Analysis_Out

June 7, 2022

```
[1]: import warnings
     warnings.filterwarnings('ignore')
```

```
[2]: import scrapbook as sb
     import pandas as pd
     import numpy as np
     import seaborn as sns
     import numpy as np
     from statistics import mean , median
     import matplotlib.pyplot as plt
```

1 Baseline

```
[3]: books = sb.read_notebooks("./BaseLine_Model_Output")
     baseLine_data = []
     for nb in books.notebooks:
         nbList=[nb.scraps['Stats Model MAE'].data,nb.scraps['Catboost MAE'].data]
         baseLine_data.append(nbList)
     df = pd.DataFrame(baseLine_data, columns = ["Stats Model","Catboost"])
     baseline_data = np.array(baseLine_data)
     stats = median(baseline_data[:,0])
     catboost = median(baseline_data[:,1])
```

2 GAN Model

```
[4]: book = sb.read_notebooks("./GAN_Output")
     gan_data = []
     gan_mse = []
     for nb in book.notebooks:
         metrics = nb.scraps['GAN_1 Metrics'].data
         for i in range(1000):
             gan_mse.append(metrics[0][i])
         nbList = [nb.scraps['GAN Model MSE'].data,
                   nb.scraps['GAN Model MAE'].data,
                   nb.scraps['GAN Model Euclidean distance'].data,
                   nb.scraps['GAN Model Manhattan Distance'].data]
```

```
        gan_data.append(nbList)

df = pd.DataFrame(gan_data, columns = ['MSE','MAE','Euclidean␣
 ↪Distance','Manhattan Distance'])
display(df.style)
print("MEDIAN:")
print(df.median(axis = 0))
gan_data = np.array(gan_data)
gan_median = median(gan_data[:,1])
print(gan_median)
```

<pandas.io.formats.style.Styler at 0x7fc4127bfe20>

```
MEDIAN:
MSE                  0.085055
MAE                  0.208172
Euclidean Distance   1.292234
Manhattan Distance   4.163449
dtype: float64
0.20817244485737757
```

3 ABC_GAN Analysis

3.1 ABC Pre-generator - Catboost

```
[5]: book = sb.read_notebooks("./ABC_GAN_Catboost")
     paramVal = [[1,1],[1,0.1],[1,0.01],[0.1,1],[0.1,0.1],[0.1,0.01],[0.01,1],[0.
      ↪01,0.1],[0.01,0.01]]
     abc_mae = [[] for i in range(9)]
     abc_mae_skip = [[] for i in range(9)]
     abc_mae_mean = [[] for i in range(9)]
     abc_mae_skip_mean = [[] for i in range(9)]
     abc_weights = [[] for i in range(9)]
     prior_model = [[] for i in range(9)]
     abc_pre_generator = [[] for i in range(9)]

     for nb in book.notebooks:
         metrics1 = np.array(nb.scraps['ABC_GAN_1 Metrics'].data)
         metrics3 = np.array(nb.scraps['ABC_GAN_3 Metrics'].data)
         paramVar = float(nb.papermill_dataframe.iloc[0]['value'])
         paramBias = float(nb.papermill_dataframe.iloc[1]['value'])
         #Divide data according to parameters
         for i in range(9):
             if paramVar == paramVal[i][0] and paramBias == paramVal[i][1]:
                 for j in range(100):
                     abc_mae[i].append(metrics1[1,j])
                     abc_mae_skip[i].append(metrics3[1,j])
                 abc_weights[i].append(nb.scraps['Skip Connection Weight'].data)
```

```
              prior_model[i].append(nb.scraps['Prior Model MSE'].data)
              abc_pre_generator[i].append(nb.scraps['ABC Pre-generator MSE'].data)
              abc_mae_skip_mean[i].append(mean(metrics3[1,:]))
              abc_mae_mean[i].append(mean(metrics1[1,:]))
```

```python
[6]: data = [[] for i in range(9)]
     for i in range(9):
         for j in range(len(abc_weights[i])):
             data[i].append([paramVal[i][0], paramVal[i][1],prior_model[i][j],
                     ␣
     ↪abc_pre_generator[i][j],abc_weights[i][j],abc_mae_mean[i][j],abc_mae_skip_mean[i][j]])
         df = pd.DataFrame(data[i], columns = ['Variance','Bias','Prior Model MAE',
                                       'ABC pre-generator MAE','Skip Node␣
     ↪weight','ABC GAN MAE','ABC_GAN MAE (skip connection)'])
         display(df.round(5))
         print(df.median(axis=0))
         print("------------------------------------------------------------")
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight
0	1	1	0.33940	1.23536	0.94826
1	1	1	0.33737	1.37975	0.61124
2	1	1	0.30833	1.32396	0.14149
3	1	1	0.24887	1.30517	0.73428
4	1	1	0.35931	1.69546	0.11051
5	1	1	0.27828	1.06569	0.17545
6	1	1	0.30177	1.24321	0.13008
7	1	1	0.24163	0.89242	0.12000
8	1	1	0.28360	1.11022	0.19241
9	1	1	0.23384	0.92098	0.19288

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.11357	0.17955
1	0.17546	0.22571
2	0.26229	0.20108
3	0.15933	0.12770
4	0.21945	0.25125
5	0.19590	0.17233
6	0.18765	0.16587
7	0.14820	0.14466
8	0.17033	0.15950
9	0.17871	0.16900

