# Mangal Prakash

mangalcrj@gmail.com | linkedin.com/in/mangalprakash | mangalp.github.io | github.com/mangalp

## Experience

**AI Research Scientist** — Oxford, UK
*Exscientia* — *Aug 2021 – Present*

- Improved the clinical imaging platform by building novel and scalable image restoration models and multimodal approaches for virtual assessment of drug phenotypic response.
- Developed a deep learning model for automatic information extraction from patent images.
- Worked on creating alignment free approaches to measure protein pocket similarity for selectivity and bispecifics.

## Education

**Max-Planck Institute (CBG)/ Technische Universität Dresden** — Dresden, Germany
*PhD in Computer Science, defense scheduled for Mar 2022 (Advisor: Dr. Florian Jug)* — *Aug 2017 – July 2021*

**University of Minnesota, Twin Cities** — Minneapolis, USA
*MS in Electrical Engineering (Advisor: Prof. Murti V. Salapaka)* — *Aug 2014 – Dec 2016*

**National Institute of Technology, Durgapur** — Durgapur, India
*B.Tech in Electrical Engineering* — *Aug 2010 – April 2014*

## Selected Projects

**Unsupervised deep image restoration** | *Python, PyTorch, Generative models, Deep Learning* — Aug 2019 – 2021

- Developed a novel state-of-the-art approach to model unsupervised diversity denoising and artefcat 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 – Present

- 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 – Present

- 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.

**Optimal resource allocation for smart grids** | *MATLAB* — Aug 2014 – Nov 2016

- Developed a distributed scheme that enables a distributed energy resource in a network to arrive at viable power reference commands while satisfying local constraints on its generation and loads it has to service. Results published at IEEE Transactions on Control of Network Systems 2020, Allerton Conference 2018, SmartGridComm 2017.

## Publications

**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.* Under review at Developmental Cell, 2021.

D. Afonso, A. Ryan, A. Lahola-Chomiak, **M. Prakash**, F. Jug, C. Modes, and J. Tabler. *Tissue scale properties of the extracellular matrix regulates nuclear shape, organisation and fate in the embryonic midline sutures* . BioRxiv, 2021.

**M. Prakash**, S. Talukdar, S. Attree, V. Yadav, and M.V. Salapaka. *Distributed stopping criterion for consensus in the presence of delays.* IEEE Transactions on Control of Network Systems, 2020.

**M. Prakash**, S. Talukdar, S. Attree, S. Patel, and M.V. Salapaka. *Distributed stopping criterion for ratio consensus.* 56th Annual Allerton Conference on Communication, Control, and Computing, 2018.

S. Patel, S. Attree, S. Talukdar, **M. Prakash**, and M.V. Salapaka. *Distributed apportioning in a power network for providing demand response services.* IEEE International Conference on Smart Grid Communications (SmartGridComm), 2017.

S. Talukdar, **M. Prakash**, D. Materassi, and M.V. Salapaka. *Reconstruction of networks of cyclostationary processes.* 54th IEEE Conference on Decision and Control (CDC), 2015.

## Invited Talks

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

## Scholarships and Awards

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

## Training, Workshops and Hackathons

**EMBO Practical Course Light Sheet Microscopy Dresden** Dresden, Germany, Aug 2018

**Deep learning Bootcamp** Dresden, Germany, Sep 2017

**DAIS/KNIME Image Processing Hackathon** Konstanz 2017, Dresden 2019, Germany

## Teaching Experience

**Mentor for Dresden Deep Learning Hackathon.** Sep 2019
*TU Dresden* *Dresden, Germany*
**Teaching Assistant for the course Signals and Systems.** Aug 2016 – Dec 2016
*University of Minnesota* *Minneapolis, USA*
**Teaching Assistant for the course State Space Control System Design.** Jan 2016 – May 2016
*University of Minnesota* *Minneapolis, USA*

## 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)