



## **CAPSTONE PROJECT 2**

### **Activity Log**

# **An Artificial Intelligence Model for Flood Prediction in Urban Areas Based on Swarm Intelligence Algorithms and Artificial Neural Networks**

by

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## 2.0. Activities, milestones, and timelines

[illegible]

Activities & Tasks	Capstone project 2 (BSE year 3 final year project: 14 weeks)													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Experiments on the optimization of the models														
Recording the output of each experiment														
Record the failures of the experiments														
Compile the gather information and data into a final report														
Project submission														
Viva session														

### 3.0 Project Revision

Initial plannings	Revised planning	Reasoning
<u>Research ideas</u> <ul style="list-style-type: none"> <li>After thorough researching on the topic, the idea was to obtain an existing dataset and as an input and then uses different method to produce an output of flood prediction data</li> <li>The dataset will be obtained from existing works from other people through online searching</li> <li>The main platform in gathering such dataset is planned to be mainly from</li> </ul>	<ul style="list-style-type: none"> <li>The method of gathering datasets is then revised into looking at GitHub and Kaggle. It is much more efficient to search for the dataset through the repositories of GitHub or Kaggle instead</li> </ul>	<ul style="list-style-type: none"> <li>Most flood prediction datasets come in the form of a .csv file and therefore it is how many recorded the data to be stored and shared with when required.</li> <li>There are a handful of repositories of such data for the use of flood predictions available in GitHub and Kaggle for future usage.</li> </ul>

google scholar and google		
<u>Algorithm choice for the optimization process</u> <ul style="list-style-type: none"> <li>The initially optimization choice was Particle Swarm Optimization due to its frequent usage in flood predictions because of the accuracy of the algorithm.</li> </ul>	<ul style="list-style-type: none"> <li>The idea was revised with the usage of K-Nearest Neighbour, Support Vectors, Logistic Regression, Decision Tree, Random Forest, Feedforward Neural Network, and Particle Swarm Optimization</li> </ul>	<ul style="list-style-type: none"> <li>For the algorithms, K-Nearest Neighbour, Support Vectors, Logistic Regression, Decision Tree, and Random Forest; these 5 algorithms will serve as the benchmark for evaluation alongside the Particle Swarm Optimization and Feedforward Neural Network.</li> </ul>
<u>Implementation Tools</u> <ul style="list-style-type: none"> <li>As mentioned above, the programming language that will be used in this project is python with the usage of PyCharm with its extension features for further assisting in this project</li> </ul>	<ul style="list-style-type: none"> <li>The plan was then revised and changed to only the usage of Visual Studio Code as a platform for running the code alongside python libraries because the library is an important part to proceed with the optimizations.</li> </ul>	<ul style="list-style-type: none"> <li>The reasoning behind this decision is because of the availability and extension that Visual Studio Code provides.</li> <li>Easy usage of libraries as well as importing from the libraries and running it all on the same platform saves time and hassle and hence making work progression faster.</li> </ul>

## 4.0 Meeting Logs

**SCHOOL OF ENGINEERING AND TECHNOLOGY**  
**DEPARTMENT OF COMPUTING AND INFORMATION SYSTEMS**  
**SUPERVISION MEETING RECORDS**

# SUPERVISION MEETING RECORD 1

Date: 25/5/2023

Time: 11:01 a.m.

Student: Chew Chien Zhen

Supervisor: Dr Muhammad Basheer Jasser

## Updates from the previous meeting:

[This is the first meeting with Dr Basheer and I for the second phase of my capstone project, so no updates]

## Items discussed this meeting:

This is the first meeting with Dr Basheer and me, Chew Chien Zhen. In this meeting, it was planned that I would inquire more regarding my models and how I would evaluate the outputs before documenting my results. However, Dr Basheer was unavailable for urgent matters, therefore I took the initiative to proceed with what I am aware of which working on my benchmark model.

## Work for the coming meeting:

During the next meeting, it is expected to be a discussion about my further plans on my work and validate if my work is fulfilling my topic as well as a follow up of what I have planned in capstone 1.

Supervisor's Signature

Student's Signature

.....Dr. basheer.....

.....Zhen.....

# SUPERVISION MEETING RECORD 2

Date: 1/6/2023

Time: 11:01 a.m.

Student: Chew Chien Zhen

Supervisor: Dr Muhammad Basheer Jasser

## Updates from the previous meeting:

Due to urgent matters, there was no meeting in the previous week therefore it is just me updating my work attempt of initiating my capstone 2.

## Items discussed this meeting:

In this meeting, I further inquire Dr Basheer what exactly should I really do in this topic's field. Whether my model was the ideal one to be used in my work. Dr Basheer pointed out what was not suitable and therefore allowed me to further evaluate my choice error. So, further correction of my methodology was needed as I took the next step in changing my model for a more suitable one.

## Work for the coming meeting:

During the next meeting, it is expected to be a discussion about my further plans on my work and my progression of the model I have come up with to evaluate the chosen dataset.

Supervisor's Signature

Student's Signature

..... Dr. basheer .....

.....Zhen.....

# SUPERVISION MEETING RECORD 3

Date: 8/6/2023

Time: 1:19 p.m.

Student: Chew Chien Zhen

Supervisor: Dr Muhammad Basheer Jasser

## Updates from the previous meeting:

From the previous meeting, I have followed Dr Basheer's guidance as best as I could and came up with a model to read and train a dataset.

