

Mangal Prakash

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PROFESSIONAL EXPERIENCE

Team Lead (ML)

Oxford, UK

Exscientia

Nov 2022 – Present

- Line managed cross-functional team of 4 AI research scientists and senior scientists to execute projects in small molecule property prediction domain.
- Led or collaborated on upto 4 concurrent projects in areas such as development of generative models for protein-ligand pose prediction, active learning for compound selection and development of predictive models for ligand property predictions.
- Spearheaded development of novel Deep Learning based algorithms for molecular representation learning.
- Conceptualized and launched projects with computational designers, medicinal chemists, research software engineers that may be important for company's future value proposition.
- Led the efforts for hiring of research scientists and interns.
- Supervised an intern on a research project for development of novel clinical image segmentation algorithms (paper in preparation).

AI Research Scientist

Oxford, UK

Exscientia

Aug 2021 – Present

- Created an extensive benchmark to assess traditional and ML-based docking algorithms for self-docking.
- Developed diffusion model based small molecule docking algorithms for fast and accurate ML-based pose prediction.
- Improved the in-house clinical imaging platform by building novel and scalable supervised and unsupervised Deep Learning based image restoration models to increase image analysis throughput.
- Conceptualized and executed a project to ingest and learn from multiple clinical data modalities including molecular graphs and microscopy images for patient stratification and *in-silico* drug screening.

EDUCATION

Max-Planck Institute (CBG)/ Technische Universität Dresden

Dresden, Germany

PhD in Computer Science — Summa Cum Laude

Aug 2017 – July 2021

University of Minnesota, Twin Cities

Minneapolis, USA

MS in Electrical Engineering

Aug 2014 – Dec 2016

National Institute of Technology, Durgapur

Durgapur, India

B.Tech in Electrical Engineering

Aug 2010 – April 2014

SELECTED ACADEMIC PROJECTS

Unsupervised deep image restoration | *PyTorch, Generative models, Deep Learning*

Aug 2019 – July 2021

- Developed a novel state-of-the-art approach to model unsupervised diversity denoising and artefact removal tasks within variational autoencoder framework using learned/estimated model of imaging noise. Results published in ICLR 2021 and ICLR 2022.
- Introduced Gaussian Mixture Models based parametric representation of camera noise characteristics for training deep learning based algorithms for fully unsupervised denoising. Results published in IEEE ISBI 2020.

Few shot cell and nuclei segmentation | *Python, TensorFlow, Deep Learning*

Jan 2019 – June 2020

- Analyzed the impact of deep learning based unsupervised denoising for cell segmentation in presence of limited ground truth annotations. Results published in IEEE ISBI 2020.
- Implemented end-to-end training schemes for joint unsupervised denoising and segmentation with very limited amount of segmentation ground truth available. Results published in BIC@ECCV 2020.

Consensus segmentation | *Python, Java, PyTorch, ILP solvers*

Aug 2018 – July 2021

- Created a framework for obtaining diverse plausible segmentation for objects of interest using only noisy input images. Results published in ICLR 2021.
- Working on an ILP based optimization formulation for segmentation fusion from different segmentation sources using active learning based framework.

SELECTED PUBLICATIONS (*google scholar citations: 429, h-index: 11, i-10 index: 13*)

