ANWAR KHAN

Gwangju-South Korea

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EDUCATION

Gwangju Institute of Science and Technology, South Korea *March 2020 - Present*
CGPA= 4.2/4.5 (Third Semester)
Master of Science, Biomedical
Department of Biomedical Sciences and Engineering

NED University of Engineering and Technology, Pakistan *January 2014 - November 2017*
CGPA= 3.47/4.0
Bachelor of Engineering, Biomedical
Faculty of Electrical and Computer Engineering

RESEARCH INTEREST

I am currently a master's student in Prof. Boreom Lee laboratory, applying statistical machine learning and deep learning methods to understanding non-linearities in large scale genomics cancer datasets (Melanoma, Gastric cancer, Lung cancer).

My scientific background is in biomedical engineering, where I am interested in developing Machine learning and Deep learning models that help in analyzing complex relationships in sequential bivariate/multivariate biomedical datasets (Imaging, transcriptomics, proteomics).

The essence of my whole research is to help in disease cure, improve patient's health, and extend the human lifespan by developing intelligent systems that can explore and exploit complex dependencies in biomedical datasets.

RESEARCH EXPERIENCE

Artificial Intelligence-based Drug Discovery

1. **Artificial Intelligence-based discovery of cancer-specific metabolic targets.**

2. **DeepGA: A novel multi-head self-attention framework for the classification of Lung cancer sub-types:**

   Micro-array has been extensively adapted to profile gene expression data of tumors and applied to cancer classification, but its success largely depends on the tools of data mining. This project aimed at proposing a collaborative multi-head attention Convolutional Neural Network (CNN) for the classification of lung cancer sub-types. Existing deep learning classification models inhibit processing the entire set of genes and are mainly based on executing feature selection as a prerequisite before training the ML classifiers. In this work, we proposed an end-to-end approach for the classification of the gene expression data, in which a self-attention module allows the model to jointly learn complex genomic information from different genes of different patient samples, shared across multiple cancer sub-types. (Manuscript submitted for english editing).

3. **Brain Tumor Segmentation using Convolutional Neural Networks:** The study was inspired from a previous study on FLAIR MRI scans, in which Mateusz et al., (2019) combined the field of deep learning and radiogenomics, and proposed a fully automatic algorithm to quantify tumor imaging characteristics using deep learning-based segmentation and test whether these characteristics are predictive of tumor genomic subtypes. However, this study is solely based on brain tumor segmentation. Earlier approaches used patch-wise implementation for semantic segmentation, which is computationally slow, and there is a trade-off between the segmentation accuracy and size of patches. A modified version of an encoder and decoder network, SegNet was proposed to yield precise segmentation with few training images. The dataset was obtained from The Cancer Imaging Archive (TCIA). To perform ablation studies, a combination of FPN with U-Net was used with originally implemented U-Net and proposed modified SegNet. Modified SegNet outperformed others with a mean DICE score of 0.88 and an IOU value of 85%.

4. **Retinal Vessel Segmentation using the U-Net CNN in pyTorch:** Retinal blood vessel segmentation in fundus images plays a major role in eye disease detection. Segmentation of such images used to be done by hand by experts. However, this task is time-consuming and tedious. In the past years, researchers have aimed to implement methods for automatic image segmentation. In this study for automatic blood vessel segmentation using the Convolutional Neural Network U-Net on three publicly available datasets: STARE, DRIVE, and CHASE-DB1. The trained network reaches an AUC of 0.98.

5. **An Image Processing Tool for the Clinical assessment of Foot deformities.**
The scope of this project was to design a novel image processing tool for the foot posture assessment, based on the Arch Index (AI) and Foot Posture Index (FPI). The first step was to design a podoscope to capture the plantar foot surface of the foot to calculate AI and FPI. Earlier approaches were insufficient to picturize perfect plantar foot image and, therefore there was a tradeoff between the diagnosis and treatment, suggested by the Orthopedician. Those plantar foot images were then processed on MATLAB based algorithm with a GUI, which can calculate AI and FPI. The algorithm designed to process plantar foot images is novel and not publicly available. This instrument is now present at the Biomechanics Lab of Karachi University for experimental analysis.

6. **Breast Cancer Detection using Near Infra-Red Imaging:** In this work, a simple and cost-effective Near Infra-Red (NIR) imaging system was proposed for breast cancer detection. Since there is a difference in optical densities b/w normal and abnormal breast tissues at infrared wavelength, a NIR imaging system was employed and, phantom experiments were implemented to show the ability of the system for detecting breast cancer.

