**Neonatal sleep/wake detection using Deep learning**

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**Introduction**

This internship exclusively gave me knowledge and gave me access to work on highly classified medical information and medical dataset, right from collection of data, through annotation and labelling, augmentation as well as training a Deep learning model with the same data collected from NICU. This internship has thought me to do all of it from scratch. Not to mention giving me exclusive access to collect data from NICU from RIT Medical College. Also, providing access to CCU to collect Healthy-pi dst data from elderly

**Work assigned:**

Collection of data from NICU, Annotation, labelling, augmentation and training (Yolo v7) model.

**Data Collection:**

* Devices used: Webcam, Audio Recorder, Laptop, PuTTY application, vitals sensor (spo2, temperature, heart rate), healthy-pi dst.
* Dataset: Video dataset converted to frames which were recorded from NICU, healthy-pi dst data recording from CCU.

**Working on Dataset (Pre-Processing)**

Extraction of Images/Frames at 30 frames from all collected and previous data from the desktop. Labelling the data using DarkLabel, augmentation and uploading data to Roboflow.

Total of 1000+ images of sleep/awake state of infant were extracted from the videos collected from NICU with 15 images of each baby in sleep/awake state.

Also, I extracted audio recording clips of infants to extract features using acoustics program from matlab.

**Paper review on biologically inspired optimisation algorithm**

* Infant speech signal analysis using grey wolf algorithm.
* Cry signal analysis using CNN, RNN, KNN and SVM.

**Paper review (Literature review)**

* Deep learning systems for automatic diagnosis of infant cry signals.
* IoT-BBMS: Internet of Things-Based Baby Monitoring System for Smart Cradle.
* Biomedical Diagnosis of Infant Cry Signals Based on Analysis of Cepstrum by Deep Feedforward Artificial Neural Network.

**Review paper:**

Introduction:

* Importance of Deep Learning.
* Advantages.
* why it is used in real time.
* Processing 1-D bio medical signals.

Bio medical signals that provide prominent info like ECG, EEG, infant cry, facial pattern of new born at NICU.

Related literature: each biomedical signals: the work that has been done / reported

The 3 aspects: deep learning, transcript learning, CNN.

Creation of synthetic data/ data augmentation technique: how it can be evaluated, what are the performance metrics that have been used.

Come up with an optimal technology based on the performance metrics

Conclusion: if one specific signal is selected then which deep learning strategy is used, which data augmentation method is used, how it will be useful.

**Technical paper: (2nd-3rd week of November)**

Look into the sleep wake of the new born

**Title: Application of the deep learning model of the detection of sleep wake cycle in NICU**

**Intro**: importance of sleep wake cycle, the different sleep stages, how sleep wake is important for the analysis of NICU, (preterm and full-term babies will be admitted in NICU so the diagnosis of whether the baby is high risk or full risk, continuous monitoring of these babies is very important) so we take video of baby and convert it into frames and introduce the frame tech

At end of intro: the significant contribution of the propose work,

Select some frame tech for accurately picking up the frame and label it into sleep or awake with the help of the staff nurse.

Use different DL methods

Do literature table to depict the different techniques that have been adopted

**Conclusion**: Drawbacks/limitations, how proposed technique is going to be helpful,

**Materials and methods**: Overall framework of the proposed methodology, inputs processing, how DL techniques have been used, outputs and performance evaluation metrics

In materials and methods: Dataset description, Deep learning technique, Performance metric

**Results**: Results obtained

Discussion: The proposed work and compare with other research (results with the validation research), performance metrics.

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