- M. Prakash**, M. Delbracio, P. Milanfar, and F. Jug. *Interpretable Unsupervised Diversity Denoising and Artefact Removal*. International Conference on Learning Representations (ICLR) 2022 (**Selected for Spotlight presentation**).
- M. Prakash**, A. Krull, and F. Jug. *Fully Unsupervised Diversity Denoising with Convolutional Variational Autoencoders*. International Conference on Learning Representations (ICLR) 2021.
- S. Haller, **M. Prakash**, L. Hutschenreiter, T. Pietzsch, C. Rother, F. Jug, P. Swoboda, and B. Savchynskyy. *A Primal-Dual Solver for Large-Scale Tracking-by-Assignment*. Proceedings of the 24th International Conference on Artificial Intelligence and Statistics (AISTATS) 2020.
- M. Prakash**, T-O. Buchholz, D. Schmidt, A. Krull, and F. Jug. *DenoiSeg: Joint Denoising and Segmentation*. Bio Image Computing Workshop@ECCV 2020 (**Selected for oral presentation**).
- M. Prakash**, M. Lalit, P. Tomancak, A. Krull, and F. Jug. *Fully Unsupervised Probabilistic Noise2Void*. IEEE International Symposium on Biomedical Imaging (ISBI) 2020 (**Selected for oral presentation**).
- M. Prakash**, T-O. Buchholz, M. Lalit, P. Tomancak, F. Jug, and A. Krull. *Leveraging Self-Supervised Denoising for Image Segmentation*. IEEE International Symposium on Biomedical Imaging (ISBI) 2020.
- A. Krull, T. Vicar, **M. Prakash**, M. Lalit, and F. Jug. *Probabilistic Noise2Void: Unsupervised Content-Aware Denoising*. Frontiers in Computer Science, 2020.
- A. Jain, V. Ulman, A. Mukherjee, **M. Prakash**, M.B. Cuenca, L.G. Pimpale, S. Münster, R. Haase, K.A. Panfilio, F. Jug, S.W. Grill, P. Tomancak, and A. Pavlopoulos. *Regionalized tissue fluidization is required for epithelial gap closure during insect gastrulation*. Nature Communications, 2020.
- H. Vignes, C. Vagena-Pantoula, **M. Prakash**, C. Norden, F. Jug, and J. Vermot. *Extracellular Mechanical Forces Drive Endocardial Cell Volume Decrease During Cardiacvalve Morphogenesis*. Developmental Cell, 2021.
- M. Slabodnick, S. Tintori, **M. Prakash**, C. Higgins, A. Chen, T. Cupp, T. Wong, E. Bowie, F. Jug, B. Goldstein. *Afadin and zyxin contribute to coupling between cell junctions and contractile actomyosin networks during apical constriction*. PLOS Genetics, 2023.
- D. Alves-Afonso, A. Ryan, A. Lahola-Chomiak, **M. Prakash**, F. Jug, C. Modes, and J. Tabler. *Collagen structure maintains mesenchymal stem cell fate and nuclear shape in embryonic sutures*. Under review at Cell Reports.

INVITED TALKS

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| Unsupervised Diversity Denoising and Artefact Removal with Generative Models <i>SIAM ISS2</i> | Mar 2022 |
| Fully Unsupervised Diversity Denoising with Variational Autoencoders <i>MDC Berlin</i> | June 2021 |
| Leveraging Self-Supervised Denoising for Image Segmentation <i>QBI, University of Oxford</i> | Jan 2021 |

ACADEMIC COMMUNITY INVOLVEMENT

- Reviewer for **ICML 2023, NeurIPS 2022, ICLR 2022, NeurIPS 2021, ISBI 2021**
- Teaching Assistant for different courses in graduate school and mentor for Deep Learning and image processing hackathons

SCHOLARSHIPS AND AWARDS

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| College of Science and Engineering Fellowship <i>University of Minnesota for graduate studies</i> | 2014-2015 |
| Graduate Research and Teaching Assistantship <i>University of Minnesota for graduate studies</i> | 2015-2016 |
| Summer Research Fellowship <i>Awarded by Indian Academy of Sciences but could not undergo internship</i> | 2013 |
| Merit certificate <i>Awarded by CBSE to top 0.1% students nationwide for matriculation exams</i> | 2007 |

PROFICIENT TECHNICAL SKILLS

- Programming Languages:** Python (advanced), Java (advanced), MATLAB (basic)
- Deep Learning Frameworks:** PyTorch (advanced), Keras (good), TensorFlow (good)
- Developer Tools:** Git (advanced), Github (advanced), PyCharm (advanced), Eclipse (advanced)
- Bioimage Analysis Softwares:** Fiji/ImageJ (advanced), Ilastik (advanced), Labkit (advanced)
- Others:** Light sheet microscopy (basic), Latex (advanced)