SUBHADIP MUKHERJEE

Emails: smukherjee@ece.iitkgp.ac.in, subhadipju@gmail.com

Assistant Professor Grade I

Department of Electronics and Electrical Communication Engineering ⋄ IIT-Kharagpur, India

Updated on 21 July 2023

Work Experience

IIT Kharagpur, India *May 2023 – Present*
Assistant Professor (Grade I)
Department of Electronics and Electrical Communication Engineering

University of Bath, UK *September 2022 – April 2023*
Lecturer (Assistant Professor)
Department of Computer Science

University of Cambridge, UK *June 2020 - August 2022*
Research Associate
Department of Applied Mathematics and Theoretical Physics (DAMTP)

Royal Institute of Technology (KTH), Sweden *August 2018 - May 2020*
Postdoctoral researcher
Department of Mathematics

Education

Indian Institute of Science (IISc.), Bangalore, India *August 2012 - July 2018*
Ph.D. in sparsity-regularized inverse problems <div style="text-align:right">Overall GPA: 7.60/8</div>
Department of Electrical Engineering
Thesis: Sparsity-driven solutions to linear and quadratic inverse problems

Indian Institute of Science (IISc.), Bangalore, India *August 2010 - July 2012*
Master of Engineering in Signal Processing <div style="text-align:right">Overall GPA: 7.80/8</div>
Department of Electrical Communication Engineering
Thesis: Phase retrieval with sparsity constraints

Jadavpur University, Kolkata, India *July 2006 - June 2010*
Bachelor of Engineering, Department of Electrical Engineering <div style="text-align:right">Overall GPA: 9.01/10</div>
Project: Designing fuzzy PID controllers for robotic arms

Supervision and mentoring

- Dec. 2022–Present: Alexandre Vieira Pereira, **Ph.D. student** (**co-supervised** with Prof. Marco Stampanoni at ETH Zürich) (topic: Deep learning for phase contrast tomography).

- Jul. 2022–Present: Mohammad Sadegh Salehi, **Ph.D. student** (**co-supervised** with Prof. Matthias J. Ehrhardt at the University of Bath) (topic: Bilevel learning).

- Oct. 2021–Present: Hong Ye Tan, **Ph.D. student** (**co-supervised** with Prof. Carola-Bibiane Schönlieb at the University of Cambridge) (topic: Learned optimization, theory of deep learning).

- Aug. 2022–May 2023: Anthony Ntalamagkas, **UG student** at the University of Bath (**supervised** final-year dissertation) (topic: Conditional diffusion models for uncertainty quantification in X-ray CT reconstruction).

- Aug. 2022–Present: Ziruo Cai, **visiting Ph.D. student** from SJTU, China, (**mentored** with Prof. Carola-Bibiane Schönlieb and Prof. Xiaoqun Zhang) (topic: Data-driven Bayesian imaging).

- Oct. 2021–Mar. 2022: Stefano van Gogh, **visiting Ph.D. student** from ETH Zürich (**mentored** with Prof. Marco Stampanoni) (topic: Machine learning for phase-contrast CT).

- Apr.–Oct. 2021: Arthur Conmy, **UG summer project student** at the University of Cambridge (topic: StyleGAN inversion for imaging inverse problems).

- Feb.-Mar. 2021: Course project for Ph.D. students on *uncertainty quantification for inverse problems with data-driven convex priors* at Cambridge.

- Aug.-Sep. 2019: UG summer project on *data-driven convex regularization* at Cambridge.

Teaching

- Aug. 2023 - Dec. 2023: Statistical Signal Processing (EC61207), PG course, IIT Kharagpur.

- Aug. 2023 - Dec. 2023: (UG) Basic Electronics Laboratory (EC29201), IIT Kharagpur [jointly].

- Feb. 2023 - May 2023: Master's course on Bayesian Machine Learning, University of Bath, UK [jointly].