```
Variance                  1.000000
Bias                      1.000000
Prior Model MAE           0.292687
ABC pre-generator MAE     1.239285
Skip Node weight          0.183931
ABC GAN MAE               0.177082
```

```
ABC_GAN MAE (skip connection)    0.170664
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	1	0.1	0.43561	0.74859	0.35479	
1	1	0.1	0.28184	0.99126	0.08113	
2	1	0.1	0.19014	1.05491	0.07380	
3	1	0.1	0.26453	1.07082	0.08049	
4	1	0.1	0.24599	1.07991	0.07133	
5	1	0.1	0.33888	1.02142	0.08047	
6	1	0.1	0.40806	1.06797	0.81499	
7	1	0.1	0.32971	1.07045	0.07399	
8	1	0.1	0.28961	0.98322	0.29144	
9	1	0.1	0.52755	1.14063	0.47393	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.22145	0.29530
1	0.20912	0.26460
2	0.15305	0.16566
3	0.20056	0.20810
4	0.22864	0.22342
5	0.28885	0.31943
6	0.22694	0.31548
7	0.26911	0.33766
8	0.24735	0.24618
9	0.39080	0.47710

```
Variance                         1.000000
Bias                             0.100000
Prior Model MAE                  0.309664
ABC pre-generator MAE            1.061440
Skip Node weight                 0.080813
ABC GAN MAE                      0.227788
ABC_GAN MAE (skip connection)    0.279954
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	1	0.01	0.27758	1.18640	0.07398	
1	1	0.01	0.46227	0.89042	0.06550	
2	1	0.01	0.32098	0.97452	0.07880	
3	1	0.01	0.35196	1.09613	0.79278	
4	1	0.01	0.27458	0.92471	0.12406	
5	1	0.01	0.24247	1.13035	0.19510	
6	1	0.01	0.37039	1.04197	0.07143	
7	1	0.01	0.37543	0.79576	0.34068	
8	1	0.01	0.33676	1.04347	0.06413	
9	1	0.01	0.22450	1.07060	0.06762	

```
    ABC GAN MAE  ABC_GAN MAE (skip connection)
0      0.21384                        0.25977
1      0.49664                        0.47271
2      0.25224                        0.33090
3      0.31431                        0.31587
4      0.21252                        0.26446
5      0.21490                        0.26332
6      0.32317                        0.35455
7      0.35818                        0.34678
8      0.29465                        0.32400
9      0.16308                        0.19894

Variance                        1.000000
Bias                            0.010000
Prior Model MAE                 0.328871
ABC pre-generator MAE           1.042719
Skip Node weight                0.076387
ABC GAN MAE                     0.273448
ABC_GAN MAE (skip connection)   0.319932
dtype: float64
----------------------------------------------------------------
   Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0       0.1     1          0.34522                0.91613           0.86654
1       0.1     1          0.42982                0.54821           0.20623
2       0.1     1          0.37364                0.89897           0.45629
3       0.1     1          0.30149                0.89776           0.11980
4       0.1     1          0.32270                1.03394           0.10645
5       0.1     1          0.43163                1.06819           0.19981
6       0.1     1          0.27770                0.85109           0.23155
7       0.1     1          0.29862                0.62391           0.20230
8       0.1     1          0.28327                1.06640           0.62501
9       0.1     1          0.44805                1.03807           0.80594

