model tutor

January 23, 2020

0.1 Parameter tuning with `PredictTutor` class.

This class assumes the next point or set of points to check. - Multi and single objective - Models portfolio - If there is no correct model takes a point from the sampling plan. - Random or Sobol sequence sampling plan.

> "For 800 years have I trained Jedi." Yoda, to Luke Skywalker

[5]:
```
import sys
sys.path.append('..')

# --- Dependencies
import pygmo as pg
import numpy as np
import pandas as pd
# import dovpanda

import plotly
from plotly import graph_objs as go
from plotly import tools
import plotly.express as px

import sklearn.gaussian_process as gp
from sklearn.model_selection import cross_val_score, cross_validate
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.linear_model import LinearRegression

from src.composite import PredictTutor, ModelsUnion
from src.generator import SamplesGenerator
from src.ploting import plot_mo

from src.hypothesis.tpot_estimator import TpotWrp
from src.hypothesis.custom_gp_kernel import KERNEL_MAUNA, KERNEL_SIMPLE,␣
↪KERNEL_GPML
```

0.1.1 Problem definition

[6]:
```
DIM = 2
ID = 4
OBJ = 2

# --- Problem
udp = pg.wfg(prob_id=ID, dim_dvs=DIM, dim_obj=OBJ, dim_k=OBJ-1)
# udp = pg.zdt(prob_id=ID, param=DIM)
pro = pg.problem(udp)
```

0.1.2 Initialization a models for portfolio

[7]:
```
# 1
tea_pot = TpotWrp(generations=2, population_size=10, random_state=42)
# 2
gp_sim = gp.GaussianProcessRegressor(kernel=KERNEL_SIMPLE, alpha=0,␣
 ↪n_restarts_optimizer=10, normalize_y=True)
# 3
grad_uni = ModelsUnion(
    models=[GradientBoostingRegressor(n_estimators=200)],
    split_y=True)
# 4
lin_uni = ModelsUnion(models=[LinearRegression()], split_y=True)
```

0.1.3 Prediction tutor

[8]:
```
gen = SamplesGenerator(pro)
tutor = PredictTutor(pro.get_bounds(), portfolio=[tea_pot, gp_sim, grad_uni,␣
 ↪lin_uni])

iter_solution = []
x=0
while x < 300:
    x=x+1
    print("\n--- {}".format(x))
    X, y = gen.return_X_y()
    iter_solution.append(tutor.solution)
    propos = tutor.next_config(X, y, n=1, cv=4)
    gen.update(propos.tolist(), [pro.fitness(p).tolist() for p in propos])
```

```
--- 1
Initialization data generator
```

```
--- 2
In dataset add 1 new results

--- 3
In dataset add 1 new results

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In dataset add 1 new results

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In dataset add 1 new results

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In dataset add 1 new results

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In dataset add 1 new results

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In dataset add 1 new results

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In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
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Split dataset. Validation is 0.25%
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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results
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Split dataset. Validation is 0.25%
In dataset add 1 new results

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In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
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Split dataset. Validation is 0.25%
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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results
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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
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Split dataset. Validation is 0.25%
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Split dataset. Validation is 0.25%
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In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results
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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
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In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

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Split dataset. Validation is 0.25%
In dataset add 1 new results

--- 49
Split dataset. Validation is 0.25%
In dataset add 1 new results

--- 50
Split dataset. Validation is 0.25%
In dataset add 1 new results

--- 51
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
```

```
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
In dataset add 1 new results

--- 52
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
In dataset add 1 new results

--- 53
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 54
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 55
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 56
Split dataset. Validation is 0.25%
3 model(s) valid
```

```
Inner score on a validation set
Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
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size in 80 generation
In dataset add 1 new results

--- 57
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
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Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 58
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 59
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 60
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results
```

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--- 61
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
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Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
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In dataset add 1 new results

--- 62
Split dataset. Validation is 0.25%
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Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
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Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
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--- 63
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Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
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In dataset add 1 new results

--- 64
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
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In dataset add 1 new results

--- 65
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
```

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Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
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In dataset add 1 new results

--- 66
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
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--- 67
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
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In dataset add 1 new results

--- 68
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
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In dataset add 1 new results

--- 69
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
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In dataset add 1 new results

--- 70
Split dataset. Validation is 0.25%
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Inner score on a validation set
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--- 71
Split dataset. Validation is 0.25%
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--- 72
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--- 74
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--- 75
Split dataset. Validation is 0.25%
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Inner score on a validation set
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Split dataset. Validation is 0.25%
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Split dataset. Validation is 0.25%
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--- 80
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
```

