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EDUCATION

- **Master of Science, Biomedical Engineering,** University of Southern California, Los Angeles, December 2018
- **Bachelor of Engineering, Electrical and Electronics Engineering,** Bhilai Institute of Technology, India, August 2014

TECHNICAL SKILLS

- **Programming Languages**: Python, MATLAB, C++
- **Tools**: NumPy, OpenCV, MySQL, Numba, Dask
- **Scripting**: BASH, BATCH
- **Medical Imaging Tools**: DIPY, FSL (FMRIB Software Library), Free Surfer, Brain Suite, MRTrix, ITK-Snap, PMOD,VivoQuant.

RESEARCH EXPERIENCE

- **Staff Scientist,** Mallinckrodt Institute of Radiology
  Washington University School of Medicine in St. Louis July 2021 - Current
  - **Performance evaluation of mouse brain segmentation tools using digital phantoms**
    This project involves comparing mouse brain segmentation techniques for two leading software platforms using the mouse brain component of MOBY, a digital phantom. The phantom datasets are generated with region-wise activity maps to establish ground truths for analysis. The parcellated values are analyzed for the region wise tracer uptake quantifications and volumetric analysis. Additionally, the project explores novel techniques for optimizing tracer quantifications post-ROI segmentations.
  - **Scanner reconstruction optimizations for partial volume effects**
    This study is aimed to optimize and harmonize PET scanners using a partial volume correction phantom. The study compared two isotopes, [18F]-Fluorodeoxyglucose (FDG) and Cu-64, placed in spheres of different sizes within the phantom. The images were acquired on two scanners and reconstructed using OSEM3D and MAP algorithm for one scanner and TeraTomo 3D GPU- based algorithm for the other, with varying energy windows, iterations, and voxel sizes. Regions of interest were drawn on the spheres and the reference calibration void in the phantom to measure the activity concentration to calculate the recovery coefficient by comparing the calculated activity concentration to the known activity concentration of the spheres. The optimal combination of voxel size and iteration numbers was determined for both scanners and each isotope.
  - **PET-CT preprocessing pipeline for a longitudinal study in mouse brain models**
    Designed a pre-processing pipeline for a longitudinal study in mouse models to find imaging biomarkers of obesity and Alzheimer's disease. The image processing protocol involves mouse brain registrations, extracting the standard uptake value (SUV) of the radiotracer, and performing kinetic modeling to determine the regional uptakes and tracer characteristics in the brain associated with Alzheimer's progression. The PET-CT data is acquired using the [18F] FSPG radiotracer.

- **Cross modality Radiomics Correlation (Tumor / Mouse Brain)**
  Developing a tool for cross-modality radiomics correlation between histopathology Nissl Stain, Autoradiography and PET (and/or MRI) data for tumor and mouse brain imaging. The tool is being designed using advanced image processing algorithms for image registration, and computational methods to correlate radiomics features.
- **Optimization and bias effects study for under sampled radioactivity data**
  Working on optimizing under-sampled radioactivity data or time activity curve acquired for different radiotracers. Simulated data from a mathematically fitted Compartment model for different kinetic parameters are used. This work will help streamline and optimize the PET acquisitions.

- **Project Assistant,** Imaging Genetics Center
  USC Keck School of Medicine, Marina del Rey July 2019 – June 2021
  - **Scanner Invariance and Data Harmonization using Deep Learning Methods**
    Examining the effects of scanner invariability and harmonizing the multi-site, multi-modal neuroimaging data for clinical analysis. The project involves characterizing feature disparities among MRI multimodal images from different sites and vendors and utilizing deep learning methods to classify datasets based on sites or protocols.
  - **Diffusion Tensor Imaging Pre-Processing Protocols for ADNI3**
    Designed protocols for pre-processing neuroimaging data in Alzheimer's Disease Neuroimaging Initiative (ADNI) by testing and creating various image processing tools. The project comprises various statistical analyses on different denoising methods on imaging data from different vendors. Tools like HTML- based image viewer were developed for quality control, data management, and extraction. The protocol has been designed for the researchers using ADNI DTI data.
  - **Automatic Quality Assurance For MRI-Derived Cortical Segmentations**
    Contributed to the creation of a machine learning-based quality control tool for FreeSurfer cortical segmentations. Four different machine learning methods were used. The models were trained on a cortical measurement database of 12000 images containing 68 parcellations of the region of interest.
  - **Gibbs Ringing and Measurements**
    Developed tools to quantify Gibbs measurements in an image using the concept of Physically Implausible Signal. Other works include simulating artificial Gibbs on QSM neuroimages for data augmentation to train a U-Net based deep learning model for Gibbs removal.
  - **Auto Mask Correcting Tools: for DTI EPI correction & temporal and optic nerves on T1/T2**
    Created a tissue classification tool using T1 and DTI b0 volumes. The mask derived is used for epi correction using FSL. Other masking tools involving removal of high-intensity optic nerves and temporal lobes on T1/T2 images using Gaussian filter and Sobel edge detection methods to be used in the ADNI pipelines.

- **Segmentation and Quality Control Tool for DWI and High-Resolution Hippocampus**
  Testing tools for hippocampal segmentation and measurements. Designed tools for quality controlling High resolution 7T Hippocampus imaging data.

