

Projects for MS/MEngg Research Thesis:

All these projects are offered by Dr. Saad Qasim Khan, HEC Approved PhD Supervisor, Assistant Professor in Department of Computer and Information Systems Engineering, NED University of Engineering and Technology. These projects are offered to the master's students enrolled for MEngg/MS Thesis in Fall, 2023. The students are most welcome to propose their ideas and modifications as well in line with the theme of proposed projects.

1. **Cancer model simulation for its progression and impact.**

This is the extension of existing project. Dr. Saad Qasim Khan with the help of his team has created a model to computationally demonstrate the dynamics of cancer cell. The proposed project is to modify the existing model and add more refined mathematical models to show the progression of cancer cell. This project will help in the ongoing cancer research in the world and will be an aid to curb this notorious disease.

2. **Computer Vision based project to detect inactivity of Intensive care unit patients.**

This is the extension of existing project. Dr. Saad Qasim Khan with the help of his team has created a computer vision model to detect the inactivity of patients in Intensive Care Unit (ICU). This inactivity may raise an alarm and inform the hospital staff for an emergency care required by a patients. Preliminary results are available. The proposed project will be to strengthen the existing system to work in practical situations.

3. **Design and Implementation of Schumann based resonance device and study its impact on wellbeing of hospital patients**

Schumann Resonance is thought to have a positive impact on patient wellbeing. This is a new project in which Dr. Saad is interested in evaluating the impact of Schumann resonance on the outcome of patient recovery with the help of master's student. In this project the student is also required to design a Schumann resonance device and implantation of that device in hospital environment. Further it requires to study the impact of Schumann resonance on patient recovery and compare it with controlled environment patients.

4. **Neuromorphic Hardware design on Field Programmable Gate Array device**

Dr. Saad intends to implement his frequency dependent synaptic plasticity model on Field programmable gate array. In this project the student is required to implement array of digital filters on neuromorphic hardware. These filters are required to be tunable. This model has numerous applications and high chances of publication in high impact journal.

5. **A Smart System for ECG based early cardiac disease detection**

This is the extension of existing project. Dr. Saad Qasim Khan with the help of his team has created a model for heart disease diagnosis system by analysis of ECG signals. ECG signals plays a key role in identification of heart related rhythm abnormalities. A smart system model has been created to identify the anomalies in the heart rhythm to identify heart related disease. The student is required to modify the system and incorporate further features into the existing system to make it more robust and error free.

6. An electronic trap system for protection of Agricultural field against harmful flying insects.

This is the extension of existing project. Dr. Saad Qasim Khan with the help of his team has created an electronic trap for harmful flying insects in the agricultural fields. This model uses an array of different light pattern to lure the flying insects into the trap. This model further uses a computer vision model to distinguish between the harmless and harmful flying insects to avoid killing those flying bees which helps in pollination.

7. A PYNQ (FPGA) based system for efficient implementation of Computer vision applications.

PYNQ is a board produced by Xilinx for efficient implementation of Python code on FPGA hardware. There are numerous computer vision algorithms that may be implemented on PYNQ hardware. One such algorithm was implemented on PYNQ hardware by the team of Dr. Saad. The student is required to explore further this hardware and implement computer vision algorithm on it.

8. An AI doctor, an online AI system for preliminary diagnosis of disease.

Design of an expert system for medical diagnosis system is an area where multiple researchers have already produced efficient implementation yet this area requires more efforts as the medical field is evolving day by day. This project aims to design an online system that takes queries from the user and provide possible diagnosis using artificial intelligence.

9. A software filter design for implementation of Frequency Dependent Plasticity Model.

Design of a software filter that is also tunable is not a new topic but its use in frequency dependent plasticity model is a novel area of research. To explore the possibilities of different applications that may be implemented through the proposed model.

10. A Speaker identification System based on Frequency Dependent Plasticity Model

Speaker identification is a task carried out by complex artificial intelligence algorithms that requires large resources. The frequency dependent plasticity model offers an efficient and novel model for implementation of speaker identification.

11. An image classification model based on Frequency Dependent Plasticity Model.

Image classification is another classic example of artificial intelligence in general and computer vision in particular. There are numerous image classification models existing in current time. The purpose of this research project is to design an image classification model based on frequency dependent synaptic plasticity model. The frequency-based plasticity model was proposed by Dr. Saad during his PhD research. He intends to explore different applications that may be developed through this mode.

12. A computational model for detection of oxidative stress in patients with high probability of cancer.

Dr. Saad has keen interest in the research related to cancer and the role of computational models in the eradication of this dreaded disease. One of the key step in this regard is early identification of cancer. There are many precursors to cancer.

13. A diabetic management system for Type 2 diabetic patients.

Type 2 diabetes is progressing with a rapid pace throughout the world. After initial diagnosis, a patient has to go through the life long diabetic management. In this project a student is required to design an artificial intelligent based system for management of Type 2 diabetic patients.

14. A software/hardware model for an integrate and fire neuron model

Integrate and fire neuron model is the most biological plausible neuron model. In this new project, a student is required to design a neuron model. The option of designing a neuron model in either software or hardware is available. Neuron plays a key computational role in any neural network. Implementation of new neuron model may open up new gateways for different neural implementations.

15. An EEG based smart system for early detection of epileptic seizure.

The onset of epileptic seizure is sudden and many times may cause harm to the patients of epilepsy. A system is proposed here which may inform in advance regarding occurrence of epileptic seizure. This system may help thousand of epileptic patients in future.