WORK EXPERIENCE

Gwangju Institute of Science and Technology (GIST), South Korea   Present
Research Assistant (Paid)   *Bio-Medical Information and Signal (BMIS) Lab*

* Conducting detailed research and formulate effective and efficient research processes.

* Anticipating research issues and promptly resolving them.

* Test research methodologies to confirm intended purpose of evaluation.

* Document, report, and present research findings to the Professor.

Gwangju Institute of Science and Technology (GIST), South Korea June 2019
Research Intern (Paid) *3D Biomedical Imaging and Technology Lab*

* Carried out literature and evidence reviews, including identifying relevant research evidence, appraising the quality of evidence and writing up key findings.

* Conducted a successful research project and recorded results within a poster presentation.

* Attended lab group meetings and presented research papers.

Medline Technologies (Pvt.) Ltd., Karachi January 2018- June 2019
Product Specialist and Service Engineer *Critical Care Division and Ultrasound*

* Demonstrate product functionality and communicate all technical specifications.

* Coordinate with engineering and manufacturing teams in product development activities.

* Seek self-improvement through mentoring and coaching from senior team members.

The INDUS Hospital, Karachi November 2017- January 2018
Trainee Service Biomedical Engineer *Radiology*

* Perform calibration of healthcare equipment(Example: Air and Water calibration of CT detectors to prevent Ring Artifacts).

* Planning and undertaking scheduled maintenance (PPM).

* Ensuring compliance with health and safety.

TECHNICAL STRENGTHS

Programming Languages	Python, R, MATLAB.
ML and DL liabraries	Keras,Tensorflow, pyTorch, sklearn, Numpy, Pandas.

CODEATHON AND HACKATHONS

* Cold Spring Harbor Laboratory Biological Data Science Codeathon.

CONFERENCES AND SEMINARS

* Biological Data Science(Cold Spring Harbor Laboratory), 2020.

* International Conference on Medical Image Computing and Computer Assisted Intervention-MICCAI, 2020.

* German Conference on Bioinformatics-GCB, 2020.

* Thirty-seventh International Conference on Machine Learning- ICML 2020.

* Brain somatic mutations in human neurological disorders.

* Brief History of PET and MRI For the Brain Science.

* Non-invasive Brain-Computer Interfaces for Communication and Control.

* IEEE Brain Virtual Conference: Bio-electronics. Tutorial 1: Organic Bio-electronics.

HONOUR, AWARD AND CERTIFICATIONS

* Awarded Lotte scholarship for master studies in GIST.

* Best Edible Car design awarded by NSA Pakistan.

* Awarded membership of Force Biomedical team, India.

* Honored to represent Pakistan at Global Intern Program, South Korea.

* Honored to volunteer for Anjuman Ittehad Muslimeen-Pertab Garh, who are working for the education of less privileged children.

* Certificate of Competency by NVIDIA Deep Learning Institute.

* Coursera Certification of Computer Vision Deep Learning and Neural Network.

* Coursera Certification of Fundamental Neuroscience for Neuroimaging.

* Registered Engineer from Pakistan Engineering Council(PEC).

* Certified Microsoft Word Specialist.

CO-CURRICULAR ACTIVITIES

* Serving as President of GIST International Students Association (GISA).

* Serving as Vice President of the BMSE Student Council, 2021.

* Serving as a co-ordinator for all universities in South region of Korea to increase academic opportunities for the community.

* Serving as a President of Pakistani community at GIST.

* **HEC KEP Foot Biomechanics Symposium:** Organized 3-days symposium on Foot Biomechanics in which the guest of Honor was Dr. Wiejie Wang from University of Dundee, UK.

* Attended a seminar on **Machine Learning and Visual Analytics** by Data Science Journey, Pakistan.

* Attended a workshop on Boosting up your Employability by INJAZZ Pakistan.

* **Founded, Robotics Club, N.E.D University, Karachi:** where regular competitions were held for the members to come up with clever solutions for problems with the help of using robot.

PERSONAL TRAITS

* Highly motivated and willing to learn new skills.

* Strong leadership skills.

* Ability to work as an individual as well as in group.

* Ability to speak Korean, English and Urdu/Hindi Languages.