real_experiment_Air_quality_B2

May 29, 2025

```python
[15]: import importlib
      import src.plots

      importlib.reload(src.plots)
```

```
[15]: <module 'src.plots' from '/Users/milenaangelova/git-
      repo/FedCluLearn/src/plots.py'>
```

```python
[16]: from src.plots import plot_plotly, preprocessing_results, plot_plotly_real
```

```python
[17]: # Air quality, 5 partitions, 250 global rounds
      local_FedCluLearn = 'results/results_FedCluLearn_2025-03-01 09:51:51.529043.txt'
      global_FedCluLearn = 'results/global_model_evaluation_FedCluLearn_2025-03-01 09:
       ↪51:51.529043.txt'

      global_FedCluLearn_Prox = 'results/
       ↪global_model_evaluation_FedCluLearn_Prox_2025-03-01 09:52:36.832767.txt'
      local_FedCluLearn_Prox = 'results/results_FedCluLearn_Prox_2025-03-01 09:52:36.
       ↪832767.txt'

      local_FedAvg = 'results/results_FedAvg_2025-03-01 10:04:23.908322.txt'
      global_FedAvg = 'results/global_model_evaluation_FedAvg_2025-03-01 10:04:23.
       ↪908322.txt'

      local_FedAtt = 'results/results_FedAtt_2025-03-01 10:04:31.386712.txt'
      global_FedAtt = 'results/global_model_evaluation_FedAtt_2025-03-01 10:04:31.