- Oct. 2022 - Jan. 2023: Master's course on Machine Learning, University of Bath, UK [jointly].

- Co-developed course contents for a master's level course on image analysis, to be offered at DAMTP, University of Cambridge, in 2024.

- Co-designed a master's level course on the mathematics of deep learning, to be offered at DAMTP, University of Cambridge, in 2023.

- Served as the teaching assistant (TA) for the following (graduate level) courses at IISc. Bangalore:

  - Jan. to Apr. 2015: Convex Optimization
  - Aug. to Dec. 2014: Linear and Nonlinear Optimization
  - Jan. to Apr. 2012: Time-Frequency Analysis

Professional activities

- Member of the AI and image analysis team of the all-in-one cancer imaging project (`https://sites.google.com/cam.ac.uk/all-in-one/home`).

- Co-organizer of the ICIAM mini-symposium on recent advances in data-driven solutions for inverse problems (to be held in August-2023).

- Co-organizer of the SIAM-Imaging mini-symposium on the provable properties of learned reconstruction approaches for inverse problems (March-2022).

- Co-organizer of the London Mathematical Society (LMS) workshop on the mathematics of deep learning to be held at the Isaac Newton Institute, University of Cambridge, in March-2022.

- Reviewed for IEEE Signal Processing Letters, IEEE Transactions on Image Processing, SIAM Journal of Imaging Sciences, SIAM Journal on Mathematics of Data Science, Journal of Mathematical Imaging and Vision, ICASSP, ICIP, SPCOM, and EUSIPCO.

- Student co-organizer of the 4th Electrical Sciences Divisional Symposium, IISc. (2013).

Invited research talks (past and upcoming)

- September 2023: Applied Inverse Problems Conference in Göttingen (two invited talks)

- August 2023: International Congress on Industrial and Applied Mathematics (ICIAM), mini-symposium on *mathematics for limited, incomplete, and complex data.*

- June 2023: INdAM (Italian Maths. Research Institute) workshop on *learning for inverse problems.*

- February 2023: British Applied Mathematics Colloquium, Bristol 2023.

- 30 January - 3 February 2023: Workshop on *Rich and Nonlinear Tomography (RNT) in Radar, Astronomy and Geophysics* at the University of Cambridge.

- 24-26 January 2023: Workshop on *Interfacing Bayesian statistics, machine learning and applied analysis, and the challenges of solving blind or semi-blind inverse problems* at ICMS, Edinburgh.

- 27 September 2022: SIAM Conference on Mathematics of Data Science, mini-symposium on *inverse problems and machine learning.*

- 13 September 2022: University College London (UCL) workshop in the area of *modern image reconstruction algorithms and practices for medical imaging.*

- 26 July 2022: CMIH Academic Engagement Event, University of Cambridge, on *deep learning for image reconstruction in X-ray CT.*

- 26 May 2022: International Conference on Inverse Problems: Modeling and Simulation (IPMS) [topic: Data-driven adversarial regularization for imaging inverse problems]

- 16 April 2022: Winter School of AI and Robotics, IIT Kharagpur, on *machine learning for inverse problems in imaging.*

- 21 March 2022: SIAM Conference on Imaging Science (topic: Adversarially learned regularization for inverse problems)

- 11 March 2021: Oberwolfach Workshop on deep learning and inverse problems (jointly with Prof. Carola-Bibiane Schönlieb).

- 9 March 2021: Pre-GAMM talk on introduction to deep learning for inverse problems (jointly with Dr. Christian Etmann).

- 14 August 2020: International Conference in Monte Carlo & Quasi-Monte Carlo Methods in Scientific Computing organized by the Univ. of Oxford (topic: Unsupervised deep learning for inverse problems).

Awards and achievements

- Offered full-time position as an Assistant Professor (Lecturer) from the University of Bath (Dept. of Computer Science), UK; and the University of Glasgow (School of Computing), UK.

