Soumya Snigdha Kundu

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Education

King's College London — London, United Kingdom
Ph.D., Biomedical Engineering and Imaging Science Research *[Proposed Thesis]* — *Oct. 2023 – Oct. 2027 (Expected)*
Advisors: Prof. Tom Vercauteren (Computational) and Dr. Jonathan Shapey (Clinical)

Queen Mary University of London — London, United Kingdom
M.Sc., Machine Learning for Visual Data Analytics; Grade: Distinction — *Sep. 2022 – Sep. 2023*
Advisors: Prof. Greg Slabaugh (Computational) and Dr. Vineet Batta (Clinical)

SRM Institute of Science and Technology — Chennai, India
B.Tech., Computer Science and Engineering; Grade: Distinction — *Jul. 2018 – May. 2022*

Selected Publications

1. ***Kundu, S.S.***, 2021, December. A Distributed Deep Learning Framework for Federated Big Medical Image Analysis. In 2021 IEEE International Conference on Big Data (Big Data) (pp. 5938-5940). IEEE.
2. Kumar, A., Ghosal, P., ***Kundu, S.S.***, Mukherjee, A. and Nandi, D., 2022. A lightweight asymmetric U-Net framework for acute ischemic stroke lesion segmentation in CT and CTP images. Computer Methods and Programs in Biomedicine, 226, p.107157.
3. Wang, H., Naidu, R., Michael, J. and ***Kundu, S.S.***, 2020. SS-CAM: Smoothed Score-CAM for sharper visual feature localization. arXiv preprint arXiv:2006.14255.

Reviewing: IEEE-ISBI 2024.

Research Experience

University of Oxford — Prof. Bartek Papiez
Research Intern – Deep Learning; Li Ka Shing Centre for Health Information and Discovery — *Jul. 2023 – Sep. 2023*

- Developed the 1^{st} new bone formation (osteophytes) **identification** pipeline achieving 84% precision with complete **MLOps** and **high performance computing** functionalities.
- Implemented the latest **R-CNN**, **YOLO**, **Transformer**, **nnUNet** and **ConvNeXt** frameworks whilst integrating automated data **labeling**, **self-supervised** pretraining and novel **augmentation** processes for enhanced efficiency.
- Designed a multi-view **post-processing** strategy *SegPatch* to efficiently extract regions of interests in segmentation masks.

Luton and Dunstable University Hospital — Dr. Vineet Batta
Research Assistant – Software Engineering & Medical Image Computing; Department of Orthopaedics — *Oct. 2020 – Sept. 2022*

- Raised $\sim$ £50000 to develop a system to identify 10 separate make and models of orthopaedic implants via **convolutional neural networks** and **image processing**, while reducing data requirements by >90% and achieving 98% F1-Score.
- Spearheaded a multi-institutional collaboration involving renowned Orthopaedic Surgeons, gathering valuable insights and perspectives to publish an in-depth systematic review of 50+ papers on automated orthopaedic implant identification and develop the 1^{st} automated orthopaedic implant annotator.
- Reviewed and analyzed monthly updates of 12 students' software submissions, identifying potential improvements and increasing code performance metrics by an average of 15%.

National Institute of Technology - Durgapur — Prof. Debashis Nandi
Research Intern – Deep Learning; Machine Intelligence and Medical Imaging Research Group — *Jun. 2020 – May. 2021*

- Published a lightweight asymmetric U-Net architecture to segment stroke lesions in the brain; optimising inference times and achieving the 2^{nd} highest test dice score on the ISLES Challenge 2018 - Ischemic Stroke Lesion Segmentation.
- Designed a joint study of **classification** and **segmentation** encompassing 3 separate challenge brain MRI datasets, securing the highest test precision in distinguishing severity of Alzheimer's disease and maintaining **generizability** with only a marginal 5% deviation on an external test set.
- Engineered a compound segmentation model for multiple sclerosis lesions that outperforms stand-alone backbone networks by 10-12% dice score.

Project

Large Language Model Based Automated Debugging Enhancement Tool.

- Developed a shell command using LLMs, LangChain and Claude-API to help debug python errors.
- Proposed a novel Error Analysis **Prompting** method integrating Error Analysis and Code-Context-Aware Prompting, achieving equivalent performance to Chain of Thought Prompting in 1 iteration.
- Secured a Top 8 Position at the Anthropic Hackathon - London out of 50 Teams.

Skills

Programming: Python, C++ | **Software**: PyTorch, OpenCV, TensorFlow, JAX, NumPy, LangChain, LaTeX.

Fellowships, Grants and Awards.

MRC DTP Postgraduate *Studentship* — King's College London || $<$ 2% Selection rate. || $\sim$ £205000 || 2023 Cohort
BDI Summer *Internship* Programme — University of Oxford || 1 of 4 selected applicants || 2023 Cohort
Summer Research *Internship* Program — IIT - Gandhinagar || $<$ 0.008% Selection rate. || 2023 Cohort
MITACS Globalink Research *Internship* — TRIUMF (UVic) || $<$ 3% Selection rate || 2021 Cohort
UKRI Fast Start: Innovation *Grant* — Co-Applicant || $\sim$ £50000 || 2022 Cohort
IEEE-ICETCI'21 *Competition* (Electrical Substation Detection) — 3^{rd} Place