       ↪386712.txt'

      local_FedProx = 'results/results_FedProx_2025-03-01 10:21:02.496987.txt'
      global_FedProx = 'results/global_model_evaluation_FedProx_2025-03-01 10:21:02.
       ↪496987.txt'

      local_FedCluLearn_recent = 'results/results_FedCluLearn_recent_2025-03-01 10:21:
       ↪17.925095.txt'
      global_FedCluLearn_recent = 'results/
       ↪global_model_evaluation_FedCluLearn_recent_2025-03-01 10:21:17.925095.txt'
```

```python
local_FedCluLearn_Prox_recent = 'results/
↪results_FedCluLearn_Prox_recent_2025-03-01 10:37:43.355040.txt'
global_FedCluLearn_Prox_recent = 'results/
↪global_model_evaluation_FedCluLearn_Prox_recent_2025-03-01 10:37:43.355040.
↪txt'

local_FedCluLearn_Prox_percentage = 'results/
↪results_FedCluLearn_Prox_percentage_2025-03-01 10:37:51.469483.txt'
global_FedCluLearn_Prox_percentage = 'results/
↪global_model_evaluation_FedCluLearn_Prox_percentage_2025-03-01 10:37:51.
↪469483.txt'

local_FedCluLearn_percentage = 'results/
↪results_FedCluLearn_percentage_2025-03-01 10:50:36.016247.txt'
global_FedCluLearn_percentage = 'results/