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Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
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--- 81
Split dataset. Validation is 0.25%
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--- 82
Split dataset. Validation is 0.25%
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In dataset add 1 new results

--- 83
Split dataset. Validation is 0.25%
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generation
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--- 84
Split dataset. Validation is 0.25%
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Inner score on a validation set
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size in 80 generation
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In dataset add 1 new results

--- 85
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
```

```
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 86
Split dataset. Validation is 0.25%
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Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
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generation
In dataset add 1 new results

--- 87
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
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--- 88
Split dataset. Validation is 0.25%
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--- 89
Split dataset. Validation is 0.25%
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generation
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In dataset add 1 new results

--- 90
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
```

```
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
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--- 91
Split dataset. Validation is 0.25%
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Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
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--- 92
Split dataset. Validation is 0.25%
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--- 93
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--- 94
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
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generation
In dataset add 1 new results

--- 95
Split dataset. Validation is 0.25%
2 model(s) valid
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```
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
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--- 96
Split dataset. Validation is 0.25%
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--- 97
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
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In dataset add 1 new results

--- 98
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 99
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
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generation
In dataset add 1 new results

--- 100
Split dataset. Validation is 0.25%
2 model(s) valid
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```
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 101
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
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--- 102
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
In dataset add 1 new results

--- 103
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 104
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 105
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
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size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 106
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 107
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 108
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
In dataset add 1 new results

--- 109
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
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--- 110
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results
```

```
--- 111
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
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--- 112
Split dataset. Validation is 0.25%
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Inner score on a validation set
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--- 113
Split dataset. Validation is 0.25%
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Inner score on a validation set
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--- 114
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
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--- 115
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
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--- 116
Split dataset. Validation is 0.25%
```

```
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Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
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generation
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--- 117
Split dataset. Validation is 0.25%
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Inner score on a validation set
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--- 118
Split dataset. Validation is 0.25%
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--- 119
Split dataset. Validation is 0.25%
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Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
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generation
In dataset add 1 new results

--- 120
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
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size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 121
Split dataset. Validation is 0.25%
2 model(s) valid
```

```
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 122
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 123
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 124
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 125
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 126
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
```

```
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 127
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 128
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 129
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 130
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 131
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
Evolve GaussianProcessRegressor by 80 population size in 80 generation
```

```
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 132
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 133
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 134
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 135
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 136
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
```

```
Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 137
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 138
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 139
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 140
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 141
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
```

```
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
In dataset add 1 new results

--- 142
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 143
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 144
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 145
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 146
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
```

```
In dataset add 1 new results

--- 147
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 148
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 149
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 150
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 151
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
```

```
generation
In dataset add 1 new results

--- 152
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 153
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 154
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 155
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 156
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results
```

```
--- 157
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 158
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 159
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 160
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 161
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
```

```
In dataset add 1 new results

--- 162
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 163
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 164
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 165
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 166
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 167
```

```
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 168
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 169
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 170
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 171
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 172
Split dataset. Validation is 0.25%
```

```
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 173
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 174
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 175
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 176
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 177
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
```

```
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 178
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 179
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 180
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 181
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 182
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results
```

```
--- 183
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 184
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 185
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 186
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 187
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 188
Split dataset. Validation is 0.25%
```

```
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 189
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 190
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 191
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 192
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 193
Split dataset. Validation is 0.25%
2 model(s) valid
```

```
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 194
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 195
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 196
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 197
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 198
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
```

```
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 199
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 200
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 201
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 202
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 203
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results
```

```
--- 204
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 205
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 206
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 207
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 208
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 209
```

```
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 210
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 211
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 212
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 213
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 214
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
```

```
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 215
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 216
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 217
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 218
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 219
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
```

```
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 220
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 221
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 222
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 223
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 224
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results
```

```
--- 225
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 226
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 227
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 228
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 229
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 230
Split dataset. Validation is 0.25%
```

```
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 231
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 232
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 233
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 234
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 235
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
```

```
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 236
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 237
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 238
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 239
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 240
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
```

```
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 241
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 242
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 243
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 244
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 245
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
```

```
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 246
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 247
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 248
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 249
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 250
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results
```

```
--- 251
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 252
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 253
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 254
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 255
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 256
Split dataset. Validation is 0.25%
2 model(s) valid
```

