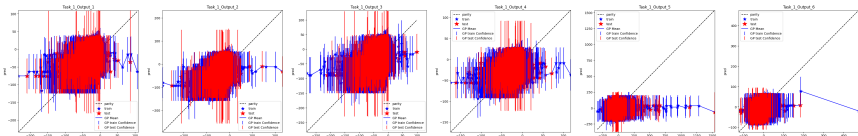


# Reduce dimensions

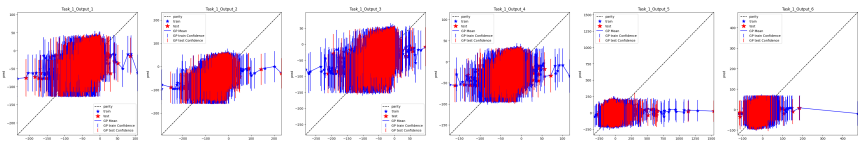
Wednesday, July 30, 2025 1:05 AM

50 features



|         | Task_1_Output_1 | Task_1_Output_2 | Task_1_Output_3 | Task_1_Output_4 | \ |
|---------|-----------------|-----------------|-----------------|-----------------|---|
| MAE     | 1.896000e+01    | 2.314000e+01    | 2.159000e+01    | 1.503000e+01    |   |
| MAE2    | 1.395000e+01    | 1.518000e+01    | 1.557000e+01    | 1.070000e+01    |   |
| MSE     | 6.880500e+02    | 1.089240e+03    | 8.537900e+02    | 4.327000e+02    |   |
| RMSE    | 2.623000e+01    | 3.300000e+01    | 2.922000e+01    | 2.080000e+01    |   |
| MAPE    | 1.039211e+15    | 1.180411e+15    | 1.282482e+15    | 8.694970e+14    |   |
| MAXE    | 1.340300e+02    | 2.648900e+02    | 1.634000e+02    | 1.053500e+02    |   |
| EVS     | 3.700000e-01    | 3.900000e-01    | 3.900000e-01    | 2.600000e-01    |   |
| R2      | 3.700000e-01    | 3.900000e-01    | 3.900000e-01    | 2.600000e-01    |   |
| AVG_STD | -1.610000e+00   | -1.940000e+00   | -1.730000e+00   | -1.640000e+00   |   |
| MIN_STD | -1.560000e+00   | -1.870000e+00   | -1.670000e+00   | -1.590000e+00   |   |
| MAX_STD | -4.590000e+00   | -5.780000e+00   | -4.940000e+00   | -4.580000e+00   |   |

|         | Task_1_Output_5 | Task_1_Output_6 |
|---------|-----------------|-----------------|
| MAE     | 5.288000e+01    | 1.515000e+01    |
| MAE2    | 2.302000e+01    | 1.062000e+01    |
| MSE     | 1.274714e+04    | 4.987200e+02    |
| RMSE    | 1.129000e+02    | 2.233000e+01    |
| MAPE    | 6.169283e+14    | 1.020740e+15    |
| MAXE    | 1.602110e+03    | 1.747000e+02    |
| EVS     | 3.000000e-02    | 1.500000e-01    |
| R2      | 3.000000e-02    | 1.400000e-01    |
| AVG_STD | -2.328000e+01   | -3.830000e+00   |
| MIN_STD | -2.289000e+01   | -3.780000e+00   |
| MAX_STD | -4.488000e+01   | -6.550000e+00   |



| Task_1_Output_1 | Task_1_Output_2 | Task_1_Output_3 | Task_1_Output_4 | \             |
|-----------------|-----------------|-----------------|-----------------|---------------|
| MAE             | 1.899000e+01    | 2.321000e+01    | 2.160000e+01    | 1.505000e+01  |
| MAE2            | 1.383000e+01    | 1.558000e+01    | 1.540000e+01    | 1.106000e+01  |
| MSE             | 6.814300e+02    | 1.086050e+03    | 8.598100e+02    | 4.365200e+02  |
| RMSE            | 2.610000e+01    | 3.296000e+01    | 2.932000e+01    | 2.089000e+01  |
| MAPE            | 1.033771e+15    | 1.313832e+15    | 1.270993e+15    | 8.572940e+14  |
| MAXE            | 1.343100e+02    | 2.622000e+02    | 1.664500e+02    | 1.045100e+02  |
| EVS             | 3.800000e-01    | 3.900000e-01    | 3.900000e-01    | 2.600000e-01  |
| R2              | 3.700000e-01    | 3.900000e-01    | 3.900000e-01    | 2.600000e-01  |
| AVG_STD         | -1.610000e+00   | -1.860000e+00   | -1.670000e+00   | -1.690000e+00 |

