# Mangal Prakash

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## Summary

Research leader and hands-on ML contributor in drug discovery and personalised medicine, with expertise in foundation models, multimodal learning, and biologically grounded predictive modeling. I build scalable ML solutions across omics, molecular structure, gene regulation, and clinical data to advance therapeutic design and delivery. Combining strategic leadership with deep technical work, I drive innovation through cross-functional collaborations while mentoring emerging scientists and contributing to impactful research.

## Professional Experience

**Principal Scientist** — High Wycombe, UK
*Johnson & Johnson Innovative Medicine* — *July 2024 – Present*

- Lead a team of three research scientists and mentor two junior colleagues, combining hands-on ML research with people and project leadership.
- Led development of foundation models for gRNA on-target efficiency prediction in Cell Therapy, improving CRISPR experiment performance and enabling efficient gRNA design (paper in preparation).
- Initiated and led 5 cross-functional projects across multi-modal ML for Antibody Drug Conjugate (ADC) optimization, antigen developability, Gene Regulatory Network (GRN) inference for target prioritization in Oncology, and predictive modeling for antibody manufacturing — driving innovation across the pipeline.
- Co-initiated an academic collaboration on novel ML methods for multi-modal toxicity prediction with limited data, supporting safer and more effective drug design.
- Recruited and managed 2 interns whose work resulted in 2 ICLR 2025 papers, advancing the field and expanding internal research capabilities.

**Senior Scientist** — High Wycombe, UK
*Johnson & Johnson Innovative Medicine* — *Nov 2023 – June 2024*

- Line managed one research scientist and mentored a junior colleague, contributing to team development and technical growth.
- Developed a first-of-its-kind foundation model leveraging biological priors for antibody expression prediction from mRNA, achieving state-of-the-art accuracy, validated in internal production, and applicable across a broad project portfolio — accelerating antibody design cycles.
- Co-developed a computationally efficient model for long-context, all-atom geometric modeling, enabling scalable structural analysis of large biomolecules.
- Published two papers, including one recognized with the *Outstanding Paper Award* at the GRaM Workshop @ ICML 2024, shaping research directions in therapeutic ML.

**AI Research Scientist (Team Lead)** — Oxford, UK
*Exscientia* — *Aug 2021 – Oct 2023*

- Line-managed and led a team of 3 AI researchers, driving projects in molecular property prediction, and clinical data modeling.
- Contributed to initiatives in generative modeling, active learning for compound selection, and multimodal ML for patient stratification and in-silico screening.
- Developed novel deep learning methods for molecular representations and clinical image restoration.
- Built and deployed tools supporting 3 pipeline programs, and contributed to team growth through hiring and intern supervision, resulting in a journal publication.

## 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 Publications

**M. Prakash**, M.Y. Jahromi, T. Mansi, A. Moskalev, and R. Liao. *HELM: Hierarchical Encoding for mRNA Language Modeling.* International Conference on Learning Representations (ICLR) 2025.

J. Xu, A. Moskalev, T. Mansi, R. Liao, and **M. Prakash**. *Beyond Sequence: Impact of Geometric Context for RNA Property Prediction.* International Conference on Learning Representations (ICLR) 2025.

T. Cui, S.J. Xu, A. Moskalev, S. Li, T. Mansi, R. Liao, and **M. Prakash**. *InfoSEM: A Deep Generative Model with Informative Priors for Gene Regulatory Network Inference.* AI4NA@ International Conference on Learning Representations (ICLR) 2025 (**Oral**).

J. Xu, A. Moskalev, T. Mansi, R. Liao, and **M. Prakash**. *HARMONY: A Multi-Representation Framework for RNA Property Prediction.* AI4NA@ International Conference on Learning Representations (ICLR) 2025.

A. Moskalev, **M. Prakash**, R. Liao, and T. Mansi. *SE (3)-Hyena Operator for Scalable Equivariant Learning.* GRaM@ International Conference on Machine Learning (ICML) 2024 (**Outstanding paper award**).

**M. Prakash**,A. Moskalev, P. DiMaggio, S. Combs, T. Mansi, J. Scheer, and R. Liao. *Bridging biomolecular modalities for knowledge transfer in bio-language models.* FM4Science@ Neural Information Processing Systems (NeurIPS) 2024.

J. Yang, H. Triendl, A. Soltan, D. Clifton, and **M. Prakash**. *Addressing label noise for electronic health records: insights from computer vision for tabular data.* BMC Medical Informatics and Decision Making 2024.

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.

**M. Prakash**, M. Delbracio, P. Milanfar, and F. Jug. *Interpretable Unsupervised Diversity Denoising and Artefact Removal.* International Conference on Learning Representations (ICLR) 2022 (**Spotlight**).

**M. Prakash**, A. Krull, and F. Jug. *Fully Unsupervised Diversity Denoising with Convolutional Variational Autoencoders.* International Conference on Learning Representations (ICLR) 2021.

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.

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@ ECCV 2020 (**Oral**).

**M. Prakash**, M. Lalit, P. Tomancak, A. Krull, and F. Jug. *Fully Unsupervised Probabilistic Noise2Void.* IEEE International Symposium on Biomedical Imaging (ISBI) 2020 (**Oral**).

**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.

D.A. Afonso, A. Ryan, A.L. 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

**Learning Language of Life: AI for Advancing RNA & Molecular Modeling** | *Human Technopole* May 2025
**HELM: Hierarchical Encoding for mRNA Language Modeling** | *MILA* April 2025
**Beyond Sequence: Impact of Geometric Context for RNA Property Prediction** | *MILA* Feb 2025
**Hierarchical mRNA Encoding, Geometry-Aware predictions & Efficient Equivariance** | *EPFL* Feb 2025
**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

## Intern Supervision

Mehdi Yazdani-Jahromi | *Hierarchical encoding for mRNA language modeling* May 2024 -Nov 2024
Junjie Xu | *Impact of geometric context for mRNA property prediction* May 2024 -Nov 2024
Jenny Yang | *Addressing label noise for electronic health records* Oct 2023 -Mar 2024

## Research Impact

**Spotlight/Oral/Best paper** recognition at AI4NA@ICLR 2025, GRaM@ICML 2024, ICLR 2022
Reviewer for **NeurIPS (2021–2024), ICLR (2022–2025), ICML (2023–2025), ISBI (2021)**

## Scholarships and Awards

**INSPIRE Award at J&J** | *Awarded in recognition of exceptional leadership and scientific contribution* 2024-2025
**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

## Proficient Technical Skills

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