Shakra Batool

Contact Information

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Research Interests

Machine Learning, Deep Learning, Data Mining and Data Analysis, Feature Extraction, Image Processing, Image Classification, Image Segmentation.

Education

NUST University., Islamabad, Pakistan.

Masters of Bioinformatics — Sep. 2021 - Present

- **Thesis**: Development of Deep Learning pipeline for Airways segmentation in Human Lungs
- **Relevent Cources**: Applied Machine Learning, Data Analysis, and Statistics, Deep Learning, Deep Learning in Medicine

COMSATS University., Islamabad, Pakistan.

Bachlors of Bioinformatics — Feb. 2017 - Jan 2021

- **Thesis**: Breast Cancer Detection and Segmentation using Convolutional Neural Networks.
- **Relevent Cources**: Artificial Intelligence and Neural Networks, Bioinformatics Analysis

Work Experience

- **Research Assistant:** — Oct. 2021 - Present
  - **I**mage Analysis Lab (SINES, NUST)
- **Research Assistant:** — Sep. 2020 - Jan. 2021
  - **N**ational Center for Artificial Intelligence(NCAI)

Research Projects

Development of Deep Learning Pipeline For Airways Segmentation in Human Lungs

Approach: For the project, 3D CT scans of lungs were used for Airways Segmentation. The dataset was taken from an online competition presented in **MICCAI**. After several pre-processing steps, the dataset was given to deep learning architecture **U-Net** for training. Pre-processing steps include conversion from 3D to 2D format **DICOM**, windowing, filtration, thresholding, and resizing techniques. These steps were performed on jupyter notebook. Training was done on High-Performance Computing (HPC) using putty and MobaXterm tools. Hyper-parameter tunning is performed to improve the results.

Outcome: Trained U-Net model which is able to segment the airways from 2D DICOM images.

Cancer Detection using Convolutional Neural Networks

Approach: I evaluated several CNN models including **VGG16**, **ResNet50**, and **MobileNet** to detect tumors from mammograms and histopathological images. For training and testing **CBIS-DDSM dataset** is used which is an updated and standardized version of the Digital Database for Screening Mammography (DDSM).

Outcome: Trained MobileNet models which are able to classify the tumor into benign and malignant classes accurately.

Cancer Segmentation using UNet

Approach: I used the UNet model for training on a publically available dataset namely Data Science Bowl 2018. The training dataset contains images along with the mask of nuclei present in images. To reduce overfitting, data augmentation is used.

Outcome: A trained UNet model is able to segment the nuclei present in images.

Cource Projects

- Auto diabetes detection using logistic regression on the microbiome of the human body.
- Cow disease prediction using different machine learning models along with MLP(multi-layer-perceptron) and comparison of performance evaluation for all models.
- Identification and Extraction of specific human proteins using dictionaries and suffix trees.
- Application of Linear Regression for age prediction.
- Restaurant Management System with online reservation system using Object Oriented Programming.
- **MUSINTO:** A game for kids to teach rhymes, alphabets, and numbers.

Languages and Tools

- **Languages:** Java, C++, Python, SQL, R, Matlab. I am also familiar with HTML, Visual Studio, and C.
- **Tools:** Eclipse, Idle, Google Colab, Netbeans, Visual Studio, MS SQL Server, XAMP, MobaXterm, Putty, WinSCP.

Other Skills

- Machine learning models like Linear Regression, Logistic Regression, Decision Trees, and Random Forest.
- Drug Designing by receptor-ligand binding using Bioinformatics Software including Hex Software, Ligplot Plus, PDB Editor, Chimera, and Wincoot, along with virtual screening using ML models.
- Study of DNA of different species using NCBI, EBI, and SwissProt.
- DNA to Proteins Conversions using Bioinformatics Tool ExPasy.
- Microsoft Word, Microsoft Exel, Microsoft Powerpoint, Microsoft Access, Linux.

Awards and Scholarships

- Best Poster Presentation Award.
- Merit Based Scholarship in FS.c.

Volunteer Work

- Fund raising and distribution to local deserving people affected by COVID-19.
- Awareness talk on Muscular Dystrophy and Thalasymia.
- Hospital visit to understand the cause and effects of Muscular Dystrophy and Thalasymia in young children.
- Hospital visit to understand the role of airway anatomy in Chronic Obstructive Pulmonary Diseases(COPD).