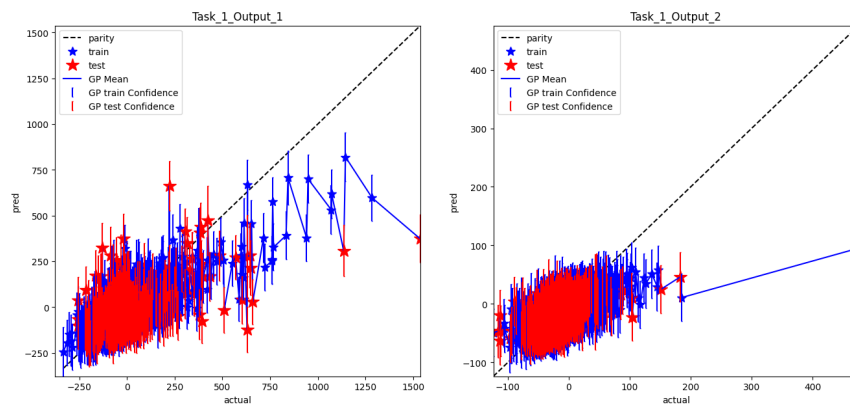
|         |               |               |               |               |
|---------|---------------|---------------|---------------|---------------|
| MIN_STD | -1.600000e+00 | -1.850000e+00 | -1.650000e+00 | -1.680000e+00 |
| MAX_STD | -1.800000e+00 | -2.110000e+00 | -1.920000e+00 | -1.950000e+00 |

|         |                 |                 |
|---------|-----------------|-----------------|
|         | Task_1_Output_5 | Task_1_Output_6 |
| MAE     | 5.305000e+01    | 1.519000e+01    |
| MAE2    | 2.269000e+01    | 1.091000e+01    |
| MSE     | 1.247675e+04    | 5.065400e+02    |
| RMSE    | 1.117000e+02    | 2.251000e+01    |
| MAPE    | 6.778064e+14    | 1.119183e+15    |
| MAXE    | 1.510910e+03    | 1.749600e+02    |
| EVS     | 5.000000e-02    | 1.300000e-01    |
| R2      | 5.000000e-02    | 1.300000e-01    |
| AVG_STD | -2.305000e+01   | -3.820000e+00   |
| MIN_STD | -2.291000e+01   | -3.810000e+00   |
| MAX_STD | -2.622000e+01   | -4.070000e+00   |

Before dimension reduction (159 features, last two targets)

|         | Task_1_Output_1    | Task_1_Output_2   |
|---------|--------------------|-------------------|
| MAE     | 47.31              | 11.65             |
| MAE2    | 19.4               | 6.66              |
| MSE     | 9492.33            | 359.66            |
| RMSE    | 97.43              | 18.96             |
| MAPE    | 410408282431536.94 | 356189060245255.7 |
| MAXE    | 1164.57            | 136.73            |
| EVS     | 0.28               | 0.38              |
| R2      | 0.27               | 0.38              |
| AVG_STD | -18.25             | -2.62             |
| MIN_STD | -16.92             | -2.52             |
| MAX_STD | -32.02             | -3.57             |



Log1p transformation after minmax for last two y

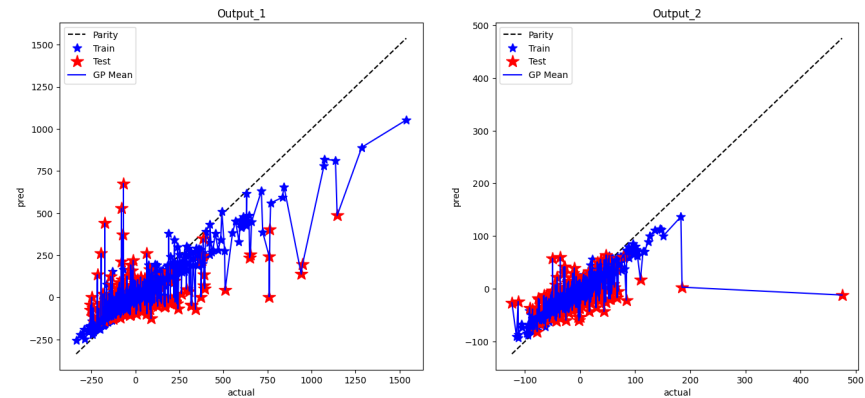
|         | Task_1_Output_1      | Task_1_Output_2      |
|---------|----------------------|----------------------|
| MAE     | 0.019999999552965200 | 0.019999999552965200 |
| MAE2    | 0.009999999776482580 | 0.009999999776482580 |
| MSE     | 0.0                  | 0.0                  |
| RMSE    | 0.03999999910593030  | 0.029999999329447700 |
| MAPE    | 0.12999999523162800  | 0.12999999523162800  |
| MAXE    | 0.46000000834465000  | 0.17000000178813900  |
| EVS     | 0.28                 | 0.39                 |
| R2      | 0.28                 | 0.39                 |
| AVG_STD | 0.4099999964237210   | 0.3100000023841860   |
| MIN_STD | 0.28000000560489500  | 0.200000001102002000 |

|         |                     |                     |
|---------|---------------------|---------------------|
| MIN_STD | 0.36999998369466300 | 0.30000001192092900 |
| MAX_STD | 0.5600000023841860  | 0.4399999976158140  |