- Best Ph.D. thesis award (honorable mention) in the International Conf. on Signal Processing and Communications (SPCOM), 2020.

- *Tata Consultancy Services Ph.D. Fellowship* (Aug. 2013 – May 2018).

- *IEEE Publication Award* by the IEEE SPS Bangalore Chapter for the year 2015.

- *Prof. I.S.N. Murthy medal* for being the best master's student (in Signal Processing) in the Department of Electrical Communication Engineering, IISc. (2012).

- All-India rank 13 in the GATE examination (2010) in the branch of Electrical Engineering.

- University medal for the 2$^{\text{nd}}$ position in a class of 101 students in undergrad studies.

Computing skills

- Scientific Computing and Programming Languages: Proficient in Python and Matlab.

- Experienced in working with the PyTorch deep learning framework.

- Well-versed with collaborative software development tools (such as git).

- Softwares and operating systems: LaTeX, MS-Excel, well-versed with Linux, Mac-OSX, and Windows.

Codes for some selected algorithms that I developed can be found on: `https://github.com/Subhadip-1`.

Publications

Journal papers (published/accepted)

1. H. Y. Tan, **S. Mukherjee**, J. Tang, and C.-B. Schönlieb, "Data-driven mirror descent with input-convex neural networks," *SIAM Journal on Mathematics of Data Science*, vol. 5, no. 2, pp. 558–587, 2023 [IF: 3.921].

2. S. van Gogh, M. Rawlik, A. Pereira, S. Spindler, **S. Mukherjee**, M.-C. Zdora, M. Stauber, R. Alaifari, Z. Varga, and M. Stampanoni, "Clinical-dose grating interferometry breast CT with fused intensity-based iterative reconstruction," *Optics Express*, vol. 31, issue 5, pp. 9052–9071, 2023 [IF: 3.833].

3. **S. Mukherjee***, A. Hauptmann*, O. Öktem, M. Pereyra, and C.-B. Schönlieb, "Learned reconstruction methods with convergence guarantees: A survey of concepts and applications," *IEEE Signal Processing Magazine*, vol. 40, no. 1, pp. 164–182, Jan. 2023 [IF: 15.204].

4. D. Bandyopadhyay, **S. Mukherjee**, G. Singh, and D. Coomes, "The rapid vegetation-line shift in response to glacial dynamics and climate variability in Himalaya between 2000 and 2014," *Environmental Monitoring and Assessment (Springer)*, vol 195, issue 1, pp. 1–18, Jan. 2023 [IF: 3.307].

5. S. van Gogh, **S. Mukherjee**, J. Xu, Z. Wang, M. Rawlik, Z. Varga, R. Alaifari, C.-B. Schönlieb, and M. Stampanoni, "Iterative phase contrast CT reconstruction with novel tomographic operator and data-driven prior," PLOS-ONE, vol. 17, no. 9, Aug. 2022 (DOI: `https://doi.org/10.1371/journal.pone.0272963`) [IF: 3.752].

6. S. van Gogh, Z. Wang, M. Rawlik, C. Etmann, **S. Mukherjee**, C.-B. Schönlieb, F. Angst, A. Boss, and M. Stampanoni, "INSIDEnet: Interpretable NonexpanSIve Data-Efficient network for denoising in Grating Interferometry Breast CT," *Medical Physics*, vol. 49, issue 6, pages 3729–3748, Jan. 2022 [IF: 4.506].

7. J. Sadasivan, **S. Mukherjee**, and C. S. Seelamantula, "Signal denoising using the minimum probability-of-error criterion," *APSIPA Trans. Signal and Information Processing*, vol. 9, Jan. 2020 (DOI: `https://doi.org/10.1017/ATSIP.2019.27`) [IF: 3.217].

8. **S. Mukherjee** and C. S. Seelamantula, "Quantization-aware phase retrieval," *Special Issue of Intl. J. Wavelets, Multires., and Information Processing* (invited paper), vol. 20, no. 3, Jul. 2020 [IF: 1.408].

