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# 1 RESULTS

## 1.1 Exp-1 ($NH_3N$ baseline model)

### 1.1.1 Keys

- ☐ The benefit of data pre-processing by comparing validation and test loss.
- ☐ The selection of best model by comparing validation and test loss.
- ☐ Test data could be in poor quality.
- ☐ Show another test data results and compare the test and valid loss.

### 1.1.2 Fig and table

- Result 1
  - LSTM and GRU have lower test loss than RNN, DNN, and RF.
  - The lowest test loss of $NH_3N$ forecasting approach has higher validation loss than several approaches.

Table 1.1: Evaluation of each baseline model forecasting approach.

| Rank | Model-Dataset | Test loss* | valid loss |
|---|---|---|---|
| 1 | GRU-sg7 | 0.0383 | 1.2508 |
| 2 | GRU-sg5 | 0.0385 | 1.2644 |
| 3 | LSTM-ew3 | 0.0388 | **1.0796** |
| 4 | LSTM-sg7 | 0.0388 | 1.1804 |
| 5 | LSTM-sg5 | 0.0388 | 1.2346 |
| 6 | GRU-ew2 | 0.0389 | 1.1891 |
| 7 | GRU-ew4 | 0.0391 | 1.2390 |
| 8 | LSTM-ew2 | 0.0392 | **1.0969** |
| 9 | GRU-ew3 | 0.0392 | 1.2199 |
| 10 | LSTM-ew4 | 0.0395 | **1.1219** |
| 11 | GRU-sg9 | 0.0396 | 1.3097 |
| 12 | LSTM-or | 0.0398 | 1.2612 |
| 13 | LSTM-obs | 0.0405 | 1.2366 |
| 14 | GRU-or | 0.0405 | 1.3993 |
| 15 | LSTM-sg9 | 0.0410 | 1.3076 |
| 16 | GRU-obs | 0.0414 | 1.3638 |
| 17 | RNN-sg5 | 0.0415 | 1.5088 |
| 18 | RNN-ew2 | 0.0421 | 1.5425 |

| Rank | Model-Dataset | Test loss* | valid loss |
|---|---|---|---|
| 19 | RNN-sg7 | 0.0423 | 1.6267 |
| 20 | RNN-ew4 | 0.0432 | 1.5992 |

- Result 2
  - Test dataset from 1/16 to 1/22 performed differently on the same forecasting approach compared to validation loss.

Table 1.2: Comparison of $NH_3N$ val/test loss from 1/16 to 1/22.

| GRU | Test loss* | Val loss | LSTM | Test loss* | Val loss |
|---|---|---|---|---|---|
| sg7 | 0.0383 | 1.2508 | ew3 | 0.0388 | **1.0796**(1) |
| sg5 | 0.0385 | 1.2644 | sg7 | 0.0388 | 1.1804 |
| ew2 | 0.0389 | **1.1891**(1) | sg5 | 0.0388 | 1.2346 |
| ew4 | 0.0391 | **1.2390**(3) | ew2 | 0.0392 | **1.0969**(2) |
| ew3 | 0.0392 | **1.2199**(2) | ew4 | 0.0395 | **1.1219**(3) |
| sg9 | 0.0396 | 1.3097 | or | 0.0398 | 1.2612 |
| or | 0.0405 | 1.3993 | obs | 0.0405 | 1.2366 |
| obs | 0.0414 | 1.3638 | sg9 | 0.0410 | 1.3076 |

- Result 3
  - The influence of each pre-processing method on model training is different.

Table 1.3: Evaluation of pre-processing methods on LSTM and GRU models from 1/16 to 1/22.

| Rank | GRU | LSTM |
|---|---|---|
| 1 | sg7 | ew3 |
| 2 | sg5 | sg7 |
| 3 | ew2 | sg5 |
| 4 | ew4 | ew2 |
| 5 | ew3 | ew4 |
| 6 | sg9 | or |
| 7 | or | obs |
| 8 | obs | sg9 |

- Result 4
  - Test dataset from 10/10 to 10/16 performed similar on the same forecasting approach compared to validation loss.