↪global_model_evaluation_FedCluLearn_percentage_2025-03-01 10:50:36.016247.
↪txt'

local_FedCluLearn_percentage_25 = 'results/
↪results_FedCluLearn_percentage_2025-03-01 18:38:33.162443.txt'
global_FedCluLearn_percentage_25 = 'results/
↪global_model_evaluation_FedCluLearn_percentage_2025-03-01 18:38:33.162443.
↪txt'

local_FedCluLearn_Prox_percentage_25 = 'results/
↪results_FedCluLearn_Prox_percentage_2025-03-01 18:38:40.197468.txt'
global_FedCluLearn_Prox_percentage_25 = 'results/
↪global_model_evaluation_FedCluLearn_Prox_percentage_2025-03-01 18:38:40.
↪197468.txt'

local_FedCluLearn_Prox_percentage_75 = 'results/
↪results_FedCluLearn_Prox_percentage_2025-03-01 18:50:18.689538.txt'
global_FedCluLearn_Prox_percentage_75 = 'results/
↪global_model_evaluation_FedCluLearn_Prox_percentage_2025-03-01 18:50:18.
↪689538.txt'

local_FedCluLearn_percentage_75 = 'results/
↪results_FedCluLearn_percentage_2025-03-01 18:50:24.475484.txt'
global_FedCluLearn_percentage_75 = 'results/
↪global_model_evaluation_FedCluLearn_percentage_2025-03-01 18:50:24.475484.
↪txt'
```
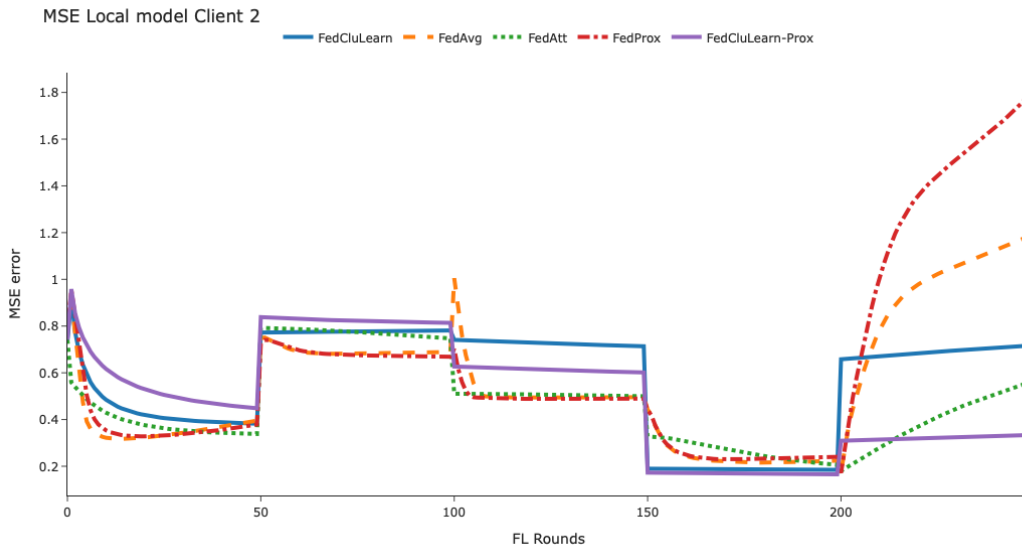
```python
[18]: local_filenames = [local_FedCluLearn, local_FedAvg, local_FedAtt,␣
