Daksh Maheshwari

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EDUCATION

Master of Science in Electrical and Computer Engineering Aug 2022 - Apr 2024
Specialization: Signal & Image Processing and Machine Learning GPA: 3.81/4.0
University of Michigan, Ann Arbor

Bachelor of Engineering in Electronics and Instrumentation Engineering Aug 2016 - May 2020
Birla Institute of Technology and Science, Pilani GPA: 8.1/10.0

PUBLICATIONS

Maheshwari, D., Ghosh, S. K., Tripathy, R. K., & Sharma, M. (2021). Automated accurate emotion recognition system using rhythm-specific deep convolutional neural network technique with multi-channel EEG signals. Computers in Biology and Medicine. doi.org/10.1016/j.compbiomed.2021.104428

TEACHING EXPERIENCE

Graduate Student Instructor: SI - 330 (Data Manipulation) Fall 2023, Winter 2024

INDUSTRY EXPERIENCE

Application Engineer Sep 2020 - Jul 2022
Oracle
Spearheaded the design and development of applications for Oracle Fusion SCM Inventory Management products, leveraging Oracle ADF, Oracle JET, and PL/SQL

Data Engineering Intern Jan 2020 - Jul 2020
AFour Technologies
Designed and implemented Metadata Management and Data Governance pipeline with Apache Atlas, enhancing search functionality and improving data accessibility

PROJECTS

Representation Learning for Medical Images and Reports Aug 2023 - Dec 2023
University of Michigan

- Addressed challenges when dealing with scarcity of medical images, utilizing medical imaging data and reports to learn representations that can be used for downstream tasks.
- Developed models which learns a latent representation using transformer based models, 150K+ chest radiographs, and reports from OpenAccess (CXR-8, OpenI) datasets.
- Evaluated downstream tasks such as image-text retrieval, classification, and radiology report generation using a single learnt latent representation.

Domain Adaptation & Doman Generalization for Glaucoma Classification May 2023 - Jul 2023
QTIM Lab, University of Colorado, Anschutz Medical Campus

- Investigated impact of domain shift on Supervised and Self-Supervised methods for glaucoma classification, proposing innovative solutions to enhance deep learning model performance amidst domain shift.
- Explored self-supervised methods such as Masked Auto-Encoders and SimCLR for domain generalization, engaging in pre-training models and fine-tuning for downstream tasks.
- Surpassed state-of-the-art ResNet50 performance by at least 5% in Classification, AttUNet performance in Segmentation, underscoring the potential of Masked Auto-Encoders (MAEs) for domain generalization.

Pushing the limits of Random Consensus Robust PCA Jan 2023 - Apr 2023
University of Michigan

- Addressed challenges in managing large corrupted datasets, enhancing computational performance and memory usage of Random Consensus Robust PCA by 10x and 100x respectively.
- Improved R2PCA, by identifying subspace `U` spanned by the low rank matrix, dividing the data matrix into subsets for individual PCA application
- Demonstrated robust performance in managing numerous outliers, ensuring accurate low-rank subspace projections, its effectiveness with large corrupted datasets and precise recovery of low-rank subspaces.

Study on Implicit Bias in terms of Optimization Geometry Jan 2023 - Apr 2023
University of Michigan

- Delved into the intricacies of implicit bias, investigating its origins, manifestations, and effects within the realm of decision-making processes.
- Identified crucial factors that contribute to the formation and persistence of implicit bias, offering valuable insights into the cognitive and social aspects at play.

CARETS: CAncer RElated Terms Search Jan 2023 - Apr 2023
University of Michigan

- Created a robust and user-friendly cancer search engine that serves as a centralized platform for accessing information on cancer, including its types, genomic profiles, symptoms, trials, and treatment options.
- Integrated various data sources such as SEERs, Trials.gov, and National Cancer Institute GDC Atlas to ensure a comprehensive and reliable search experience for users.
- Implemented using web technologies including Next.js, Flask, and Docker to develop a highly efficient and scalable web application.

MR-based *in-vivo* Microstructural Imaging Sep 2022 - Apr 2023
Dr. Yue Cao, Department of Radiation Oncology, University of Michigan

- Implemented deep learning pipelines using novel Multidimensional Mesh 2D Recurrent Networks and Convolutional Neural Networks, and automated workflows for MR-based *in-vivo* Microstructural Imaging.
- Achieved precise estimation of tissue microstructural parameters, including free diffusion coefficient (d_0), cell size (V/S), and cell permeability (κ), reducing NRMSE less than 1%.
- Conducted comprehensive evaluations of models using simulated, noisy, and clinical data sets, documented insights for future improvements and applications.

Ultrasound, CT, MRI Reconstruction Aug 2022 - Dec 2022
University of Michigan

- Implemented beamforming and scan conversion algorithms in MATLAB for a unique ultrasound system, focusing on detailed analysis, image generation, and comprehensive reporting.
- Developed a Bloch equation simulator to study the spin-warp pulse sequence with slice selection, facilitating a comprehensive understanding of magnetization behavior, image acquisition methods, and slice selective excitation in MRI.
- Implemented and compared image reconstruction methods (filtered-backprojection and direct Fourier interpolation) in a computed tomography simulation, applying algorithms to various datasets, and conducting detailed analysis of results, artifacts, and inaccuracies.

Discriminating Gait for Different Surfaces 2020 - 2021
Prof. Rajesh Kumar Tripathy, BITS Pilani

- Conducted an in-depth research study on irregular surfaces using gait data from wearable inertial measurement units (IMUs), enhancing the understanding of human stride on uneven surfaces.
- Proposed and implemented a novel methodology, leveraging 1D CNNs and LSTMs to analyze Gyroscopic, Accelerometer, and Magnetometer data, achieving classification accuracy of over 91%.
- Provided critical insights into the biomechanics of gait patterns, contributing to the assessment and mitigation of risks associated with falls and injuries on uneven surfaces.

EEG-based Emotion Recognition using Rhythm-Specific Deep CNNs 2018 - 2020
Prof. Rajesh Kumar Tripathy, BITS Pilani

- Conducted an empirical investigation into the efficacy of multi-channel EEG signals and the Circumplex model of emotions in facilitating the accurate recognition of emotions in human-computer interaction.
- Proposed a novel rhythm-specific multi-channel convolutional neural network based approach that leverages the delta, theta, alpha, beta, and gamma rhythms of EEG and uses these rhythms to train a deep CNN for accurate emotion classification tasks.
- Validated the proposed model on three publicly available datasets (DEAP, DREAMER, and DASPS) with an average accuracy of 95%+ across all datasets.

SKILLS

Programming Languages Python, C++, Rust, MATLAB, PL/SQL, Java, Julia
Machine Learning Frameworks PyTorch, Tensorflow, JAX, TinyGrad
Software Developement Frameworks Flask, FastAPI, Django, Oracle ADF, Oracle JET, Next.js