9. **S. Mukherjee** and C. S. Seelamantula, "Phase retrieval from binary measurements," *IEEE Signal Processing Letters*, vol. 25, no. 3, pp. 348–352, Mar. 2018 [IF: 3.670].

10. **S. Mukherjee**, R. Basu, and C. S. Seelamantula, "ℓ_1-K-SVD: A robust dictionary learning algorithm with simultaneous update," *Signal Processing (Elsevier)*, vol. 123, pp. 42–52, Jun. 2016 [IF: 4.729].

11. **S. Mukherjee** and C. S. Seelamantula, "Fienup algorithm with sparsity constraints: Application to frequency-domain optical-coherence tomography," *IEEE Transactions on Signal Processing*, vol. 62, no. 18, pp. 4659–4672, Sep. 2014 [IF: 5.230].

12. **S. Mukherjee** and C. S. Seelamantula, "A non-iterative phase retrieval algorithm for minimum-phase signals using the annihilating filter," *Sampling Theory in Signal and Image Processing (Special Issue)*, pp. 165–193, vol. 11, 2012.

Conference/workshop papers (published/accepted)

1. V. Stergiopoulou, **S. Mukherjee**, L. Calatroni, and L. Blanc-Féraud, "Fluctuation-based deconvolution in fluorescence microscopy using plug-and-play denoisers," accepted to the 9th *International Conf. on Scale Space and Variational Methods in Computer Vision (SSVM)*, May 2023.

2. H. Y. Tan, **S. Mukherjee**, J. Tang, A. Hauptmann, and C.-B. Schŭlieb, "Robust data-driven accelerated mirror descent," accepted to the *IEEE International Conf. on Acoust., Speech, and Signal Processing* (ICASSP), 2023.

3. S. van Gogh, **S. Mukherjee**, M. Rawlik, Z. Wang, J. Xu, Z. Varga, C.-B. Schönlieb, and M. Stampanoni, "Iterative grating interferometry-based phase contrast CT reconstruction with a data-driven denoising prior," accepted to the *7th International Conference on Image Formation in X-Ray Computed Tomography*, Baltimore, June 2022.

4. A. Conmy, **S. Mukherjee**, and C.-B. Schönlieb, "StyleGAN-induced data-driven regularization for inverse problems," arXiv:2110.03814v1, Oct. 2021 (accepted to the *IEEE International Conf. on Acoust., Speech, and Signal Processing* (ICASSP) 2022).

5. **S. Mukherjee***, M. Carioni*, O. Öktem, and C.-B. Schönlieb, "End-to-end reconstruction meets data-driven regularization for inverse problems," accepted to NeurIPS, Dec. 2021.

6. **S. Mukherjee**, C.-B. Schönlieb, and M. Burger, "Learning convex regularizers satisfying the variational source condition for inverse problems," accepted to the NeurIPS Workshop on Deep Learning and Inverse Problems, Dec. 2021.

7. **S. Mukherjee**, O. Öktem, and C.-B. Schönlieb, "Adversarially learned iterative reconstruction for imaging inverse problems," accepted to *the 8th International Conf. on Scale Space and Variational Methods in Computer Vision (SSVM)*, May 2021.

8. V. Kishore, **S. Mukherjee**, and C. S. Seelamantula, "PhaseSense–Signal reconstruction from phase-only measurements via quadratic programming," in *Proc. International Conf. on Signal Processing and Communications (SPCOM)*, Jul. 2020.

9. J. Sadasivan, **S. Mukherjee**, and C. S. Seelamantula, "Speech enhancement using the minimum probability of error criterion," in *Proc. InterSpeech*, Sep. 2018.

10. **S. Mukherjee** and C. S. Seelamantula, "A Singular value relaxation technique for learning sparsifying transforms," in *Proc. International Conf. on Signal Processing and Communications (SPCOM)*, Jul. 2018.