      ↪local_FedProx, local_FedCluLearn_Prox]
      global_filenames = [global_FedCluLearn, global_FedAvg, global_FedAtt,␣
      ↪global_FedProx, global_FedCluLearn_Prox]
```
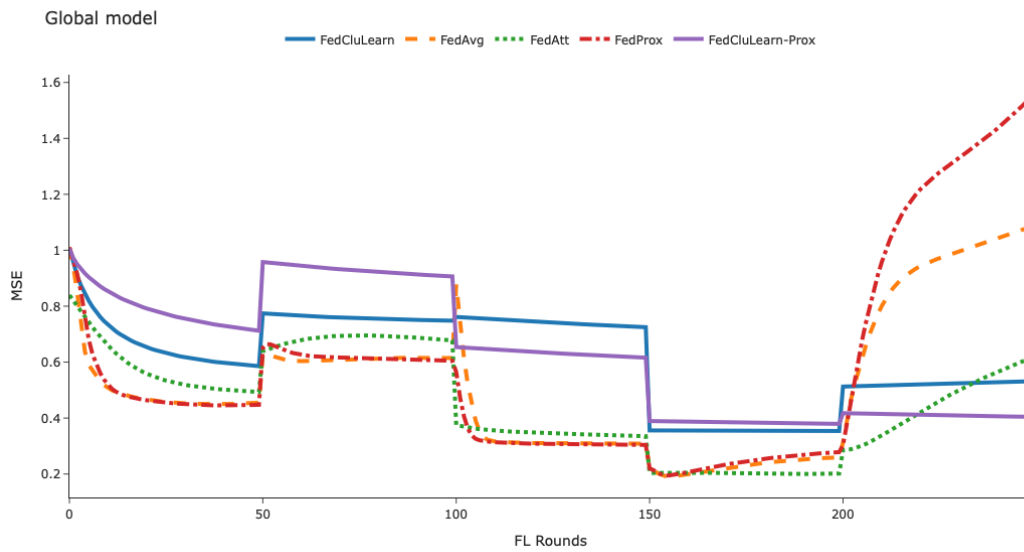
```
[19]: mse_column = 'mse'
      n_rounds, y = preprocessing_results(filenames=local_filenames,␣
       ↪mse_column=mse_column)
      plot_plotly(n_rounds, y, title='Avg MSE Local models',␣
       ↪y_axis_title=f'{mse_column.upper()} error', y_axis_max=0.3)
```
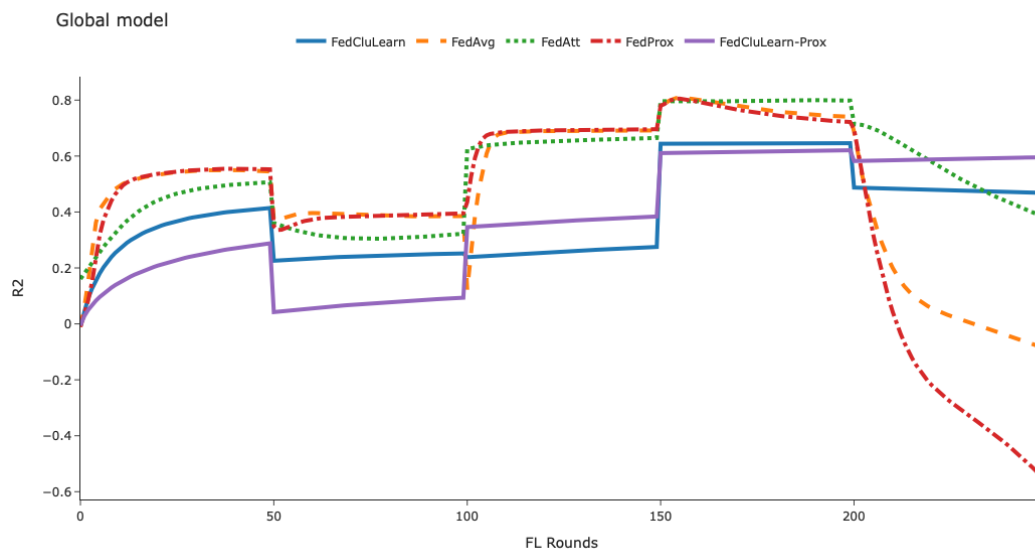
```
[20]: for client_id in [0,1,2]:
          n_rounds, y = preprocessing_results(filenames=local_filenames,␣
       ↪client_id=client_id, mse_column='mse')
          plot_plotly(n_rounds, y, title=f'MSE Local model Client {client_id}',␣
       ↪y_axis_title='MSE error')
```
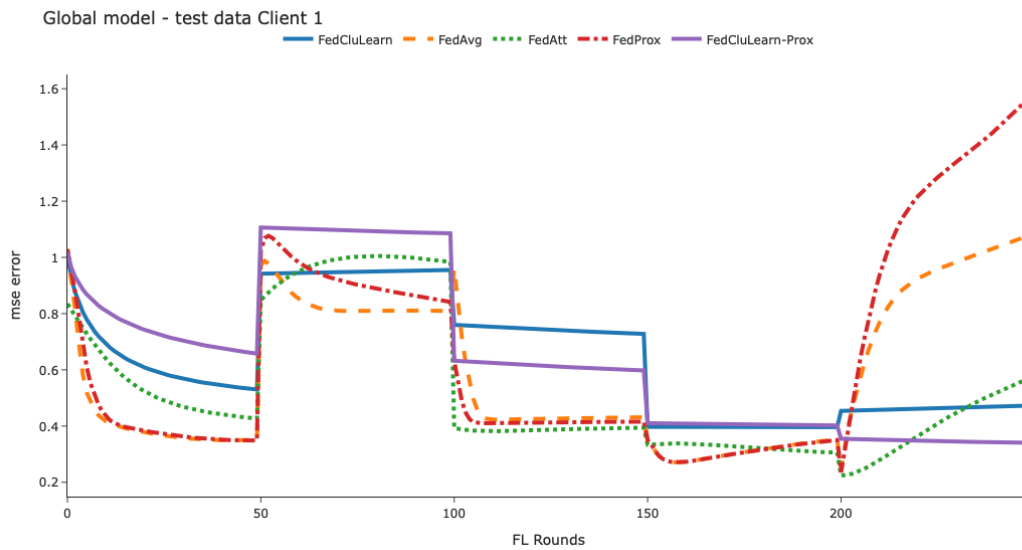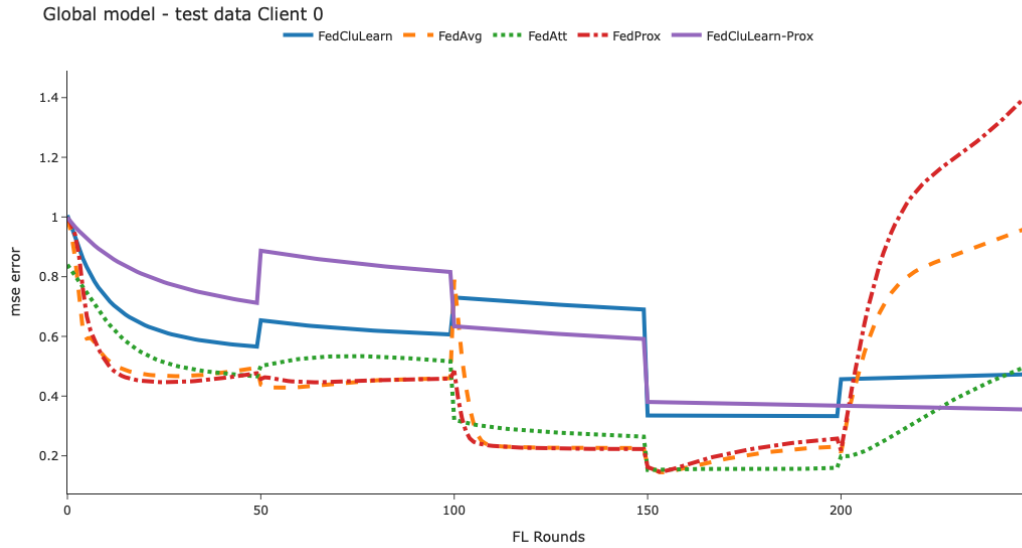


```
[21]: mse_column = 'mse'
      # n_rounds, y = preprocessing_results(filenames=[global_FedCluLearn,␣
       ↪global_FedCluLearn_recent, global_FedCluLearn_percentage, global_FedAvg,␣
       ↪global_FedAtt, global_FedProx, global_FedCluLearn_Prox,␣