Table 1.4: Comparison of $NH_3N$ val/test loss from 10/10 to 10/16.

| GRU | Test loss* | Val loss | LSTM | Test loss* | Val loss |
|---|---|---|---|---|---|
| ew3 | 0.0167 | **1.2199**(2) | ew3 | 0.0158 | **1.0796**(1) |
| ew4 | 0.0169 | **1.239**(3) | ew2 | 0.0161 | **1.0969**(2) |
| ew2 | 0.017 | **1.1891**(1) | ew4 | 0.0163 | **1.1219**(3) |
| sg9 | 0.0174 | 1.3097 | sg5 | 0.0166 | 1.2346 |
| sg5 | 0.0178 | 1.2644 | obs | 0.0175 | 1.2366 |
| sg7 | 0.018 | 1.2508 | or | 0.0177 | 1.2612 |
| or | 0.0187 | 1.3993 | sg7 | 0.018 | 1.1804 |
| obs | 0.0189 | 1.3638 | sg9 | 0.0188 | 1.3076 |

- Result 5
  - EWMA pre-processing method can improve model forecasting performance in general.

Table 1.5: Evaluation of pre-processing methods on LSTM and GRU from 10/10 to 10/16.

| Rank | GRU | LSTM |
|---|---|---|
| 1 | ew3 | ew3 |
| 2 | ew4 | ew2 |
| 3 | ew2 | ew4 |
| 4 | sg9 | sg5 |
| 5 | sg5 | obs |

| Rank | GRU | LSTM |
|---|---|---|
| 6 | sg7 | or |
| 7 | or | sg7 |
| 8 | obs | sg9 |

### 1.2 Exp-2

### 1.3 Exp-5

### 1.4 Exp-6

## 2 Result

### 2.1 sdfas

Table 2.1: Validation and test loss comparison from 1/16 to 1/22.

| Model-dataset | Validation Loss |
|---|---|
| LSTM-ew3 | 1.0796 |
| LSTM-ew2 | 1.0969 |
| LSTM-ew4 | 1.1219 |

### 2.2 asdf

Table 2.2: Validation and test loss comparison from 1/16 to 1/22.

| Model-dataset | Validation Loss | Model-dataset | Test loss |
|---|---|---|---|
| LSTM-ew3 | 1.0796 | GRU-sg7 | 0.0383 |
| LSTM-ew2 | 1.0969 | GRU-sg5 | 0.0385 |

| Model-dataset | Validation Loss | Model-dataset | Test loss |
|---|---|---|---|
| LSTM-ew4 | 1.1219 | **LSTM-ew3** | 0.0388 |

Thanks, it works. But I have another problem now. My images are a little large, and when put in the same row they cannot fit into one slide. Is it possible to control the size of the image? Thanks, it works. But I have another problem now. My images are a little large, and when put in the same row they cannot fit into one slide. Is it possible to control the size of the image? Thanks, it works. But I have another problem now. My images are a little large, and when put in the same row they cannot fit into one slide. Is it possible to control the size of the image? Thanks, it works. But I have another problem now. My images are a little large, and when put in the same row they cannot fit into one slide. Is it possible to control the size of the image?

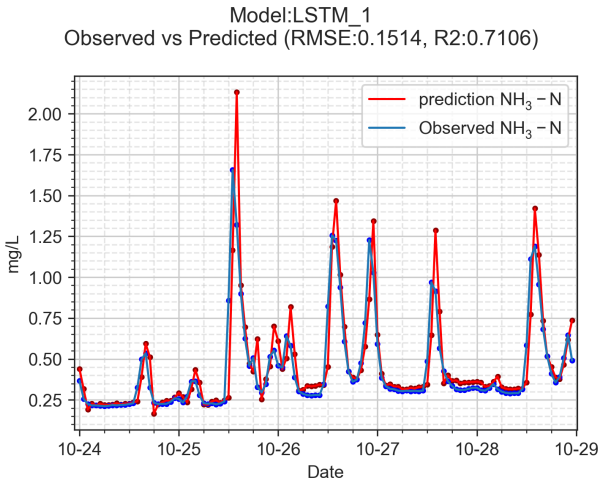


Figure 2.1: tesst

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