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

National University of Science and Technology (NUST), Islamabad, Pakistan.

Masters in 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.

Bachelors in 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
  - **M**edical Image and Diangostic Lab,
    National 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, including conversion from 3D to 2D format, the dataset was fed to the DNN architecture U-Net for training.

- **DICOM**

  Approach: Windowing, filtration, thresholding, and resizing techniques. Training was done on High-Performance Computing (HPC) clusters. Hyper-parameter tunning is performed to improve the results further. **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 UNet model for training on a publicly available dataset namely Data Science Bowl 2018. The training dataset contained images along with the mask of nuclei present in the images. To reduce overfitting, data augmentation was employed. **Outcome:** A trained UNet model was able to segment the nuclei present in images.

Course Projects

- Auto diabetes detection using logistic regression on the microbiome of the human body.
- Cow disease prediction using different machine learning models including MLP (multi-layer perceptron) and performance evaluation of various 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, Flutter, and C#.
- **Tools:** Eclipse, Idle, Google Colab, Netbeans, Visual Studio, MS SQL Server.

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.
- App Development using Visual Studio and Flutter.
- Microsoft Word, Microsoft Exel, Microsoft Powerpoint, Microsoft Access, Linux.

Awards and Scholarships

- Best Poster Presentation Award.
- Merit Based Scholarship in Higher Secondary School Examination (HSSC).

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).