

## Half Yearly Progress Report for Jan-May 2019

### Data Sheet for M.S Scholars

**Name** : Sadbhavana Babar  
**Registration No** : CS18S029  
**Department** : Computer Science and Engineering  
**Date of Joining** : 09/07/2018  
**Specialization / Stream** : Computer Vision  
**Area of Research work** : Scene understanding, object detection and recognition  
**Category of Admission** : Project  
**Guide** : Prof. Sukhendu Das  
**Date of GTC meetings** :

Description	Event	Date
1st GTC meeting	Research Scholar will have a Mid-Term Review meeting. GTC may recommend on continuation of HTRA.	1.5 years
2nd GTC meeting	Seminar	
3rd GTC meeting	Submission of Synopsis	1 month before thesis submission

### Details of Course work

S.No	Course No.	Course Title	Sem/Year	Credits	Grade
<b>Core Courses</b>					
1	CS6015	Linear Algebra and Random Processes	1 (Jul - Nov 2018)	12	B
2	CS6730	Probabilistic Graphical Models	2 (Jan - May 2019)	12	A
3	CS7015	Deep Learning	2 (Jan - May 2019)	12	A

<b>Elective Courses</b>					
1	CS5020	Non-Linear Optimization : Theory and algorithms	1 (Jul - Nov 2018)	12	C
2	CS5691	Pattern Recognition and Machine Learning	1 (Jul - Nov 2018)	15	C
3	CS6350	Computer Vision	2 (Jan - May 2019)	12	B
4	CS6777	Optimization Methods for Computer Vision Applications	3 (Jul - Nov 2019)	12	
<b>Compulsory Courses / Optional Courses</b>					
1	ID6020	Introduction of Research (Institute Module)	1 (Jul - Nov 2018)	0	P
2	CS6020	Introduction to Research	1 (Jul - Nov 2018)	0	P

Signature of Scholar

Signature of Guide

### **Contents**

**i) Title of Research Work :** Scene Understanding for identification of covert geo-locations, in a scene, using a Hyper-classifier based Visual Intelligent System.

**ii) Problem Definition (of Project) / Research Objectives :** Object Detection and Recognition is one of the fundamental problems in Computer Vision which helps to understand visual scenes better. Depending on the kind of problem to be solved, there are two types of methods for Object Detection and Recognition - i) Single stage method : Here the main target is the speed with which the objects are detected in a scene. ii) Two stage methods : Here the target is the accuracy with which the algorithm is able to detect objects in a given scene. Its main purpose is to classify the objects into their correct classes and localize them accurately. So there is always a trade-off between speed and accuracy. Hence the goal is to design an algorithm which will be able to bridge this gap.

### **iii) Summary of Work Done before Review (From the date of admission till now) :**

- Dataset collection for the project : Collected indoor scenes in the form of images/videos shot inside the campus in various labs and corridors. We have collected around 200 videos approximately, with an average length of 35-40 seconds per video.
- Annotation of the dataset collected : Completed 40% of annotation of the complete dataset.
- Course work : Completed six courses, three in the first semester (Jul - nov 2018) and three in the second semester (Jan - May 2019). In the first semester I took courses which would help me build my fundamentals to work in the field of machine learning. In Linear Algebra and Random Processes, I learnt about the importance of using different kinds of Matrices and their decompositions. I also learnt about different types of Probability Distributions which can be closely mapped onto some real world problems. In Non-Linear Optimization, I learnt about various techniques to solve different kind of optimization problems. I learnt about SVMs, logistic regression, gradient descent and its variants. In Pattern Recognition and Machine Learning, I learnt about Bayesian classifiers, GMMs, HMMs and their applications in solving problems related to speech and vision related tasks. I also learnt about non-parametric techniques to solve complex machine learning problems, and also dimensionality reduction methods like PCA, LDA.
- Literature Review : Read research papers about recent advances in Object Detection and Recognition.

### **iv) Work Done During Review (Even Semester 2019)**

- Attended 11th Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP) 2018 to get an insight about the current trends in Computer Vision.
- Course work : Completed 3 courses each of 12 credits. In Computer Vision, I learnt about the various classical techniques used to address problems like Depth Estimation, Segmentation, Object Detection. I also did a term project in which I explored various existing algorithms in Object Detection based on Deep Learning and implemented one of them on PASCAL VOC 2007 + 2012 dataset. In Deep Learning, I learnt to implement Multi Layer Feed Forward Neural Networks on various Regression and Classification problems. I also learnt to implement AutoEncoders, RBMs, CNN, LSTM on various datasets. In Probabilistic Graphical Models, I learnt about various graph structures and their properties and how a problem can be massaged as a graph algorithm problem. It also consisted of some interesting topics like Bayesian Inference, Monte Carlo Markov Chains, Variational Inference, Gibbs Sampling. I also got introduced to causality in neural networks which is a flourishing research area, towards the end of this course.
- Literature Review : Read papers about recent advances in Object Detection and Recognition and successfully implemented one of them on some standard datasets available for the same, like PASCAL VOC 2007, MS COCO.
- Attended various seminars in and outside the department related to my field of research.

### **v) Issues affecting Research Progress, if any : None**

**vi) Future Plans, with proposed timeline :**

- **Course work** : Completed the course work requirement of 5 courses. Planning to take one more course titled “Optimization Methods for Computer Vision Applications” which will help me in my research work. [Jul - Nov 2019]
- **Research work** : To complete annotation of the collected dataset. To design an object detection algorithm whose performance is at par with current methods available, both in terms of speed as well as accuracy and evaluate its performance on the collected dataset.

**vii) Visible Research Output:**

(a) Paper(s) Published in Journals : None

(b) Full Paper(s) Published in Conference Proceedings : None

(c) Seminars/Workshops/Conferences/Exchange Programmes attended :

- Attended 11th Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP) 2018 held at IIIT Hyderabad from 18/12/2018 to 22/12/2018.
- Going to attend CVIT Summer School 2019, IIIT Hyderabad from 1/7/2019 to 7/7/2019.

(d) Awards/Honours, if any : None