MOBARAKOL ISLAM

Postdoc | Causal ML/DL | Medical Image Analysis | Surgical Data Science

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BioMedIA, Imperial College London, London SW7 2AZ, UK.

RESEARCH

PostDoc

BioMedIA

Feb 2020 – Present DoC, Imperial College London, UK

- Spatially Varying LS: Capturing Uncertainty from Expert Annotations.
- Counterfactual Data Aug. via Deep Structural Causal Models.
- Class-distribution-Aware Calibration for Long-tailed Recognition.
- Curriculum by Feature and Label Smoothing.

MMLAB

Aug 2019 – Feb 2020 BME, National University of Singapore

- Develop an approach to generate the scene graph and predict surgical interactions during robot-assisted surgery[1].
- Design an attention link function with the graph parsing network.
- Empirically demonstrate the feature extraction methods by employing label smoothing weighted loss.

PhD Student

Medical Mechatronics Lab

Jan 2016 – July 2019 BME, NUS, Singapore

- Propose a spatiotemporal multitask learning (MTL) model with the novel design of LSTM++, and asynchronous optimization to estimate the surgical scanpath while tracking instrument in robotic surgery [2].
- Design a MTL model by incorporating visual attention with segmentation while tracking instrument in robotic surgery [3].
- Propose a real-time joint detection and segmentation model with dynamic attention pruning for surgical instrument tracking [4].
- Propose a real-time surgical instrument tracking model using auxiliary supervised deep adversarial learning [5].
- Propose a radiogenomic model for glioblastoma prognosis: synthesis, segmentation, and survival prediction [7].
- Develop approaches for glioma segmentation and survival prediction [6, 8, 9, 11].
- Propose end-to-end attention models for intracerebral and ischemic hemorrhage segmentation and hematoma prediction [10,12].

Visual Information Processing Lab

August 2015 – December 2015 ECE, NUS, Singapore

- Visual attention models to train deep learning model with small dataset.
- Observe the generalization and the chaocity of the dynamics of learning neural networks with Backpropagation.

Research Engineer

Samsung R & D Institute

June 2011 – July 2015 Dhaka, Bangladesh

- Research on vision for face and gesture detection
- Innovative idea generation, filing and implementation
- OCR based testing automation for Android & Tizen OS
- Feature development and bug fixing of Android, Tizen, NXP, SNMP

EDUCATION

Ph.D. in Deep Learning and Medical Imaging

NUS Graduate School for Integrative Sciences and Engineering (NGS), National University of Singapore (NUS)

Aug 2015 – Dec 31 Singapore

Thesis title: Representation Learning in Multimodal Spatiotemporal Image-Guided Medical Procedures.

B.Sc. in Electronics & Communication Engineering

Faculty of Engineering, Khulna University of Engineering & Technology

Mar 07 – Apr 11 Bangladesh

Thesis title: Training Neural Network with Chaotic Learning Rate.

AWARDS

NGS Research Scholarship

NGS, National University of Singapore

August 2015 – August 2019

AUAPAF Conference Scholarship

ASIAN UNIVERSITIES ALLIANCE POSTGRADUATE ACADEMIC FORUM

October 2018

SKILLS

Deep Learning, CNN, LSTM, GAN, RL
Multitask Learning | Visual Attention
Robotic Surgery | Brain Imaging
3D, Multi-modal, Spatiotemporal Imaging
Brain Tumor, Glioma, Glioblastoma
Ischemic, hemorrhagic Stroke | Genomic
Python, LUA, C/C++, Cuda, Matlab, Java

LANGUAGES

English
Bengali
Chinese

TEACHING

Teaching Assistant

EE2024: Programming for Computer Interfaces

January 2016 – Aug 2018 ECE, NUS, Singapore

- Teaching ARM embedded system using assembly language and C
- Guiding students in final projects including interfacing with devices such as sensors and actuators using I2C, SPI/SSP, UART
- Assessing project with demonstration and marking reports

GRANT APPLICATION

PhD Student

Medical Mechatronics Lab

January 2016 – Aug 2019 NUS, Singapore

1. "Palliative Care with Overall Survival Prognosis and Deep Learning for Glioblastoma Mulitforme (GBM) patients." SMF Grant 2017.
2. "Real-Time Scene Understanding in Robotic Surgery." Amazon Research Award, 2018.
3. "Surgical Scene Understanding in Robotic Surgery: Learning Where to Look While Tracking." AI Singapore Research Programme, 2019.