       ↪global_FedCluLearn_Prox_recent, None], mse_column=mse_column)
      # global_filenames = [global_FedCluLearn, global_FedAvg, global_FedAtt,␣
       ↪global_FedProx, global_FedCluLearn_Prox]
      global_filenames = [global_FedCluLearn, global_FedAvg, global_FedAtt,␣
       ↪global_FedProx, global_FedCluLearn_Prox]
      n_rounds, y = preprocessing_results(filenames=global_filenames,␣
       ↪mse_column=mse_column)
      #Avg {mse_column.upper()} Global model
      plot_plotly(n_rounds, y, title=f'Global model', y_axis_title=f'{mse_column.
       ↪upper()}', y_axis_max=1)
```
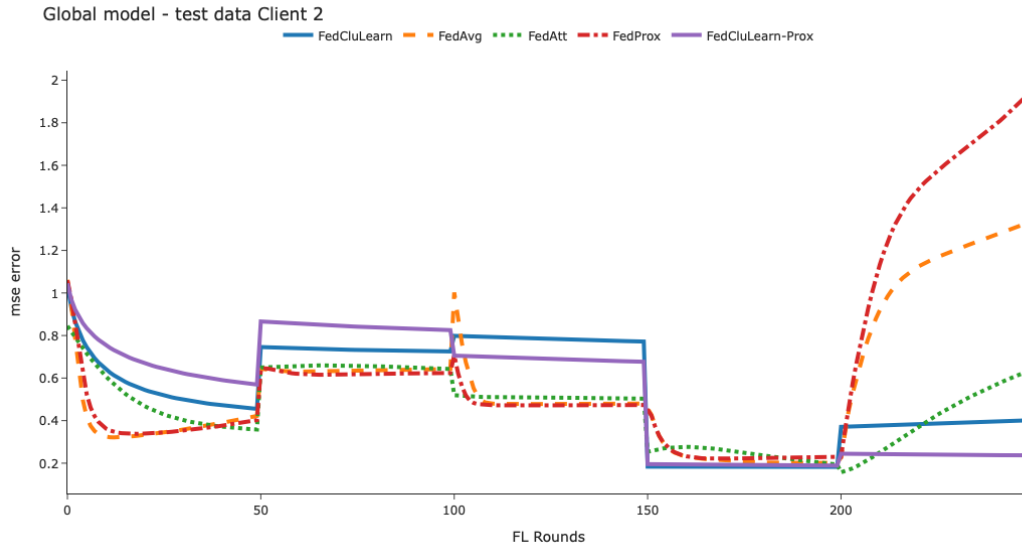
Global model

```
[22]: mse_column = 'r2'
      global_filenames = [global_FedCluLearn, global_FedAvg, global_FedAtt,␣
        ↪global_FedProx, global_FedCluLearn_Prox]
      n_rounds, y = preprocessing_results(filenames=global_filenames,␣
        ↪mse_column=mse_column)
      plot_plotly(n_rounds, y, title=f'Global model', y_axis_title=f'{mse_column.
        ↪upper()}', y_axis_max=1)
```
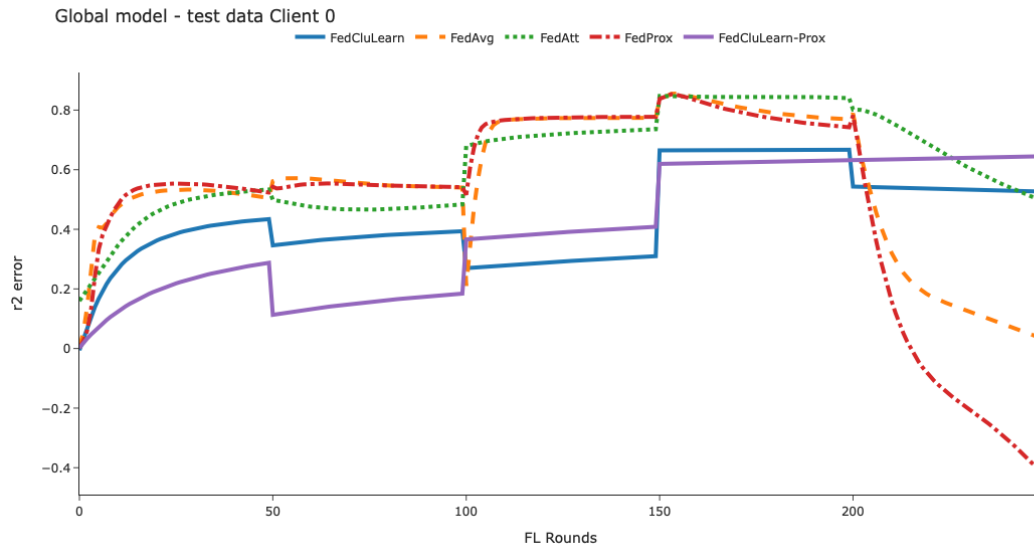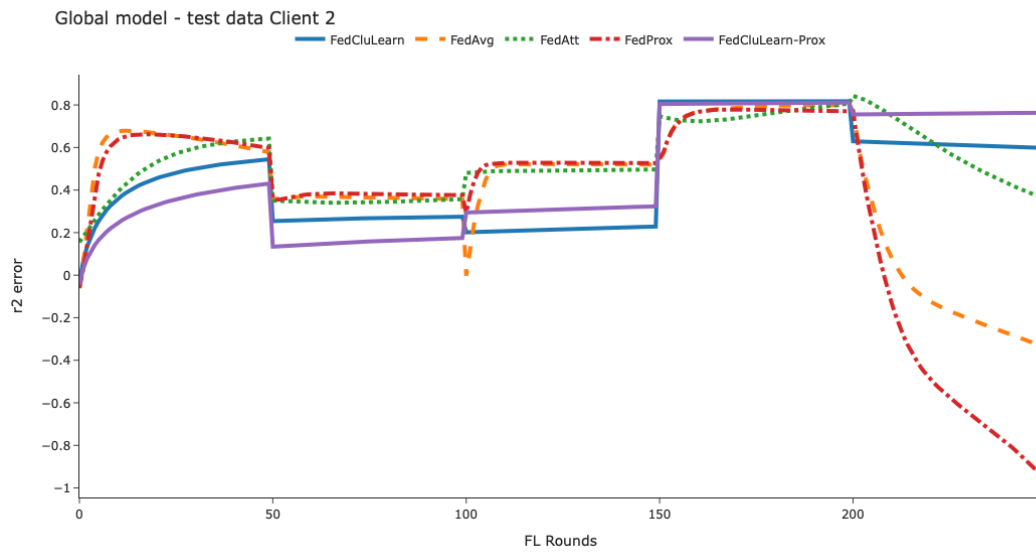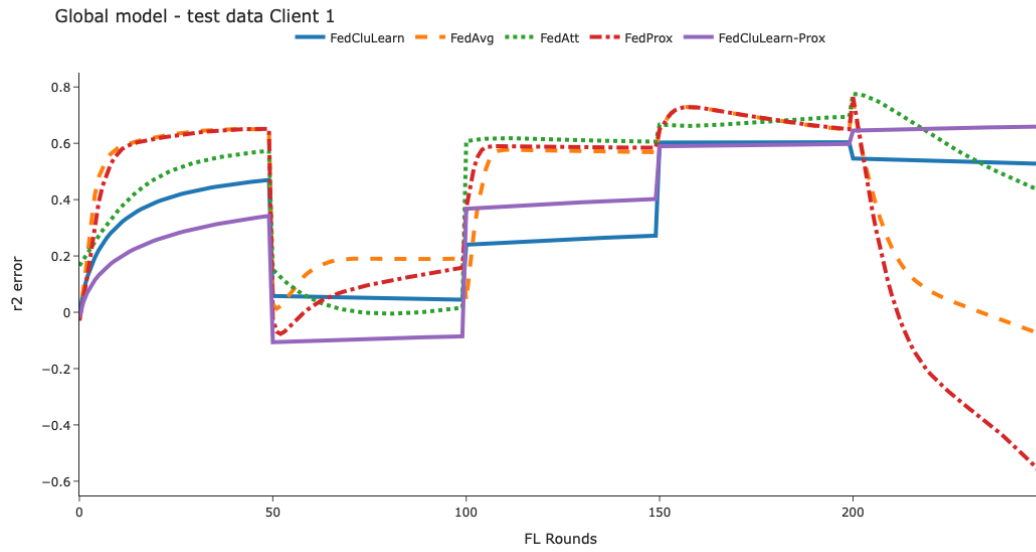

