Pakistan Institute of Engineering and Applied Sciences
Nilore, Islamabad, 45650 Pakistan

THESIS PROJECT PROPOSAL PROFORMA

Project Title	**Correlation Filter Banks for Medical Image Analysis**
Nature	Computational
Prerequisites	Knowledge of the following will be helpful: • Machine Learning / Computational Intelligence / Pattern Classification • Python Programming • Image Processing / Computer Vision Interested students will be required to take courses or conduct supervisor guided self-study in machine learning and image processing (or equivalent) if they lack such background.
Field	Computational Intelligence
Expected Cost (if any)	
Work Place*	PIEAS

*define %age of work to be done in PIEAS or at some other place

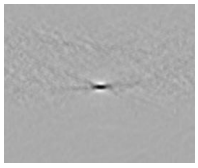
Supervisor Information

Name of supervisor and designation	Supervisor: Dr. Fayyaz ul Amir Afsar Minhas, Senior Scientist		
Department\Division and Organization	Department of Computer Science, PIEAS		
Contact	Office: 3164	Mobile:	Fax:
Email address	fayyazafsar@gmail.com, afsar@pieas.edu.pk		

Project Details

Synopsis

Motivation: Computational analysis of medical images such as ultrasounds and CT scans can improve medical diagnosis and treatment. In our earlier work, we have found that correlation filters are very useful in analysis of liver ultrasound images. Correlation filters have a very simple principle of operation of simply correlating a given image with a template of the desired structure to locate biologically interesting features. The template (or filter) is obtained using training data. An example of a correlation filter in action for identifying the surface of the liver in the ultrasound image is shown below.


Correlation Filter


Input Ultrasound Image


Detected Liver Surface

Objectives: There are two primary objectives of this project:

I. Identifying potential application areas of correlation filters in biomedical image analysis (such as cancer histopathology images, etc.) and evaluating the performance of correlation filters in these areas.

II. Developing a mathematical formulation for a classifier based on correlation filters.

Skills Resulting from the project: Image analysis, machine learning, Correlation Filters, Python Programming, Multidisciplinary Research methodologies and publishing.

Goals of the Project

4th Semester (3 credit hour per week are available)	**I. Development of understanding of correlation filters and biomedical imaging** **II. Exploring different problem areas** **III. Baseline implementation**
5th Semester (12 credit hour per week are available)	**I. Formal analysis of correlation filters** **II. Development of machine learning models** **III. Comparison**

Instructions

- All the columns of project proposal forms are mandatory to be filled.
- The minimum qualification for a supervisor is eighteen years of education plus two years service.
- The minimum requirement for a co-supervisor is eighteen years of education.
- In case of external supervisor (outside DCIS), a co-supervisor will be mandatory from faculty.
- Wherever the project work is carried out (including classified establishments), the defense (only examiners and supervisor) and final presentation (open to all) will be held at PIEAS. The presence of supervisor is necessary for all presentations of fourth and fifth semesters.
- DCIS has right to reject or accept any project.

Signature of Supervisor

Signature Head of the Department
(With name and designation)