   ABC GAN MAE  ABC_GAN MAE (skip connection)
0      0.26365                        0.20268
1      0.21470                        0.18884
2      0.23385                        0.18193
3      0.14368                        0.11256
4      0.26111                        0.18188
5      0.20641                        0.14709
6      0.19811                        0.18025
7      0.21804                        0.15272
8      0.20653                        0.20672
9      0.22724                        0.17899

Variance                        0.100000
Bias                            1.000000
```

```
Prior Model MAE               0.333960
ABC pre-generator MAE         0.907547
Skip Node weight              0.218894
ABC GAN MAE                   0.216369
ABC_GAN MAE (skip connection) 0.181066
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	0.1	0.1	0.43950	0.46254	0.52780	
1	0.1	0.1	0.27478	0.26016	0.04903	
2	0.1	0.1	0.33685	0.38292	0.80767	
3	0.1	0.1	0.25214	0.31656	0.10125	
4	0.1	0.1	0.33587	0.35658	0.66519	
5	0.1	0.1	0.26255	0.30937	0.06615	
6	0.1	0.1	0.60386	0.61524	0.06667	
7	0.1	0.1	0.28395	0.34426	0.08852	
8	0.1	0.1	0.24195	0.24939	0.08934	
9	0.1	0.1	0.38222	0.32636	0.74403	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.38173	0.37531
1	0.18777	0.21756
2	0.26388	0.24969
3	0.19014	0.21465
4	0.26158	0.20687
5	0.21574	0.21770
6	0.51544	0.44774
7	0.26835	0.21137
8	0.16007	0.20482
9	0.34925	0.32487

```
Variance                      0.100000
Bias                          0.100000
Prior Model MAE               0.309908
ABC pre-generator MAE         0.335309
Skip Node weight              0.095297
ABC GAN MAE                   0.262730
ABC_GAN MAE (skip connection) 0.217627
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	0.1	0.01	0.33745	0.34370	0.02917	
1	0.1	0.01	0.24996	0.29032	0.03959	
2	0.1	0.01	0.31676	0.35565	0.23461	
3	0.1	0.01	0.27503	0.26694	0.01949	
4	0.1	0.01	0.28844	0.31127	0.37802	
5	0.1	0.01	0.34123	0.36295	0.04284	

```
6      0.1  0.01       0.36247              0.35394           0.57680
7      0.1  0.01       0.39652              0.43883           0.03971
8      0.1  0.01       0.38956              0.40877           0.03805
9      0.1  0.01       0.33376              0.34394           0.04291


   ABC GAN MAE  ABC_GAN MAE (skip connection)
0     0.29314                        0.33796
1     0.21448                        0.24310
2     0.23542                        0.32889
3     0.21190                        0.26835
4     0.24617                        0.28877
5     0.33728                        0.33237
6     0.34596                        0.33463
7     0.32287                        0.36958
8     0.34555                        0.38855
9     0.29818                        0.32839

Variance                      0.100000
Bias                          0.010000
Prior Model MAE               0.335605
ABC pre-generator MAE         0.348943
Skip Node weight              0.041275
ABC GAN MAE                   0.295663
ABC_GAN MAE (skip connection)    0.330630
dtype: float64
-------------------------------------------------------------
   Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0      0.01     1          0.25246                0.84264           0.13170
1      0.01     1          0.26360                0.61303           0.84795
2      0.01     1          0.32241                0.75332           0.13259
3      0.01     1          0.40234                0.85302           0.19845
4      0.01     1          0.23324                0.74013           0.12878
5      0.01     1          0.38712                0.62617           0.77245
6      0.01     1          0.37999                0.67656           0.11361
7      0.01     1          0.26258                0.65570           0.15128
8      0.01     1          0.34960                0.80329           0.12742
9      0.01     1          0.33424                0.84481           0.63255


   ABC GAN MAE  ABC_GAN MAE (skip connection)
0     0.13808                        0.11835
1     0.12200                        0.13767
2     0.19736                        0.18479
3     0.24229                        0.17864
4     0.14509                        0.15236
5     0.13587                        0.17123
6     0.26438                        0.17171
7     0.20190                        0.15850
8     0.19761                        0.21005
```