11. **S. Mukherjee**, A. K. Sekuboyina, and C. S. Seelamantula, "Binary compressive sensing and super-resolution with unknown threshold," in *Proc. International Conf. on Signal Processing and Communications (SPCOM)*, Jul. 2018.

12. **S. Mukherjee**, S. Shit, and C. S. Seelamantula, "PhaseSplit: A variable splitting framework for phase retrieval," in *Proc. IEEE International Conf. on Acoust., Speech, and Signal Processing (ICASSP)*, Apr. 2018.

13. **S. Mukherjee** and C. S. Seelamantula, "Sparse phase retrieval algorithms for frequency-domain optical coherence tomography," in *Proc. Focus on Microscopy (FOM)*, Mar. 2018.

14. **S. Mukherjee**, D. Mahapatra, and C. S. Seelamantula, "DNNs for sparse coding and dictionary learning," in *Proc. Bayesian Deep Learning Workshop, NeurIPS*, Dec. 2017.

15. **S. Mukherjee** and C. S. Seelamantula, "Learning transforms with a specified condition number," in *Proc. Signal Process. with Adapt. Sparse Struct. Repr. (SPARS)*, Jun. 2017.

16. **S. Mukherjee** and C. S. Seelamantula, "A divide-and-conquer dictionary learning algorithm and its performance analysis," in *Proc. IEEE International Conf. on Acoust., Speech, and Signal Processing (ICASSP)*, pp. 4712–4716, Mar. 2016.

17. J. Sadasivan, **S. Mukherjee**, and C. S. Seelamantula, "Joint dictionary training for bandwidth extension of speech signals," in *Proc. IEEE International Conf. on Acoust., Speech, and Signal Processing (ICASSP)*, pp. 5925–5929, Mar. 2016.

18. **S. Mukherjee**, and C. S. Seelamantula, "Convergence-rate analysis of smoothed LASSO," in *Proc. IEEE National Conf. on Communications (NCC)*, pp. 1–6, Mar. 2016.

19. J. Sadasivan, **S. Mukherjee**, and C. S. Seelamantula, "An optimum shrinkage estimator based on minimum probability of error criterion and application to signal denoising," in *Proc. IEEE International Conf. on Acoust., Speech, and Signal Processing (ICASSP)*, pp. 4249–4253, May 2014.

20. **S. Mukherjee** and C. S. Seelamantula, "A split-and-merge dictionary learning algorithm for sparse representation: Application to image denoising," in *Proc. 19th International Conf. on Digital Signal Process. (DSP)*, pp. 310–315, 2014.

21. B. A. Shenoy, **S. Mukherjee**, and C. S. Seelamantula, "Phase retrieval for a class of 2-D signals characterized by first-order difference equations," in *Proc. IEEE International Conf. on Image Processing (ICIP)*, pp. 325-329, Sep. 2013.

22. **S. Mukherjee** and C. S. Seelamantula, "Fixed-point algorithms for sparse-signal phase retrieval," in *Proc. Signal Process. with Adapt. Sparse Struct. Repr. (SPARS)*, 2013.

23. **S. Mukherjee** and C. S. Seelamantula, "An iterative algorithm for phase retrieval with sparsity constraints: Application to frequency domain optical coherence tomography," in *Proc. IEEE International Conf. on Acoust., Speech, and Signal Processing (ICASSP)*, Mar. 2012.

Referees

1. **Prof. Carola-Bibiane Schönlieb** (Postdoc supervisor)
   Professor, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, UK
   Email: cbs31@cam.ac.uk

2. **Prof. Ozan Öktem** (Postdoc supervisor)
   Associate Professor, Department of Mathematics, KTH – Royal Institute of Technology, Sweden
   Email: ozan@kth.se

3. **Prof. Chandra Sekhar Seelamantula** (Ph.D. supervisor)
   Professor, Department of Electrical Engineering, IISc., Bangalore
   Email: css@iisc.ac.in