```
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 257
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 258
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 259
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 260
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 261
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
```

```
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 262
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 263
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 264
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 265
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 266
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
```

```
generation
In dataset add 1 new results

--- 267
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 268
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 269
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 270
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 271
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results
```

```
--- 272
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 273
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 274
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 275
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 276
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results

--- 277
```

```
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 278
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 279
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 280
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 281
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 282
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
```

```
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 283
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 284
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 285
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 286
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 287
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
```

```
In dataset add 1 new results

--- 288
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 289
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 290
Split dataset. Validation is 0.25%
3 model(s) valid
Inner score on a validation set
Evolve GaussianProcessRegressor by 80 population size in 80 generation
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 291
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 292
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results
```

```
--- 293
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 294
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 295
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 296
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 297
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
In dataset add 1 new results

--- 298
Split dataset. Validation is 0.25%
```

```
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 299
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve GradientBoostingRegressor vs GradientBoostingRegressor by 80 population
size in 80 generation
Evolve Pipeline vs Pipeline by 80 population size in 80 generation
In dataset add 1 new results

--- 300
Split dataset. Validation is 0.25%
2 model(s) valid
Inner score on a validation set
Evolve Pipeline vs GradientBoostingRegressor by 80 population size in 80
generation
Evolve GradientBoostingRegressor vs Pipeline by 80 population size in 80
generation
In dataset add 1 new results
```

0.1.4 Results analysis

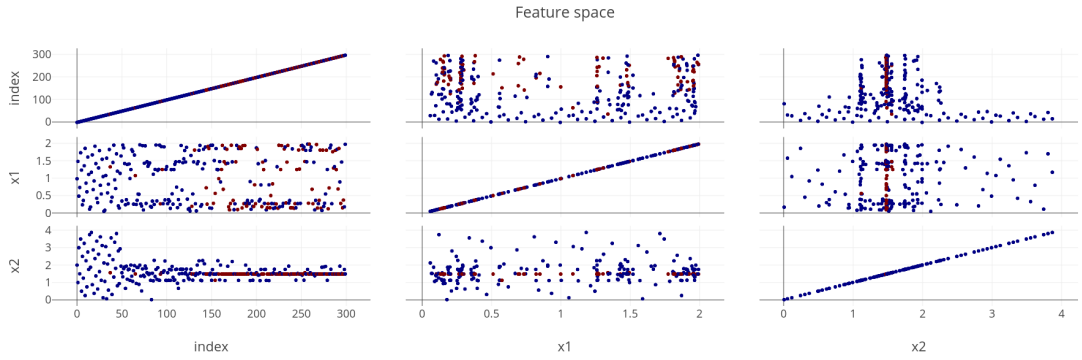
[9]:
```
X, y = gen.return_X_y()
ndf, dl, dc, ndr = pg.fast_non_dominated_sorting(y.values)
ndf_in_total = 100*(len(ndf[0])/len(X))
y.reset_index(drop=True, inplace=True)

print("Evaluated {} point(s). Non-dominated solutions is {:.1f}% from all␣
 ↪dataset".format(len(X), ndf_in_total))
print("Hypervolume: {:.2f}".format(pg.hypervolume(-y.loc[ndf[0],:].values).
 ↪compute([0]*OBJ)))
```

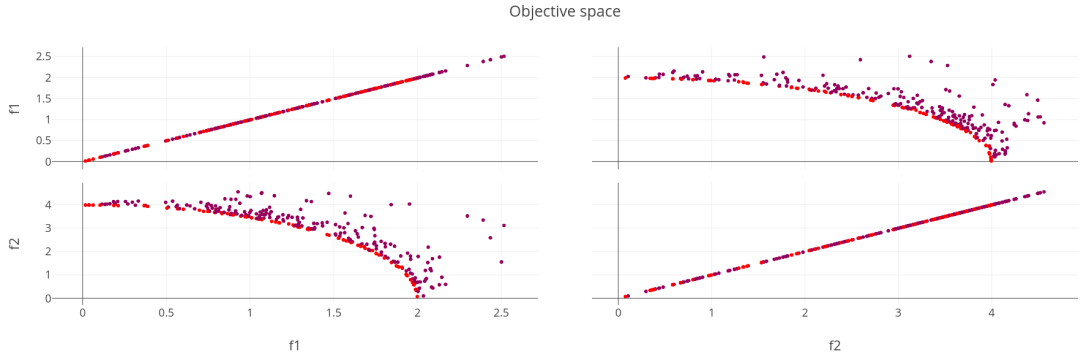
```
Evaluated 300 point(s). Non-dominated solutions is 29.7% from all dataset
Hypervolume: 6.25
```

[45]:
```
X_ndf = X.copy().reset_index()
X_ndf['ndf'] = 0
X_ndf.loc[ndf[0],['ndf']] = 1
```

