www.umu.se/en/research/groups/mathematical-modeling-and-analysis/events-and-seminars/> *Feb 2, 2022*
- Development and Analysis of a Class of Partial Differential Equation-Based Models: Application to Image Restoration, TIFR CAM Bangalore, India. <https://www.math.tifrbng.res.in/events/development-and-analysis-of-a-class-of-partial-differential-equation-based-models-application-to-image-restoration> *Jan 14, 2021*

Paper and poster presentations

- A Gray Level Indicator Based Telegraph Diffusion Model: Application to Poisson Noise Reduction (poster), School of Data Science research poster session, The University of North Carolina at Charlotte, USA. *April 26, 2024*
- Fractional Order Partial Differential Equations in Image Processing (poster), ANUSANDHAN-2017, Indian Institute of Technology Mandi, Himachal Pradesh, India. *4 March, 2017*

Conferences and workshops attended

- International Conference on Differential Equations and Control Problems: Modeling, Analysis, and Computation (ICDECP19), IIT Mandi, India. *June 17 - 19, 2019*
- Instructional School for Teachers (IST) On Partial Differential Equations: From Theory to Computation, sponsored by National Centre for Mathematics (NCM), IIT Mandi, India. <https://www.ncmath.org/archives/atms/2019/ist/pdefetc> *June 3 - 15, 2019*
- Advance Level Training Programme on Differential Equations with Application in Engineering, IIT Mandi, India. *July 1 - 8, 2016*
- Post Graduate Level Training Programme on Differential Equations (NPDE-TCA), sponsored by the Department of Science and Technology, Government of India. IIT Ropar, India. <https://www.iitrpr.ac.in/npde-2016> *May 16 - June 04, 2016*
- Advance Level Workshop on Controllability of Heat and Wave Equations (NPDE-TCE), sponsored by Department of Science and Technology, IIT Mandi, India. http://www.npde-tca.math.iitb.ac.in/html/workshop_mandi_2015venue.html *November 16 - 20, 2015*

Collaboration

- Dr. Ananta K. Majee, Assistant Professor, Department of Mathematics, Indian Institute of Technology Delhi, India, <https://sites.google.com/view/amajee/home>.
- Dr. Subit K. Jain, Assistant Professor, Department of Mathematics, National Institute of Technology Hamirpur, India, <https://portfolios.nith.ac.in/index.php?/nith/dr-subit-kumar-jain>.
- Dr. Åke Brännström, Professor, Department of Mathematics and Mathematical Statistics, Umeå University, Umeå, Sweden, <https://www.umu.se/en/staff/ake-brannstrom/>.
- Dr. Thilo Strauss, Associate Professor, School of AI and Advanced Computing, Xi'an Jiaotong-Liverpool University ((XJTLU)), China, <https://scholar.xjtlu.edu.cn/en/persons/ThiloStrauss>.
- Dr. Anuj Abhishek, Assistant Professor, Department of Mathematics, Applied Mathematics, and Statistics, Case Western Reserve University, USA, <https://mathstats.case.edu/faculty/anuj-abhishek/>.

Referees

1. **Dr. Rajendra K. Ray**

Professor, School of Mathematical and Statistical Sciences, Indian Institute of Technology Mandi, Mandi, Himachal Pradesh, India-175005, <http://faculty.iitmandi.ac.in/~rajendra/>

☎ +91-1905-267041

✉ rajendra@iitmandi.ac.in

2. **Dr. Taufiquar Khan**

Professor, Department of Mathematics and Statistics, The University of North Carolina at Charlotte, Charlotte, USA-28223, <https://math.charlotte.edu/directory/taufiquar-khan>

☎ +1-7046870635

✉ taufiquar.khan@charlotte.edu

3. **Dr. Åke Brännström**

Professor, Department of Mathematics and Mathematical Statistics, Umeå University, Umeå, Sweden-90187, <https://www.umu.se/personal/ake-brannstrom/>

☎ +46-907867862

✉ ake.brannstrom@umu.se

4. **Dr. Ananta K. Majee**

Assistant Professor, Department of Mathematics, Indian Institute of Technology Delhi, Delhi, India-110016, <https://sites.google.com/view/amajee/home>

☎ +91-11-26591428

✉ majee@maths.iitd.ac.in

5. **Dr. Niklas L.P. Lundström**

Associate Professor, Department of Mathematics and Mathematical Statistics, Umeå University, Umeå, Sweden- 90187, <https://www.umu.se/personal/niklas-lundstrom/>

☎ +46-907866386

✉ niklas.lundstrom@umu.se