```
9      0.13561                       0.15046
Variance                    0.010000
Bias                        1.000000
Prior Model MAE             0.328327
ABC pre-generator MAE       0.746724
Skip Node weight            0.141935
ABC GAN MAE                 0.171229
ABC_GAN MAE (skip connection)   0.164863
dtype: float64
------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	0.01	0.1	0.30430	0.30129	0.15095	
1	0.01	0.1	0.39774	0.38213	0.13709	
2	0.01	0.1	0.28413	0.26740	0.41843	
3	0.01	0.1	0.36408	0.39441	0.17876	
4	0.01	0.1	0.23620	0.27116	0.47520	
5	0.01	0.1	0.23179	0.25252	0.66364	
6	0.01	0.1	0.27544	0.28041	0.10142	
7	0.01	0.1	0.28580	0.35268	0.72014	
8	0.01	0.1	0.25405	0.26982	0.17634	
9	0.01	0.1	0.33591	0.34922	0.75330	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.23484	0.29508
1	0.27188	0.35350
2	0.25492	0.24405
3	0.29581	0.33370
4	0.21088	0.18163
5	0.23508	0.20055
6	0.28224	0.25594
7	0.21666	0.24109
8	0.18361	0.18345
9	0.26488	0.23432

```
Variance                    0.010000
Bias                        0.100000
Prior Model MAE             0.284960
ABC pre-generator MAE       0.290849
Skip Node weight            0.298597
ABC GAN MAE                 0.244997
ABC_GAN MAE (skip connection)   0.242570
dtype: float64
------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	0.01	0.01	0.27262	0.27318	0.02091	
1	0.01	0.01	0.32522	0.32539	0.09307	
2	0.01	0.01	0.23807	0.23956	0.03329	

```
3      0.01  0.01          0.26071                    0.25984                  0.00000
4      0.01  0.01          0.36726                    0.36846                  0.01966
5      0.01  0.01          0.42144                    0.42595                  0.24959
6      0.01  0.01          0.25616                    0.25749                  0.01207
7      0.01  0.01          0.45660                    0.45366                  0.16975
8      0.01  0.01          0.48094                    0.47900                  0.00000
9      0.01  0.01          0.27894                    0.27478                  0.17984

   ABC GAN MAE   ABC_GAN MAE (skip connection)
0      0.25381                         0.26873
1      0.27625                         0.32448
2      0.23518                         0.23842
3      0.27751                         0.25573
4      0.34628                         0.36449
5      0.37507                         0.40614
6      0.24578                         0.25556
7      0.43720                         0.46657
8      0.42872                         0.47976
9      0.23169                         0.27350

Variance                        0.010000
Bias                            0.010000
Prior Model MAE                 0.302076
ABC pre-generator MAE           0.300085
Skip Node weight                0.027104
ABC GAN MAE                     0.276881
ABC_GAN MAE (skip connection)   0.298988
dtype: float64
-------------------------------------------------------------
```

```python
# Display Catboost Summary Tables
data = np.array(data)
catboostData = []
for i in range(9):
    catboostData.append([paramVal[i][0],
    paramVal[i][1],catboost,median(data[i][:,3]),median(data[i][:
    ,5]),median(data[i][:,6]),median(data[i][:,4])])
df = pd.DataFrame(catboostData, columns = ['Variance','Bias','Catboost','Prior
    Model MAE','mGAN','skipGAN','Skip Node weight'])
display(df.round(5))
```

```
   Variance  Bias  Catboost  Prior Model MAE      mGAN   skipGAN  \
0      1.00  1.00   0.14426          1.23929   0.17708   0.17066
1      1.00  0.10   0.14426          1.06144   0.22779   0.27995
2      1.00  0.01   0.14426          1.04272   0.27345   0.31993
3      0.10  1.00   0.14426          0.90755   0.21637   0.18107
4      0.10  0.10   0.14426          0.33531   0.26273   0.21763
5      0.10  0.01   0.14426          0.34894   0.29566   0.33063
```

```
6      0.01  1.00  0.14426          0.74672  0.17123  0.16486
7      0.01  0.10  0.14426          0.29085  0.24500  0.24257
8      0.01  0.01  0.14426          0.30009  0.27688  0.29899

   Skip Node weight
0           0.18393
1           0.08081
2           0.07639
3           0.21889
4           0.09530
5           0.04127
6           0.14193
7           0.29860
8           0.02710
```

3.2 ABC Pre-generator - Stats