PUBLICATIONS* (SELECTED)

1. Islam, Mobarakol, et al. "Learning and Reasoning with the Graph Structure Representation in Robotic Surgery." ***International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*** (2020) [oral].
2. Islam, Mobarakol, et al. "ST-MTL: Spatio-Temporal Multitask Learning Model to Predict Scanpath While Tracking Instruments in Robotic Surgery." ***Elsevier Medical Image Analysis (MedIA)*** (2020).
3. Islam, Mobarakol, et al. "Learning Where to Look While Tracking Instruments in Robot-assisted Surgery." ***International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*** (2019) [oral].
4. Islam, Mobarakol, et al. "AP-MTL: Attention Pruned Multi-task Learning Model for Real-time Instrument Detection and Segmentation in Robot-assisted Surgery" ***ICRA*** (2020).
5. Islam, Mobarakol, et al. "Real-Time Instrument Segmentation in Robotic Surgery using Auxiliary Supervised Deep Adversarial Learning." ***IEEE Robotics and Automation Letters*** (2019).
6. Islam, Mobarakol, et al. "Brain Tumor Segmentation and Survival Prediction Using 3D Attention UNet." ***International MICCAI Brainlesion Workshop*** Springer, Cham, 2019.
7. Islam, Mobarakol, et al. "Glioblastoma Multiforme Prognosis: MRI Missing Modality Generation, Segmentation and Radiogenomic Survival Prediction." ***Computerized Medical Imaging and Graphics*** (2021).
8. Winzeck, Stefan,.., Islam, Mobarakol, et al. "ISLES 2016 and 2017-Benchmarking Ischemic Stroke Lesion Outcome Prediction Based on Multispectral MRI." ***Frontiers in neurology 9*** (2018).
9. Islam, Mobarakol, et al."Glioma Prognosis: Segmentation of the Tumor and Survival Prediction Using Shape, Geometric and Clinical Information."***International MICCAI Brainlesion Workshop*** Springer, Cham, 2018.
10. Islam, Mobarakol, et al. "ICHNet: Intracerebral Hemorrhage (ICH) Segmentation Using Deep Learning." ***International MICCAI-SWITCH Workshop*** Springer, Cham, 2018.
11. Islam, Mobarakol, et al. "Multi-modal PixelNet for Brain Tumor Segmentation." ***International MICCAI Brainlesion Workshop*** Springer, Cham, 2017.
12. Islam, Mobarakol, et al. "Ischemic Stroke Lesion Segmentation Using Adversarial Learning." ***International MICCAI Brainlesion Workshop*** Springer, Cham, 2018.

COLLABORATION

Dr. Nicolas Kon Kam King, Neurosurgeon

Prognostic Factors of Survival and Functional Outcomes in Intracerebral Haemorrhage

Mar 17 – Ongoing NNI, SG

Dr. Yusuke Suenaga, Staff Scientist

Human Frontier Science Program

Nov 18 – Ongoing Cancer Genome C., Japan

GUIDING INTERNS

1. Undergrad student, SJTU, China
   Visual Attention in Surgical Scene Understanding
   Jan 19 – Aug 19
2. SERIUS Team 18, 19: University of Pittsburgh, USA, UToronto, CA
   Glioma Resection Clinical Routine, 3D segmentation, Tracking
   May 18/19 – Aug 18/19
3. Undergrad student, UM, Sri Lanka
   Radiogenomic Model for GBM Overall Survival Prediction
   May 18 – Dec 18
4. Undergrad student, NIT-Trichy, India
   Adversarial Learning for Medical Image Segmentation and Synthesis
   May 18/19 – Aug 18/19
5. DCP-Team 18, 19: Undergrad student, NUS, Singapore
   Spatiotemporal Ultrasound Needle Tracking and Trajectory Prediction
   Jan 18/19 – Dec 18/19

REVIEWER

MICCAI-19,20 | AAAI-17 | IEEE RA-L 19 | Brainlesion Workshop 17,18, 19 | ICIA 2019 | Neurocomputing 2020 | IJCARS 2020

COMPETITIONS

BraTS 17, 18, 19 | ISLES 17, ISLES 18 | Robotic Instrument Seg. Challenge 18 | MonuSeg 18, Pathology 18 | PALM 19

MEDICAL DATA

MRI | CT | X-Ray | Ultrasound | Microscope | Endoscope | DNA sequence | Gene Expression Profiling