```
px.scatter_matrix(X_ndf, template="presentation" , dimensions=list(X.columns),␣
 ↪color='ndf', color_continuous_scale='Jet', title="Feature space").
 ↪update_layout(coloraxis_showscale=False)
```



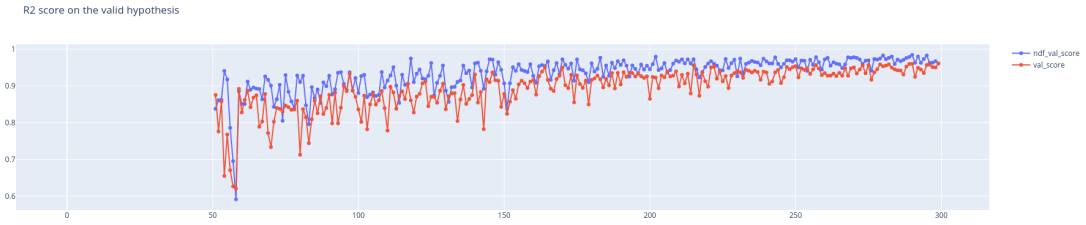
[11]:
```
y_ndf = y.copy().reset_index()
y_ndf['ndf'] = 0
y_ndf.loc[ndf[0],['ndf']] = 1
px.scatter_matrix(y_ndf, template="presentation", dimensions=list(y.columns),␣
 ↪color='ndf', color_continuous_scale='Rainbow', title="Objective space").
 ↪update_layout(coloraxis_showscale=False)
```



[12]:
```
ndf_val_score = [frame.iloc[0]['ndf_val_score'] if isinstance(frame, pd.
 ↪DataFrame) else frame for frame in iter_solution]
val_score = [frame.iloc[0]['val_score'] if isinstance(frame, pd.DataFrame) else␣
 ↪frame for frame in iter_solution]

x = np.arange(len(val_score))
fig = go.Figure()
fig.add_trace(go.Scatter(x=x, y=ndf_val_score,
                         mode='lines+markers',
```

```
                    name='ndf_val_score'))
fig.add_trace(go.Scatter(x=x, y=val_score,
                    mode='lines+markers',
                    name='val_score'))
fig.update_layout(title='R2 score on the valid hypothesis')
fig.show()
```



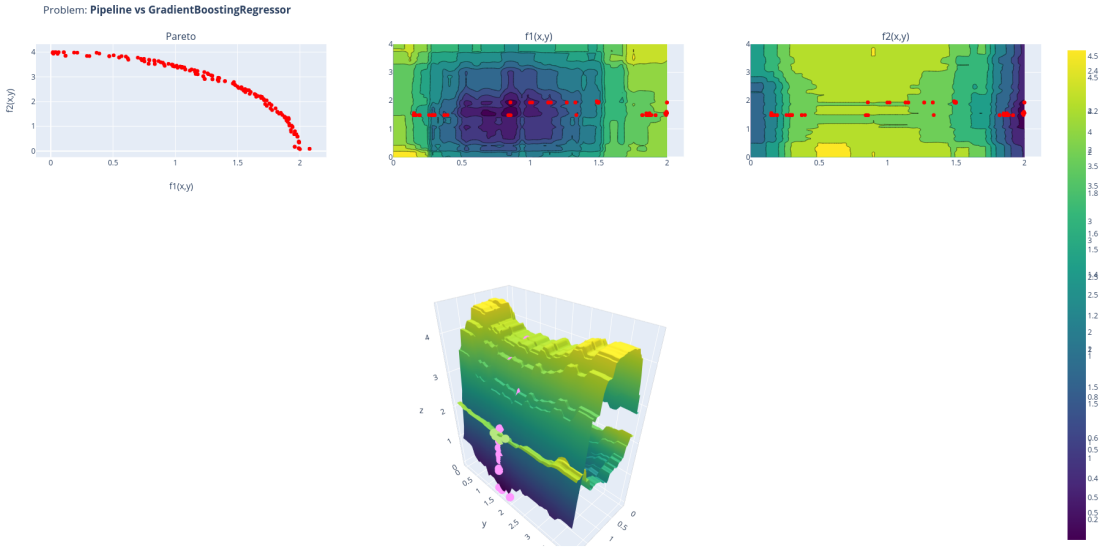
0.1.5 *Plotting objectives and search space for the last iteration of tuning - Red points are Pare front from the hypothesis. - Blue points are non-dominated solutions from evaluated points. Set of the best solutions available for this iteration.

**if the dimension of problem and objective space is 2*

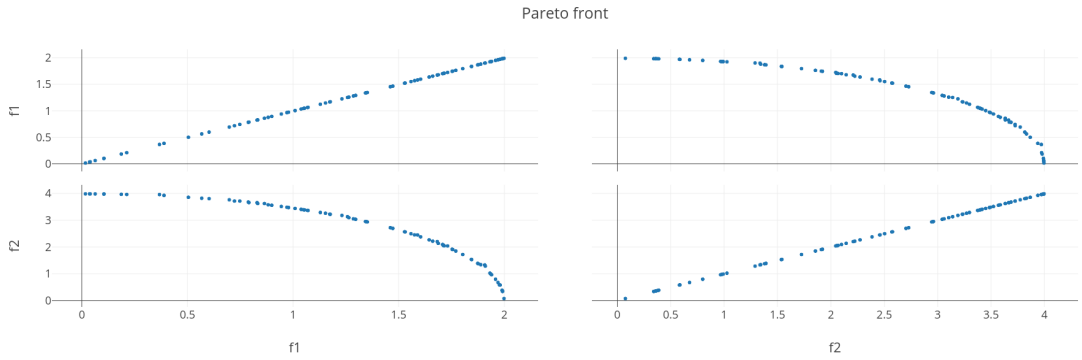
[44]:
```
if OBJ==2 and DIM == 2:
    # Plot last population from TutorModel
    X, y = gen.return_X_y()
    X = X.reset_index()
    y = y.reset_index()