```python
[8]: book = sb.read_notebooks("./ABC_GAN_Stats")
     paramVal = [[1,1],[0.1,1],[0.01,1],[1,0.1],[0.1,0.1],[0.01,0.1],[1,0.01],[0.1,0.
      →01],[0.01,0.01]]
     abc_mae = [[] for i in range(9)]
     abc_mae_skip = [[] for i in range(9)]
     abc_mae_mean = [[] for i in range(9)]
     abc_mae_skip_mean = [[] for i in range(9)]
     abc_weights = [[] for i in range(9)]
     prior_model = [[] for i in range(9)]
     abc_pre_generator = [[] for i in range(9)]

     for nb in book.notebooks:
         metrics1 = np.array(nb.scraps['ABC_GAN_1 Metrics'].data)
         metrics3 = np.array(nb.scraps['ABC_GAN_3 Metrics'].data)
         paramVar = float(nb.papermill_dataframe.iloc[0]['value'])
         paramBias = float(nb.papermill_dataframe.iloc[1]['value'])
         #Divide data according to parameters
         for i in range(9):
             if paramVar == paramVal[i][0] and paramBias == paramVal[i][1]:
                 for j in range(100):
                     abc_mae[i].append(metrics1[1,j])
                     abc_mae_skip[i].append(metrics3[1,j])
                 abc_weights[i].append(nb.scraps['Skip Connection Weight'].data)
                 prior_model[i].append(nb.scraps['Prior Model MSE'].data)
                 abc_pre_generator[i].append(nb.scraps['ABC Pre-generator MSE'].data)
                 abc_mae_skip_mean[i].append(mean(metrics3[1,:]))
                 abc_mae_mean[i].append(mean(metrics1[1,:]))
```

```python
[9]: data = [[] for i in range(9)]
     for i in range(9):
```

```
    for j in range(len(abc_weights[i])):
        data[i].append([paramVal[i][0], paramVal[i][1],prior_model[i][j],
              ⊔
 ↪abc_pre_generator[i][j],abc_weights[i][j],abc_mae_mean[i][j],abc_mae_skip_mean[i][j]])

    df = pd.DataFrame(data[i], columns = ['Variance','Bias','Prior Model MAE',
                                'ABC pre-generator MAE','Skip Node⊔
 ↪weight','ABC GAN MAE','ABC_GAN MAE (skip connection)'])
    display(df.round(5))
    print(df.median(axis=0))
    print("------------------------------------------------------------")
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight
0	1	1	0.29031	1.25478	0.88258
1	1	1	0.44975	1.23064	0.87832
2	1	1	0.42078	1.42587	0.98379
3	1	1	0.43359	1.24520	1.00000
4	1	1	0.36823	1.10807	0.89985
5	1	1	0.34959	1.06025	0.99644
6	1	1	0.40612	1.07032	1.00000
7	1	1	0.47881	1.22904	0.97343
8	1	1	0.29692	1.26820	0.96820
9	1	1	0.32433	1.36152	0.99623

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.18901	0.11431
1	0.35030	0.18303
2	0.19155	0.25245
3	0.31754	0.36813
4	0.35659	0.17494
5	0.22893	0.23016
6	0.25452	0.27736
7	0.35585	0.20099
8	0.20240	0.20051
9	0.15719	0.23160

```
Variance                         1.000000
Bias                             1.000000
Prior Model MAE                  0.387177
ABC pre-generator MAE            1.237921
Skip Node weight                 0.978611
ABC GAN MAE                      0.241726
ABC_GAN MAE (skip connection)    0.215575
dtype: float64
------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight
0	0.1	1	0.31186	0.99195	0.98998

```
1       0.1     1        0.43040                0.72982              1.00000
2       0.1     1        0.35791                1.05063              0.99555
3       0.1     1        0.42437                0.79663              0.95032
4       0.1     1        0.25302                0.95273              0.98694
5       0.1     1        0.36768                0.84921              0.99555
6       0.1     1        0.43353                1.12283              0.86891
7       0.1     1        0.37974                0.97706              0.90165
8       0.1     1        0.30989                0.81079              0.85959
9       0.1     1        0.35632                1.03301              0.91324

    ABC GAN MAE  ABC_GAN MAE (skip connection)
0      0.23428                        0.22337
1      0.52050                        0.31388
2      0.22909                        0.19770
3      0.31949                        0.16097
4      0.28690                        0.17581
5      0.36063                        0.38644
6      0.30905                        0.14942
7      0.26076                        0.25680
8      0.28656                        0.13385
9      0.32711                        0.09685

