# Dr. Anima Kujur

Postdoctoral Researcher | Scientific Machine Learning | Biomedical AI | Dynamical Systems
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## RESEARCH EXPERIENCE

| Year | RESEARCH APPOINTMENT & INSTITUTION |
|---|---|
| **Oct 2024-Present** | **Postdoctoral Researcher**<br>*Interdisciplinary Center for Scientific Computing (IWR), Heidelberg University, Germany* |
| **Oct-Dec 2023** | **Visiting Research Scholar**<br>*University Medical Center Mannheim, Heidelberg University, Germany* |
| **Jan 2022-Mar 2024** | **Senior Research Fellow (SRF)**<br>*Jawaharlal Nehru University, New Delhi, India* |
| **Jul 2019-Dec 2021** | **Junior Research Fellow (JRF)**<br>*Jawaharlal Nehru University, New Delhi, India* |
| **Aug-Sep 2019** | **Research Intern**<br>*Interdisciplinary Center for Scientific Computing (IWR), Heidelberg University, Germany* |

### SELECTED RESEARCH PROJECTS & CORE CONTRIBUTIONS

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|---|---|
| **2026** | **Reliable & Uncertainty-Aware Biomedical AI**<br>RABR-Net: uncertainty-guided boundary refinement for biomedical image segmentation using predictive entropy, TTA variance, margin uncertainty and boundary cues; evaluated with calibration, risk-coverage, robustness and paired statistical testing. |
| **2024-Present** | **Longitudinal Neural Dynamics & Generalizable Reconstruction**<br>Long-horizon modelling of high-dimensional EEG/LFP with PCA/latent representations and Koopman/DMD; zero-shot cross-subject reconstruction and external validation on Allen Neuropixels data. |
| **2025-Present** | **Interpretable Dynamics of Neural-Network Training**<br>Model training as a dynamical system using weight trajectories, EDMD/Koopman analysis and Hessian/Jacobian spectra to characterize learning stages, stability and evolving representations. |
| **2023-2026** | **Multimodal Biomedical & Neuroimaging AI**<br>MRI-fMRI fusion for Alzheimer's disease, autoregressive fMRI forecasting, and MRI radiogenomics for MGMT methylation prediction in glioblastoma - spanning structural, temporal and multimodal clinical data. |
| **2019-2025** | **Medical Imaging & Clinical Machine Learning**<br>Deep-learning methods for MRI/CT and microscopy classification and segmentation, including brain tumour, Alzheimer's disease and WBC analysis; emphasis on robustness, generalization and clinically meaningful evaluation. |

## EDUCATION

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| **2019-2024** | **Ph.D., Computer Science & Technology**, Jawaharlal Nehru University, New Delhi, India |
| **2016-2019** | **Master of Computer Application (MCA)**, Jawaharlal Nehru University, New Delhi, India |
| **2013-2016** | **M.Sc. Applied Mathematics**, University of Hyderabad, Hyderabad, India |

## AWARDS & FELLOWSHIPS

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|---|---|
| **2022-2024** | **Senior Research Fellowship (SRF)**, University Grants Commission / Jawaharlal Nehru University, India |
| **2019-2021** | **Junior Research Fellowship (JRF)**, University Grants Commission / Jawaharlal Nehru University, India |
| **2019** | **UGC-NET / National Eligibility Test** – qualified, India |

## SELECTED RECENT PUBLICATIONS & RESEARCH OUTPUTS

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|---|---|
| **2026** | Beyond Accuracy: Uncertainty-Guided Boundary Refinement for Reliable Biomedical Image Segmentation. **arXiv preprint**. RABR-Net; uncertainty, calibration, risk-coverage and robustness. |
| **2026** | Learning High-Dimensional Transient Neural Dynamics for Zero-Shot Cross-Subject Reconstruction. **ICML 2026** HiLD Workshop. |
| **2026** | Multimodal Deep Learning for Dynamic and Static Neuroimaging: Integrating MRI and fMRI for Alzheimer's Disease Analysis. **Journal of Machine Learning for Modeling and Computing**. |
| **2026** | Learning Generalizable Reconstruction of High-Dimensional Neural Dynamics. arXiv:2608.16569. |
| **2025** | Transient Neural Dynamics Reconstruction. **NeurIPS 2025** Workshop. |
| **2025** | Autoregressive ConvLSTM for fMRI Forecasting. **NeurIPS 2025** Workshop. |
| **2025** | High-Fidelity Radiological Image Segmentation with Deep Learning. **IEEE AIC 2025**. |
| **2024** | DUNET: Dilated U-Net for Brain Tumor Segmentation. **Defence Life Science Journal**. |
| **2022** | Data Complexity Based Evaluation of Brain MRI Classification. **IEEE Access**. |