    best_experiments = go.Scatter(x=y.loc[ndf[0],:].f1.values,
                          y=y.loc[ndf[0],:].f2.values,
                          mode='markers',
                          name=u'Dataset. Not-dominated results ',
                          showlegend=False,
                          line=dict(color='red')
                          )

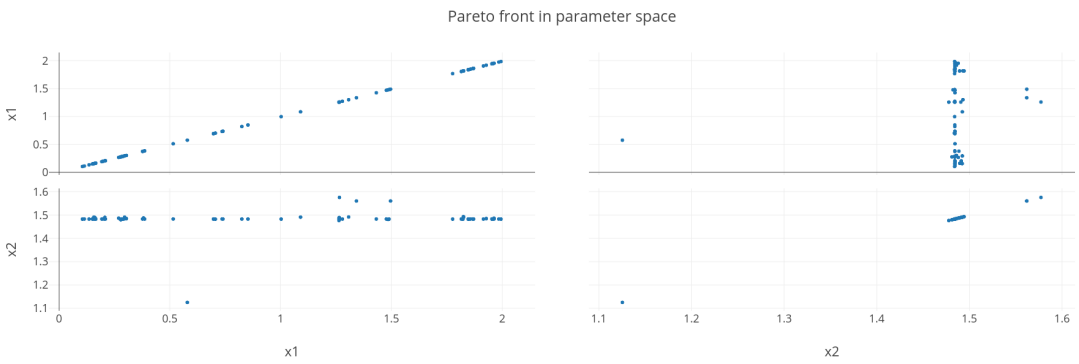
    solver = tutor.solution.solver.values[0]
    fig = plot_mo(solver.problem, solver.population)
    fig.add_trace(best_experiments, row=1, col=1)
    plotly.offline.iplot(fig)
```



[51]:
```
px.scatter_matrix(y.copy().loc[ndf[0],:], template="presentation",␣
↪dimensions=list(y.drop(columns=['index']).columns),␣
↪color_continuous_scale='Redblue', title="Pareto front").
↪update_layout(coloraxis_showscale=False)
```



[50]:
```
px.scatter_matrix(X.copy().loc[ndf[0],:], template="presentation" ,␣
↪dimensions=list(X.drop(columns=['index']).columns),␣
↪color_continuous_scale='Jet', title="Pareto front in parameter space").
↪update_layout(coloraxis_showscale=False)
```


Pareto front in parameter space
x1
x2
x1
x2