Variance                        0.100000
Bias                            1.000000
Prior Model MAE                 0.362792
ABC pre-generator MAE           0.964899
Skip Node weight                0.968629
ABC GAN MAE                     0.297976
ABC_GAN MAE (skip connection)   0.186758
dtype: float64
------------------------------------------------------------
    Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0      0.01     1        0.38728                1.09869              0.93346
1      0.01     1        0.53611                1.03067              0.91697
2      0.01     1        0.43641                0.76017              0.99795
3      0.01     1        0.46893                1.05125              0.95772
4      0.01     1        0.41863                0.85753              0.99077
5      0.01     1        0.52122                0.71846              0.97956
6      0.01     1        0.48707                1.00235              0.99346
7      0.01     1        0.25713                0.71231              0.94414
8      0.01     1        0.39914                0.78874              0.99098
9      0.01     1        0.29066                0.89550              1.00000

    ABC GAN MAE  ABC_GAN MAE (skip connection)
0      0.21018                        0.11905
1      0.36758                        0.16454
2      0.23458                        0.21013
3      0.26912                        0.25218
```

```
4      0.39182                          0.18677
5      0.38481                          0.24568
6      0.39385                          0.29901
7      0.22267                          0.11580
8      0.29706                          0.20774
9      0.28060                          0.27047

Variance                      0.010000
Bias                          1.000000
Prior Model MAE               0.427520
ABC pre-generator MAE         0.876513
Skip Node weight              0.985163
ABC GAN MAE                   0.288832
ABC_GAN MAE (skip connection) 0.208934
dtype: float64
------------------------------------------------------------
   Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0         1   0.1          0.41257                0.79406           0.44040
1         1   0.1          0.45371                0.95611           0.57612
2         1   0.1          0.39688                0.95095           0.32445
3         1   0.1          0.45879                0.97770           0.43378
4         1   0.1          0.42251                0.92074           0.39263
5         1   0.1          0.34619                1.07108           0.33271
6         1   0.1          0.34900                1.10251           0.46944
7         1   0.1          0.39553                0.89850           0.49149
8         1   0.1          0.38196                0.90301           0.35572
9         1   0.1          0.35319                1.00198           0.55072

   ABC GAN MAE  ABC_GAN MAE (skip connection)
0      0.35662                        0.23211
1      0.25812                        0.35093
2      0.27764                        0.13033
3      0.31853                        0.25538
4      0.51337                        0.14063
5      0.31402                        0.15233
6      0.30748                        0.22303
7      0.25137                        0.15429
8      0.30805                        0.20916
9      0.31537                        0.25513

Variance                      1.000000
Bias                          0.100000
Prior Model MAE               0.396203
ABC pre-generator MAE         0.953528
Skip Node weight              0.437087
ABC GAN MAE                   0.311033
ABC_GAN MAE (skip connection) 0.216094
dtype: float64
```

```
----------------------------------------------------------------
   Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0      0.1   0.1          0.33899                0.37605           0.27250
1      0.1   0.1          0.41764                0.42555           0.15203
2      0.1   0.1          0.48043                0.51058           0.13231
3      0.1   0.1          0.39148                0.43552           0.22965
4      0.1   0.1          0.34328                0.33604           0.34110
5      0.1   0.1          0.32535                0.34664           0.21488
6      0.1   0.1          0.32878                0.37201           0.27566
7      0.1   0.1          0.46466                0.48811           0.18800
8      0.1   0.1          0.49138                0.50282           0.23848
9      0.1   0.1          0.41160                0.41921           0.21276

   ABC GAN MAE  ABC_GAN MAE (skip connection)
0      0.25143                        0.17562
1      0.36053                        0.18397
2      0.35165                        0.16087
3      0.29790                        0.20947
4      0.34118                        0.19303
5      0.21494                        0.17605
6      0.25026                        0.14851
7      0.45523                        0.26467
8      0.39383                        0.16588
9      0.30211                        0.11726

Variance                        0.100000
Bias                            0.100000
Prior Model MAE                 0.401537
ABC pre-generator MAE           0.422377
Skip Node weight                0.222268
ABC GAN MAE                     0.321644
ABC_GAN MAE (skip connection)   0.175832
dtype: float64
----------------------------------------------------------------
   Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0     0.01   0.1          0.37124                0.37097           0.15151
1     0.01   0.1          0.47783                0.51363           0.22145
2     0.01   0.1          0.47916                0.49072           0.17568
3     0.01   0.1          0.47156                0.51861           0.15731
4     0.01   0.1          0.42035                0.41502           0.17332
5     0.01   0.1          0.43866                0.43418           0.23907
6     0.01   0.1          0.44115                0.45978           0.16887
7     0.01   0.1          0.28050                0.24813           0.11513
8     0.01   0.1          0.35283                0.36159           0.27447
9     0.01   0.1          0.41108                0.48806           0.05591