### Random forest

| Test    | Output_1 | Output_2 |
|---------|----------|----------|
| MAE     | 42.59    | 11.98    |
| MAE2    | 12.8     | 5.85     |
| MSE     | 9234.55  | 620.54   |
| RMSE    | 96.1     | 24.91    |
| MAPE    | 63.99    | 45.27    |
| MAXE    | 803.91   | 487.31   |
| EVS     | 0.18     | 0.2      |
| R2      | 0.18     | 0.2      |
| AVG_STD | 0.0      | 0.0      |
| MIN_STD | 0.0      | 0.0      |
| MAX_STD | 0.0      | 0.0      |

| Train   | Output_1 | Output_2 |
|---------|----------|----------|
| MAE     | 14.49    | 4.09     |
| MAE2    | 4.39     | 2.03     |
| MSE     | 1009.77  | 47.27    |
| RMSE    | 31.78    | 6.88     |
| MAPE    | 24.07    | 16.43    |
| MAXE    | 485.07   | 50.72    |
| EVS     | 0.89     | 0.92     |
| R2      | 0.89     | 0.92     |
| AVG_STD | 0.0      | 0.0      |
| MIN_STD | 0.0      | 0.0      |
| MAX_STD | 0.0      | 0.0      |

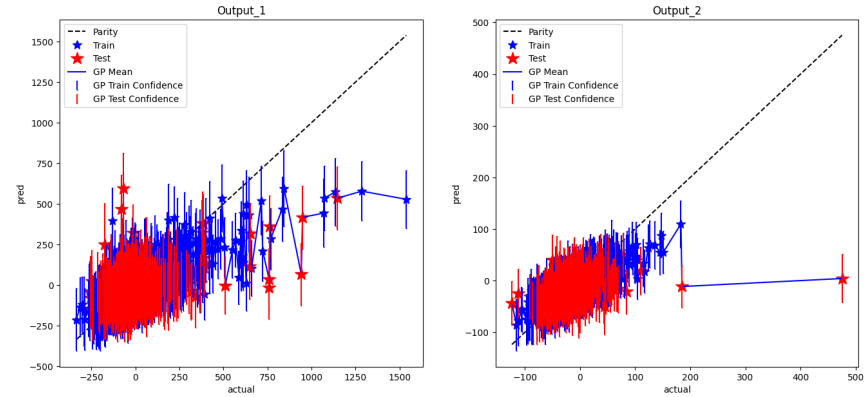


### Single GP

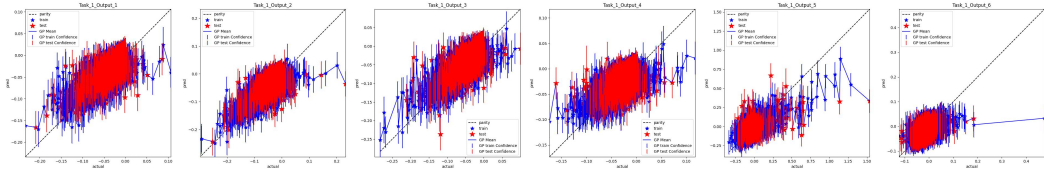
| Test    | Output_1 | Output_2 |
|---------|----------|----------|
| MAE     | 12.49    | 4.09     |
| MAE2    | 4.39     | 2.03     |
| MSE     | 1009.77  | 47.27    |
| RMSE    | 31.78    | 6.88     |
| MAPE    | 24.07    | 16.43    |
| MAXE    | 485.07   | 50.72    |
| EVS     | 0.89     | 0.92     |
| R2      | 0.89     | 0.92     |
| AVG_STD | 0.0      | 0.0      |
| MIN_STD | 0.0      | 0.0      |
| MAX_STD | 0.0      | 0.0      |