## ORAL TALKS & CONFERENCE PRESENTATIONS

**2025** **Invited Talk** - ICBRA, Prague. Multimodal Neuroimaging and Koopman-Based Neural Dynamics Analysis.

**2025** **AICOMAS, Paris**. Scientific conference presentation.

## POSTER PRESENTATIONS

**2026** **ICML HiLD Workshop** - Learning High-Dimensional Transient Neural Dynamics for Zero-Shot Cross-Subject Reconstruction.

**2026** **COSYNE** - neural-dynamics / Koopman research.

**2026** **DKFZ Postdoc Symposium** - biomedical AI research.

**2025** **NeurIPS Workshops** - transient neural dynamics reconstruction and autoregressive ConvLSTM for fMRI forecasting.

## TEACHING & RESEARCH SUPERVISION

**Current** **PhD mentoring** - mentor to one doctoral researcher.

**2024-2025** **M.Sc.-level research supervision** - fMRI time-series modelling, interpretable AI and clinical machine learning.

**2024** **Teaching Assistant, international summer school**, African Institute for Mathematical Sciences (AIMS), Cape Town, South Africa.

**2021-2023** **Mathematics Teacher**, Grades 11-12, India.

## TECHNICAL EXPERTISE

**Biomedical & Multimodal AI**: MRI, fMRI, CT, microscopy; segmentation, classification, multimodal fusion, radiogenomics

**Longitudinal & Dynamical Modelling**: EEG/LFP and fMRI time series; Koopman operator, DMD/EDMD, long-horizon reconstruction and forecasting

**Reliable & Interpretable AI**: uncertainty estimation, calibration, robustness, failure analysis, risk-coverage, reliability maps, Koopman spectra/modes

**Machine Learning & Deep Learning**: CNNs, UNet/UNet++, LSTM/GRU/RNN, ConvLSTM, Transformers; supervised/unsupervised learning

**Scientific Computing**: Python; PyTorch, TensorFlow/Keras, NumPy, SciPy, scikit-learn, MNE, pydmd, datafold

## LANGUAGES

English - fluent | German - basic (A2) | Hindi - native

## WORKSHOP & CONFERENCE PARTICIPATIONS

**2026** AI for Science Workshop, Helmholtz Munich Campus, Munich.

**2026** Grand Challenge Conference, Berlin University Alliance, Berlin.

**2025** AI in Medicine, Sorbonne-Heidelberg.

**2025** Integrative Think Tank, Heidelberg.

**2025** Infectious Disease Modeling Workshop (SWIM), Heidelberg.

## SOFT SKILLS

Structured and goal-oriented working style | Strong analytical and problem-solving ability | Interdisciplinary thinking and adaptability | Effective communication and collaboration | Independent and self-driven | Rapid learning across new domains | Mentoring

## INTERESTS & ACTIVITIES

Travelling and exploring new cities and cultures | Spirituality and personal growth | Hiking, cycling and outdoor activities | Basketball and team sports | Dance and creative expression | Cooking

## REFERENCES

**Dr. Michael Winckler** - Michael.Winckler@iwr.uni-heidelberg.de (Advisor)

**Dr. Zahra Monfared** - zahra.monfared@iwr.uni-heidelberg.de (Postdoc PI)

**Dr. Shervin Safavi** - shervin.safavi@cmclab.org (Research Collaborator)

**Prof. Zahid Raza** - zahidraza@mail.jnu.ac.in (PhD Supervisor)

**Prof. Jürgen Hesser** - Juergen.Hesser@medma.uni-heidelberg.de (Internship Supervisor)