Global model

```
[23]: mse_column='mse'
      for client_id in [0,1,2]:
          n_rounds, y = preprocessing_results(filenames=global_filenames,␣
       ↪client_id=client_id,mse_column=mse_column)
          plot_plotly(n_rounds, y, title=f'Global model - test data Client␣
       ↪{client_id}', y_axis_title=f'{mse_column} error')
```

Global model - test data Client 0

FedCluLearn FedAvg FedAtt FedProx FedCluLearn-Prox

Global model - test data Client 1

FedCluLearn FedAvg FedAtt FedProx FedCluLearn-Prox

Global model - test data Client 2

```
[24]: mse_column='r2'
      for client_id in [0,1,2]:
          n_rounds, y = preprocessing_results(filenames=global_filenames,␣
      ↪client_id=client_id,mse_column=mse_column)
          plot_plotly(n_rounds, y, title=f'Global model - test data Client␣
      ↪{client_id}', y_axis_title=f'{mse_column} error')
```


Global model - test data Client 0

Global model - test data Client 1

FedCluLearn — FedAvg ⋯⋯ FedAtt ⋯⋯ FedProx — FedCluLearn-Prox

Global model - test data Client 2

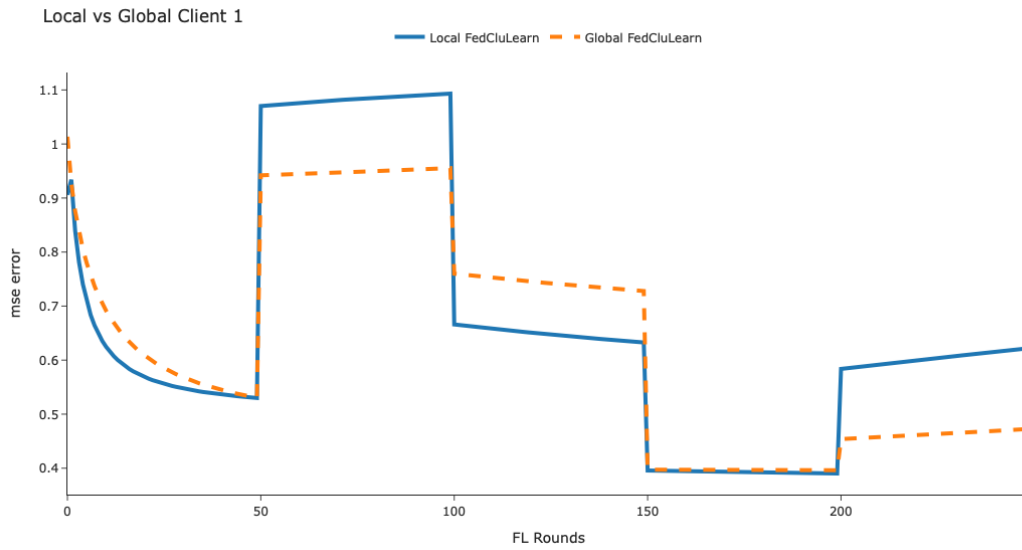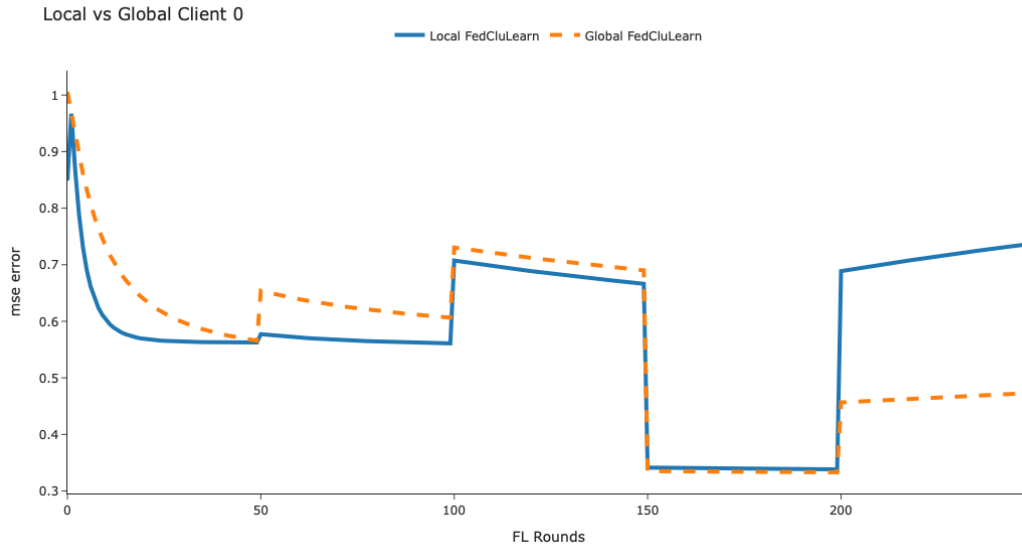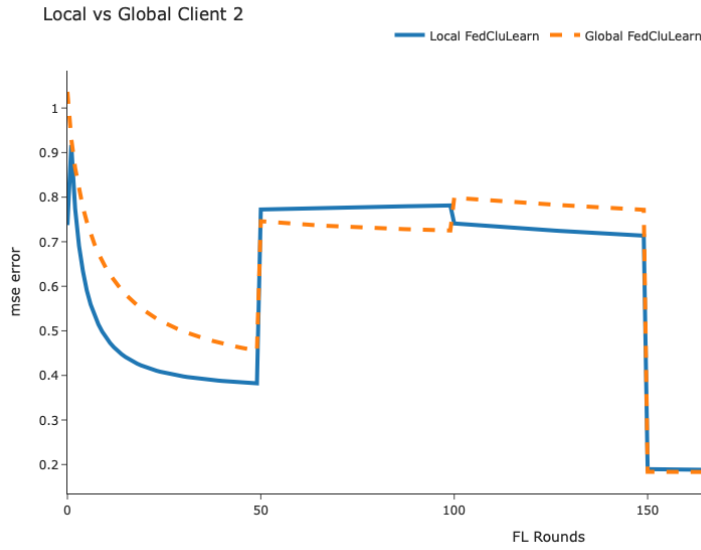FedCluLearn — FedAvg ⋯⋯ FedAtt ⋯⋯ FedProx — FedCluLearn-Prox

```
[25]: mse_column='mse'
      for client_id in [0,1,2]:
          n_rounds, y = preprocessing_results(filenames=[local_FedCluLearn,
       ↪global_FedCluLearn, None, None, None],
       ↪client_id=client_id,mse_column=mse_column)
```
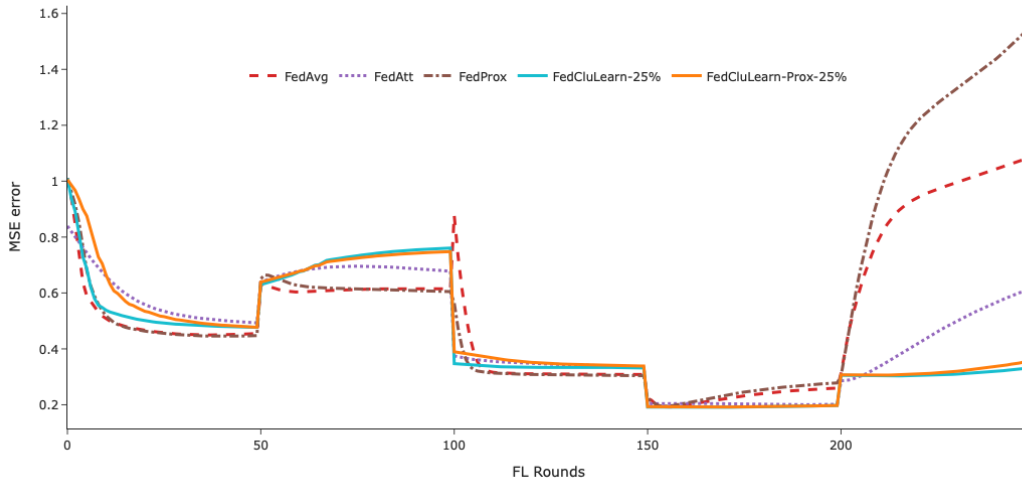
```
    plot_plotly(n_rounds, y, title=f'Local vs Global Client {client_id}',
↪y_axis_title=f'{mse_column} error', algo_name1='Local FedCluLearn',
↪algo_name4='Global FedCluLearn')
```


