

## What has been done

### Research topic

Forecasting the Ammonia Concentration in the Reclaimed Water using Machine Learning.

### 2021 Sep & Oct

- 9/21 – Progress report
  - Use manually collected data to forecast  $\text{NH}_3\text{N}$ .
  - Train model with DO, colour, etc.
- 9/30 – Finish setting up colour spectrophotometer in lab.
- 10/5 – Install colour photospectrometer on-site at SHW.
- 10/12 – Finish editing photospectrometer introduction video.
- 10/22 – Work with Zhao Jing (ML models training).

### 2021 Nov & Dec

- 11/29 – Group presentation
  - Use sensor collected data in May and June to forecast  $\text{NH}_3\text{N}$ .
  - RF, DNN, and LSTM models were used.
  - Models were trained with different input size and with/without data smoothing filter (i.e., data cleaning).
- 12/15 – Confirm thesis outline structure with Dr. Yin.

### 2022 Jan & Feb & March

- 1/21 – Group presentation
  - Use sensor collected data in Nov and Dec to forecast  $\text{NH}_3\text{N}$ .
  - 5 more models were used.
  - Models were trained with two data smoothing filters and outlier removal method.
- 2/21 – Progress report to Dr. Yin to confirm the ACS abstract content.
- 2/25 – Last day of calibrating colour spectrophotometer at SHW.
- 3/10 – Submission of ACS abstract.
- 3/18 – Finalize the coverage of my research works.

## Future plan

### April & May

- 4/22 – Finish MPhil thesis draft.
- 4/22 – Group presentation.
- 5/11 – EVNG 6050X presentation.
- 5/27 – Finish MPhil thesis 1<sup>st</sup> revision.  
(Start to schedule time for oral defense)

## June & July

- June – Preparing for oral defense
- Jul – Oral defense

Research plan in Spring semester, 2022	Feb		Mar				April					May		Jun	Jul
	18	25	4	11	18	25	1	8	15	22	29	13	27	30	31
<b>ACS abstract submission (ddl 3/14)</b>															
Finalizing methodology for NH3-N and colour forecasting															
Summarize results															
Drafting abstract for ACS fall conference															
<b>Complete MPhil thesis (ddl 5/27)</b>															
Finalize my research work															
Finish MPhil thesis 1st draft															
Prepare MPhil seminar presentation (present date: 5/4 or 5/11)															
Finish MPhil thesis 2nd draft															
<b>Oral defense (mid Jun ~ mid Jul)</b>															
Preparing for oral defense															
Tentative oral defense time (mid Jun ~ mid July)															
Thesis submission															

## Progress report

### Key findings in Feb and March

- 2/13 – Train ammonia forecasting model with colour data decreased the model performance.
- 3/2 – New state-of-the-art model (Transformer) was used and a better model performance was achieved compared to LSTM and DNN.
- 3/5 – Feature engineering was applied to increase the model performance, and the improvement of the model can be explained in environmental engineering perspective.
- 3/10 – Submit ACS abstract.
- 3/18 – Finalize the coverage of my research works.