|         |         |        |
|---------|---------|--------|
| MAE     | 42.48   | 12.09  |
| MAE2    | 15.97   | 6.1    |
| MSE     | 8433.83 | 607.08 |
| RMSE    | 91.84   | 24.64  |
| MAPE    | 105.18  | 91.4   |
| MAXE    | 875.11  | 471.26 |
| EVS     | 0.25    | 0.22   |
| R2      | 0.25    | 0.22   |
| AVG_STD | 176.92  | 41.66  |
| MIN_STD | 154.52  | 35.44  |
| MAX_STD | 255.75  | 54.93  |

| Train   | Output_1 | Output_2 |
|---------|----------|----------|
| MAE     | 31.24    | 8.01     |
| MAE2    | 12.45    | 4.16     |
| MSE     | 3997.85  | 170.14   |
| RMSE    | 63.23    | 13.04    |
| MAPE    | 66.14    | 34.91    |
| MAXE    | 1009.77  | 99.93    |
| EVS     | 0.57     | 0.7      |
| R2      | 0.57     | 0.7      |
| AVG_STD | 174.69   | 41.04    |
| MIN_STD | 153.88   | 34.74    |
| MAX_STD | 255.4    | 54.8     |



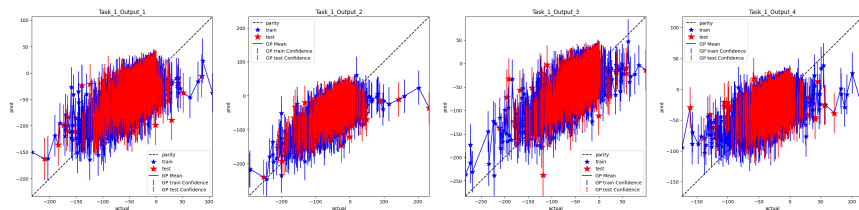
Before dimension reduction (159 features)



|  |                 |                 |                 |                 |                 |                 |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|  |                 | Task_1_Output_2 | Task_1_Output_3 | Task_1_Output_4 | Task_1_Output_5 | Task_1_Output_6 |
|  | Task 1 Output 1 |                 |                 |                 |                 |                 |

|                |                 |                 |                 |                 |                 |                 |
|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| <b>MAE</b>     | 0.01            | 0.02            | 0.01            | 0.01            | 0.05            | 0.01            |
| <b>MAE2</b>    | 0.01            | 0.01            | 0.01            | 0.01            | 0.02            | 0.01            |
| <b>MSE</b>     | 0.0             | 0.0             | 0.0             | 0.0             | 0.01            | 0.0             |
| <b>RMSE</b>    | 0.02            | 0.03            | 0.02            | 0.02            | 0.1             | 0.02            |
| <b>MAPE</b>    | 203042853013.75 | 215581028069.66 | 216080128540.48 | 179572875770.09 | 523075112400.46 | 192302908488.69 |
| <b>MAXE</b>    | 0.12            | 0.27            | 0.16            | 0.13            | 1.2             | 0.15            |
| <b>EVS</b>     | 0.6             | 0.62            | 0.65            | 0.39            | 0.28            | 0.4             |
| <b>R2</b>      | 0.6             | 0.62            | 0.65            | 0.39            | 0.28            | 0.39            |
| <b>AVG_STD</b> | -1.13           | -1.32           | -1.09           | -1.28           | -20.8           | -3.24           |
| <b>MIN_STD</b> | -1.09           | -1.27           | -1.04           | -1.22           | -19.66          | -3.18           |
| <b>MAX_STD</b> | -1.68           | -2.02           | -1.77           | -2.0            | -36.58          | -3.91           |

Before dimension reduction (159 features), first four features



|                | Task_1_Output_1   | Task_1_Output_2   | Task_1_Output_3    | Task_1_Output_4    |
|----------------|-------------------|-------------------|--------------------|--------------------|
| <b>MAE</b>     | 13.16             | 15.59             | 13.77              | 11.71              |
| <b>MAE2</b>    | 6.93              | 8.16              | 8.0                | 6.44               |
| <b>MSE</b>     | 432.66            | 677.96            | 485.66             | 348.36             |
| <b>RMSE</b>    | 20.8              | 26.04             | 22.04              | 18.66              |
| <b>MAPE</b>    | 248800014750455.3 | 286256435723804.2 | 273707128521784.47 | 174669467546814.28 |
| <b>MAXE</b>    | 118.52            | 270.1             | 157.91             | 130.94             |
| <b>EVS</b>     | 0.6               | 0.62              | 0.65               | 0.41               |
| <b>R2</b>      | 0.6               | 0.62              | 0.65               | 0.41               |
| <b>AVG_STD</b> | -1.2              | -1.41             | -1.15              | -1.36              |
| <b>MIN_STD</b> | -1.16             | -1.37             | -1.1               | -1.32              |
| <b>MAX_STD</b> | -1.57             | -1.82             | -1.62              | -1.71              |