Local vs Global Client 0

Local vs Global Client 1

Local vs Global Client 2 — Local FedCluLearn, Global FedCluLearn

```
[26]: mse_column = 'mse'
      # n_rounds, y = preprocessing_results(filenames=[global_FedCluLearn,
      ↪global_FedCluLearn_recent, global_FedCluLearn_percentage, global_FedAvg,
      ↪global_FedAtt, global_FedProx, global_FedCluLearn_Prox,
      ↪global_FedCluLearn_Prox_recent, None], mse_column=mse_column)
      # global_filenames = [None, None, global_FedCluLearn_percentage, global_FedAvg,
      ↪global_FedAtt, global_FedProx, None, None,
      ↪global_FedCluLearn_Prox_percentage, None, None, None, None]
      global_filenames = [None, None, None, global_FedAvg, global_FedAtt,
      ↪global_FedProx, None, None, None, global_FedCluLearn_percentage_25, None,
      ↪global_FedCluLearn_Prox_percentage_25, None]
      n_rounds, y = preprocessing_results(filenames=global_filenames,
      ↪mse_column=mse_column)
      plot_plotly_real(n_rounds, y, title=f'', y_axis_title=f'{mse_column.upper()}
      ↪error', y_axis_max=1, name='real_mse_air_all_5_parts',
      ↪algo_name10='FedCluLearn-25%', algo_name12='FedCluLearn-Prox-25%')  #Avg
      ↪{mse_column.upper()} Global model
```

9

Legend: FedAvg, FedAtt, FedProx, FedCluLearn-25%, FedCluLearn-Prox-25%

Y-axis: MSE error

X-axis: FL Rounds

[27]:
```
mse_column = 'mse'
# n_rounds, y = preprocessing_results(filenames=[global_FedCluLearn,
 ↪global_FedCluLearn_recent, global_FedCluLearn_percentage, global_FedAvg,
 ↪global_FedAtt, global_FedProx, global_FedCluLearn_Prox,
 ↪global_FedCluLearn_Prox_recent, None], mse_column=mse_column)
global_filenames = [global_FedCluLearn, global_FedCluLearn_recent,
 ↪global_FedCluLearn_percentage, None, None, None, None, None, None,
 ↪global_FedCluLearn_percentage_25, global_FedCluLearn_percentage_75, None,
 ↪None]
n_rounds, y = preprocessing_results(filenames=global_filenames,
 ↪mse_column=mse_column)
plot_plotly_real(n_rounds, y, title=f'Global model FedCluLearn',
 ↪y_axis_title=f'{mse_column.upper()} error', y_axis_max=1,
 ↪name='real_mse_air_fedclulearn_5_parts')  # Avg {mse_column.upper()} Global
 ↪model
```

Global model FedCluLearn
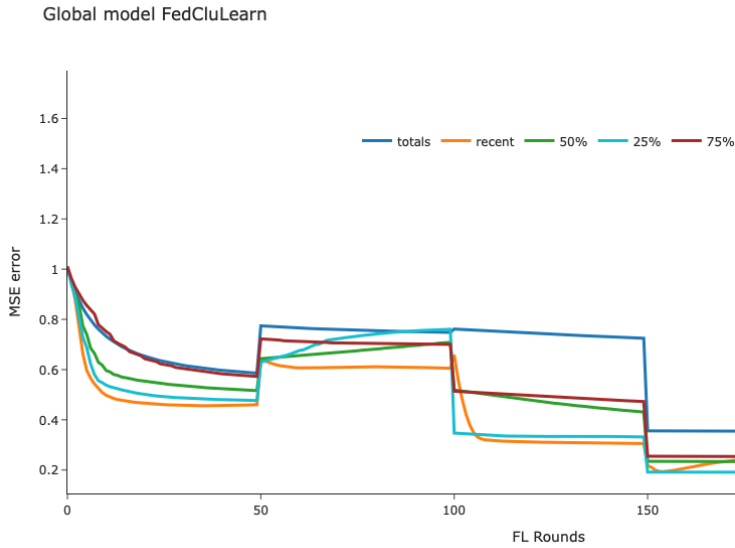
[28]:
```
mse_column = 'mse'
# n_rounds, y = preprocessing_results(filenames=[global_FedCluLearn,
 ↪global_FedCluLearn_recent, global_FedCluLearn_percentage, global_FedAvg,
 ↪global_FedAtt, global_FedProx, global_FedCluLearn_Prox,
 ↪global_FedCluLearn_Prox_recent, None], mse_column=mse_column)
global_filenames = [None, None, None, None, None, None,
 ↪global_FedCluLearn_Prox, global_FedCluLearn_Prox_recent,
 ↪global_FedCluLearn_Prox_percentage, None, None,
 ↪global_FedCluLearn_Prox_percentage_25, global_FedCluLearn_Prox_percentage_75]
n_rounds, y = preprocessing_results(filenames=global_filenames,
 ↪mse_column=mse_column)
plot_plotly_real(n_rounds, y, title=f'Global model FedCluLearn-Prox',
 ↪y_axis_title=f'{mse_column.upper()} error', y_axis_max=1,
 ↪name='real_mse_air_fedclulearn_prox_5_parts')  # Avg {mse_column.upper()}
 ↪Global model
```

Global model FedCluLearn-Prox