- **Research Assistant,** Computational Imaging of Brain Organization Research Group
  Children's Hospital Los Angeles October 2018 – June 2019
  - **Neonatal Diffusion Pre-Processing Pipeline**
    Assisted studies related to white matter injury and neurodevelopmental impairments in pre-term neonates. Helped designing an automated pipeline for removing noise, artifacts and generating diffusion tracts and measurements for Tract Specific Analysis. Designed a tool for quality control reducing the manual effort and time by 30%.

Other PROJECTS

- **Cervical Classification to aid cancer Screening (**Coursework Project**)**
  - Developed CNN based Cervical Cancer Classifier for cervical type classification on cervical images at the transformation zones affected by the disease.
  - CNN implementation using TensorFlow and image processing using OpenCV on cervical image data obtained from Kaggle.
- **FOD Based Cortical Tract Reconstruction (**Coursework Project**)**
  - Implemented corticospinal tracts reconstruction using LONI Pipeline (in-house tool) consisting of image correction algorithms from MRTrix and FSL.
  - Diffusion Tracts were generated using MRTrix's spherical deconvolution for estimating and generating tracts from ROI segmentations focusing on cerebral cortex and pons.
- **Integration of Multi-media and Informatics data for Decision Support in Injury Prevention and Sports Performance in Volleyball Athletes (**Coursework Project)
  - Helped design a web-based tool to search and retrieve athletic biomechanical data using an intelligent workflow. The tool integrates the acquisition and collection of various multi-media data acquired during the evaluation of volleyball athletes at various physically demanding tasks.
  - The system was designed to monitor and enhance athletic performance and injury prevention. From the workflow protocols to database management, the entire system can be fine-tuned on a web-GUI with streamlined tools and displays.

CONFERENCE PAPER

- Mengting Liu, **Piyush Maiti**, Sophia Thomopoulos, Alyssa Zhu, Yaqiong Chai, Hosung Kim, Neda Jahanshad. "Learning Styles for Multi-Site MRI Harmonization using Generative Adversarial Networks." In MICCAI, France, October 2021.
- Sophia Thomopoulos, Talia M. Nir, Julio E. Villalon-Reina, Artemis Zavaliangos-Petropulu, **Piyush Maiti,** Hong Zheng, Elnaz Nourollahimoghadam, Neda Jahanshad, Paul M. Thompson for the Alzheimer's Disease Neuroimaging Initiative. "Diffusion MRI Metrics and their Relation

to Dementia Severity: Effects of Harmonization Approaches." In 2021 International Symposium on Medical Information Processing and Analysis, Brazil, October 2021.

- Shruti Gadewar, Alyssa H. Zhu, Sophia I. Thomopoulos, Zhuocheng Li, Iyad Ba Gari, **Piyush Maiti**, Paul M. Thompson, Neda Jahanshad. "Region-Specific Automatic Quality Assurance For MRI-Derived Cortical Segmentations." In IEEE International Symposium on Biomedical Imaging, France 2021.

ABSTRACTS

- **Piyush Maiti**, Suya Li, Kaushik Dutta, Timothy Whitehead, Kooresh I Shoghi. "Assessing the performance of software platforms to segment mouse brains using a digital phantom." In Society of Nuclear Medicine and Molecular Imaging (SNMMI), June 2023 (Under Review).
- Chandresh Shyam, Timothy Whitehead, Dong Zhou, Lin Qiu, **Piyush Maiti,** Zhude Tu, Alexxai Kravitz, Tamara Hershey, Kooresh I Shoghi. "Imaging Neuroinflammation in an animal model of diet-induced obesity." In Society of Nuclear Medicine and Molecular Imaging (SNMMI), June 2023 (Under Review).
- Mengting Liu, **Piyush Maiti**, Sophia Thomopoulos, Nadia Kadakova, Hosung Kim, Neda Jahanshad. "Multi-Site MRI harmonization using unified Generative Adversarial Networks." In Organization for Human Brain Mapping, Seoul, June 2021.
- Iyad Ba Gari, Shruti P. Gadewar, Xingyu Wei, **Piyush Maiti**, Joshua Boyd, Neda Jahanshad. "A 3D-UNET for Gibbs artifact removal from quantitative susceptibility maps." In ISMRM 2021.
- Nir, Talia M., Lauren Salminen, Julio E. Villalon Reina, Meral A. Tubi, Sophia I. Thomopoulos, **Piyush Maiti,** Meredith N. Braskie, Paul M. Thompson, and Neda Jahanshad. "Hippocampal Subfield Microstructure Abnormalities Mediate Associations between Tau Burden and Memory Performance." In 2020 Alzheimer's Association International Conference. ALZ, 2020.
- Nir, Talia M., Julio E. Villalon Reina, Sophia I. Thomopoulos, **Piyush Maiti**, Robert I Reid, Mathew Bernstein, Clifford R Jack, Paul M. Thompson, and Neda Jahanshad. "Improved Neurite Density Estimation in Alzheimer's Disease with Multi-Tissue Multicompartment Diffusion MRI Modeling." In IEEE Engineering in Medicine and Biology Society, Montreal, July 2020.
- Talia M. Nir, Julio E. Villalon-Reina, Alyssa Zhu, Lauren E. Salminen, Sophia I. Thomopoulos, Meral A. Tubi, **Piyush Maiti**, Paul M. Thompson, Neda Jahanshad (2020). "Hippocampal Microstructural Abnormalities in Cognitively Impaired and Amyloid Positive Individuals." In Organization for Human Brain Mapping, Montreal, June 2020.

JOURNAL REVIEW

- Conference Paper/Abstract Reviewer: **IEEE *International Symposium on Biomedical Imaging* (*ISBI*)**.