## Items discussed this meeting:

In this meeting I have confirmed with Dr Basheer that it is decided, I would conduct a supervised learning method in my experiments and attempts of developing a working model. Therefore, the dataset required in my work must be an already pre-determined dataset with the results already available in the dataset csv file itself. Which means my work would focus specifically on evaluating the accuracy of the prediction done by the models. It is planned that I would look for a dataset of Malaysia where it is already pre-determined whether urban areas have already flooded or not.

## Work for the coming meeting:

During the next meeting, it is expected to be a discussion about my progression of the model and my findings of Malaysia's dataset that are suitable for the use in supervised learning. Updates regarding my findings of a suitable dataset bears fruit or not.

Supervisor's Signature

Student's Signature

..... Dr. basheer .....

.....Zhen.....



# SUPERVISION MEETING RECORD 4

Date: 10/6/2023

Time: 3:28 p.m.

Student: Chew Chien Zhen

Supervisor: Dr Muhammad Basheer Jasser

## Updates from the previous meeting:

From the previous meeting, I was unable to find a suitable dataset of Malaysia for supervised learning and therefore resort to a dataset of Kerala's flood. I have sent my datasets of Malaysia that I have found, to Dr Basheer via teams.

## Items discussed this meeting:

There was no meeting since it was an off-schedule session, and it was a weekend (Saturday). I messaged Dr Basheer on MS Teams to address my issue to let Dr Basheer beforehand before our next meeting.

## Work for the coming meeting:

During the next meeting, it is expected that Dr Basheer and I would discuss further on the suitable dataset for my upcoming models.

Supervisor's Signature

Student's Signature

..... Dr. basheer .....

.....Zhen.....

# SUPERVISION MEETING RECORD 5

Date: 22/6/2023

Time: 11:03 a.m.

Student: Chew Chien Zhen

Supervisor: Dr Muhammad Basheer Jasser

## Updates from the previous meeting:

From the previous meeting, I procure a working partial model with 3 machine learning algorithms for my Machine Learning benchmark model with the Kerala flood dataset as my data input. I was able to procure accuracy results to be used as a benchmark data for my upcoming plans of another two models.

## Items discussed this meeting:

In this meeting, I would present my partially completed benchmark model to Dr Basheer and further clarify my plans for my work. With Dr Basheer's further insights and guidance, I formed a plan to further my work progression after completing my benchmark model. I have planned that the next two models would be a Feedforward Neural Network (FFNN) model as the low accuracy model, and the Particle Swarm Optimization hybridized Artificial Neural Network (PSO-ANN) model as the high accuracy model. This is the most challenging part of my work progression thus far.

## Work for the coming meeting:

There is no meeting in the upcoming week as coincidentally the scheduled weekly meeting is on a public holiday. Therefore, for the following week's meeting I would try to complete the FFNN model and the PSO-ANN model with the input of the Kerala flood dataset and then present my work to Dr Basheer.

Supervisor's Signature

Student's Signature

..... Dr. basheer .....

.....Zhen.....

# SUPERVISION MEETING RECORD 6

Date: 6/7/2023

Time: 11:01 a.m.

Student: Chew Chien Zhen

Supervisor: Dr Muhammad Basheer Jasser

## Updates from the previous meeting:

There was no meeting in the previous week (29/6/2023) because it was a public holiday. Rolling back 2 weeks prior, the plan was for me to develop two more models to be evaluated alongside my benchmark model which is the FFNN model and the PSO-ANN model.

## Items discussed this meeting:

In this meeting, I presented my completed FFNN model and my 80% completed PSO-ANN model. The FFNN model has been successfully constructed with no errors, while the PSO-ANN still has some errors due to the need of data reshaping to fit the input conditions. Dr Basheer further evaluates my work and gave me a briefing on the viva session later on and what I should expect during my presentation of my final work.

## Work for the coming meeting:

During the next meeting, it is expected that I further discuss my work progression and the documentation of my results with Dr Basheer.

Supervisor's Signature

Student's Signature

..... Dr. basheer .....

.....Zhen.....

# SUPERVISION MEETING RECORD 7

Date: 13/7/2023

Time: 11:01 a.m.

Student: Chew Chien Zhen

Supervisor: Dr Muhammad Basheer Jasser

## Updates from the previous meeting:

Continued my work on developing the PSO-ANN model and fixing the bugs of the value errors and completed the PSO-ANN model which was up and running.

## Items discussed this meeting:

In this meeting, I presented my completed PSO-ANN model. Dr Basheer then further pointed out what I should know regarding the model, and I must know the code well. It was also highlighted that it is important for me to know the code well as the Q&A session will test my understanding and knowledge regarding the models. Therefore, a thorough breakdown of the model is crucial for my understanding and for my presentation during the viva session.

## Work for the coming meeting:

During the next meeting, it is expected that I further discuss about the viva session with Dr Basheer to further prepare myself for the upcoming viva session.

Supervisor's Signature

Student's Signature

.... Dr. basheer .....

.....Zhen.....

# SUPERVISION MEETING RECORD 8

Date: 20/7/2023

Time: 11:01 a.m.

Student: Chew Chien Zhen

Supervisor: Dr Muhammad Basheer Jasser

## Updates from the previous meeting:

From the previous meeting, I worked on covering my PSO-ANN model and did a breakdown of the model explaining in brief but concise details of the model structure. Then I continued compiling and finalizing my report before the deadline and prepare the Meeting log for Dr Basheer to sign

## Items discussed this meeting:

In this meeting, it is expected that I discuss further with Dr Basheer regarding the viva and would be to ask some questions regarding the Q&A session and what should I expect from the Q&A demonstration of my work.

## Work for the coming meeting:

There is no more meeting. This is the final meeting of my Capstone 2 project.

Supervisor's Signature

Student's Signature

..... Dr. basheer.....

.....Zhen.....