

## Professional Summary

Research Scientist specializing in deep learning architectures for multi-modal data analysis and representation learning. Expert in designing efficient attention mechanisms with strong domain generalization, focusing on extracting signals from complex spatio-temporal data. Published in NeurIPS, BMVC, with work spanning machine learning theory and real-world applications. Experienced in merging research with deployment, leading edge-optimized AI and resource-efficient models for constrained environments. Proven success in managing cross-functional teams in high-impact projects, balancing innovation with practical implementation and compliance.

## Education

### 📖 **Ph.D. Candidate | University College London, UK (2020–2025)**

**Thesis Focus:** Novel Multidimensional Attention Mechanisms for Robust Domain Generalization.

- Developed multi-dimensional attention mechanisms for extracting subtle signals from noisy spatiotemporal data, with applications spanning computer vision and signal processing.
- Developed efficient multi-modal models that ensure high performance and domain generalization with reduced computational needs, allowing deployment on various computing platforms.
- Developed and validated new data augmentation methods to improve model robustness against distribution shifts and out-of-distribution scenarios.

**Advisors:** Prof. Youngjun Cho (🔗), Prof. Nadia Berthouze (🔗)

### 📖 **M.Sc., Cognitive Systems & Interactive Media | Pompeu Fabra University, Spain (2010–2011)**

**Dissertation:** EEG-based Investigation of Brain Wave Entrainment by Binaural Beats & Music.

- Applied machine learning and signal processing to analyze multi-channel data, employing independent component analysis to extract patterns and evaluate temporal signal coherence.
- Designed experiments to study synchronization effects across stimuli conditions, using statistical analyses to evaluate system responses applicable to neural sensory processing.

**Advisors:** Dr. Sylvain Le Groux (🔗), Prof. Paul Verschure (🔗)

### 📖 **B.Tech., Electronics & Communication | Nirma University, India (2004–2008)**

**Key Modules:** Signal Processing, Digital System Design, Modern Processor Architecture

## Work Experience [Employment History]

### 📖 **Research Associate | University College London (2024 – Present)**

- Leading research on generative AI and diffusion models for photorealistic image synthesis, focusing on novel architectures that balance quality with computational efficiency.
- Developing innovative approaches for multi-modal semantic segmentation that enhance model robustness across varying environmental conditions and input distributions.

### 📖 **Solution Architect -AI | Tata Elxsi (2016 – 2024)**

- Led development of robust AI systems for healthcare applications, designing edge-computing solutions for dense object detection and point-of-care diagnostics that balanced accuracy with deployment constraints, resulting in three patents and successful clinical implementations.
- Managed cross-functional teams on high-impact projects exceeding \$1M, ensuring alignment between research innovations, engineering requirements, and regulatory compliance.
- Established comprehensive validation frameworks for AI systems in regulated environments while mentoring a team of 10+ AI engineers on deep learning and computer vision implementations.

## Work Experience [Employment History] (continued)

- **Sr. Scientist - R&D** | Azoi Inc (2014 – 2016)
  - Developed algorithms for real-time physiological sensing from multi-channel sensor data, optimizing signal processing pipelines for mobile device constraints.
  - Implemented comprehensive validation frameworks for medical device certification, ensuring system performance across diverse operational conditions.

## Selected Publications and Patents

- 1 **J. Joshi** and Y. Cho, “Efficient and Robust Multidimensional Attention in Remote Physiological Sensing through Target Signal Constrained Factorization,” *In Review*, 2025.
- 2 **J. Joshi**, S. Agaian, and Y. Cho, “FactorizePhys: Matrix factorization for multidimensional attention in remote physiological sensing,” in *The Thirty-eighth Annual Conference on Neural Information Processing Systems*, 2024. 🔗 URL: <https://openreview.net/forum?id=qrfp4eeZ47>.
- 3 **J. Joshi** and Y. Cho, “iBVP Dataset: RGB-Thermal rPPG dataset with high resolution signal quality labels,” *Electronics*, vol. 13, no. 7, p. 1334, 2024, ISSN: 2079-9292. 🔗 URL: <https://www.mdpi.com/2079-9292/13/7/1334>.
- 4 **J. Joshi**, N. Bianchi-Berthouze, and Y. Cho, “Self-adversarial multi-scale contrastive learning for semantic segmentation of thermal facial images,” in *33rd British Machine Vision Conference 2022, BMVC 2022, London, UK, November 21-24, 2022*, BMVA Press, 2022. 🔗 URL: <https://bmvc2022.mpi-inf.mpg.de/0864.pdf>.
- 5 T. Tran, H. Watson, **J. Joshi**, and R. Patel, “Compensation of intensity variances in images used for colony enumeration,” 2021. 🔗 URL: <https://patents.google.com/patent/WO2021229337A1>.
- 6 T. Tran, H. Watson, **J. Joshi**, A. SK, and R. Tiwari, “Detecting a condition for a culture device using a machine learning model,” 2021. 🔗 URL: <https://patents.google.com/patent/WO2021234514A1>.

## Awards and Achievements

- 2020 ■ **Project Excellence Awards, Tata Elxsi**
  - Led the design of an AI-based edge imaging device for automated bacterial colony counting.
- 2019 ■ **Hackathon Winner, Tata Elxsi**
  - AI-based medical image enhancement solution.
- 2018 ■ **Prestigious Tata Innovista Award**
  - Point-of-care diagnostic device for malaria and sickle cell disease 🔗 URL.

## Technical Skills

- Machine Learning: ■ Deep learning architectures, attention mechanisms, transformers, diffusion models, contrastive learning, domain generalization, cross-modal representation learning, computer vision, signal processing
- Tools & Frameworks: ■ PyTorch, TensorFlow, Python, C++, CUDA optimization, edge computing
- Professional: ■ System engineering, cross-functional leadership, research-to-product translation

## Certifications

- 2025 ■ **Generative AI with Large Language Models** (Coursera).
- 2019 ■ **Executive Data Science Specialization** (Coursera).
- 2018 ■ **Deep Learning Specialization** (Coursera).