   ABC GAN MAE  ABC_GAN MAE (skip connection)
```

```
0        0.38960                    0.21936
1        0.30370                    0.21842
2        0.40445                    0.13892
3        0.31611                 1615.63033
4        0.32743                    0.15381
5        0.33322                    0.20196
6        0.24306                  590.99878
7        0.20883                  175.39932
8        0.21419                    0.10956
9        0.35662                  159.88891

Variance                      0.010000
Bias                          0.100000
Prior Model MAE               0.429502
ABC pre-generator MAE         0.446981
Skip Node weight              0.171094
ABC GAN MAE                   0.321769
ABC_GAN MAE (skip connection)    0.218890
dtype: float64
---------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	1	0.01	0.33825	1.06361	0.30817	
1	1	0.01	0.44252	1.10204	0.29916	
2	1	0.01	0.36814	0.97746	0.31601	
3	1	0.01	0.42011	1.06187	0.29280	
4	1	0.01	0.37682	0.98590	0.32761	
5	1	0.01	0.52305	1.02595	0.30050	
6	1	0.01	0.37340	0.96680	0.34648	
7	1	0.01	0.48357	1.05886	0.26469	
8	1	0.01	0.35782	0.84048	0.27136	
9	1	0.01	0.35840	1.04120	0.29938	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.22549	0.32862
1	0.36002	0.32687
2	0.31995	0.26308
3	0.27231	0.23630
4	0.19788	0.25539
5	0.30124	0.29729
6	0.23836	0.21219
7	0.42704	0.28547
8	0.16703	0.19012
9	0.28642	0.17383

```
Variance                      1.000000
Bias                          0.010000
Prior Model MAE               0.375113
ABC pre-generator MAE         1.033574
```

```
Skip Node weight                      0.299942
ABC GAN MAE                           0.279367
ABC_GAN MAE (skip connection)         0.259238
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight
0	0.1	0.01	0.51085	0.50383	0.13876
1	0.1	0.01	0.38288	0.39016	0.24636
2	0.1	0.01	0.35142	0.31922	0.13227
3	0.1	0.01	0.30469	0.34309	0.19530
4	0.1	0.01	0.28459	0.31449	0.10088
5	0.1	0.01	0.59744	0.56481	0.17860
6	0.1	0.01	0.27812	0.26587	0.17723
7	0.1	0.01	0.48638	0.48275	0.13708
8	0.1	0.01	0.41875	0.37538	0.11681
9	0.1	0.01	0.38843	0.42875	0.31244

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.35834	0.22991
1	0.23741	0.18503
2	0.30161	0.19806
3	0.23678	24.90852
4	0.31357	12.18260
5	0.24711	0.34491
6	0.17466	0.19405
7	0.28122	0.32425
8	0.31075	79.04335
9	0.32104	0.25826

```
Variance                              0.100000
Bias                                  0.010000
Prior Model MAE                       0.385658
ABC pre-generator MAE                 0.382770
Skip Node weight                      0.157999
ABC GAN MAE                           0.291414
ABC_GAN MAE (skip connection)         0.291257
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight
0	0.01	0.01	0.35989	0.36228	0.12434
1	0.01	0.01	0.49100	0.48709	0.14930
2	0.01	0.01	0.31965	0.31279	0.14853
3	0.01	0.01	0.48614	0.48666	0.07869
4	0.01	0.01	0.44581	0.44646	0.18750
5	0.01	0.01	0.33082	0.33031	0.16819
6	0.01	0.01	0.34958	0.35190	0.12512
7	0.01	0.01	0.42027	0.41859	0.21003

```
8      0.01  0.01         0.43336              0.43338        0.12368
9      0.01  0.01         0.38277              0.38477        0.14843

     ABC GAN MAE   ABC_GAN MAE (skip connection)
0      0.27899                      0.16319
1      0.47686                      0.32685
2      0.38471                    324.35423
3      0.36744                     47.89028
4      0.37733                      0.27410
5      0.30089                    170.24077
6      0.25503                    122.50966
7      0.29019                     76.77868
8      0.27799                      0.33361
9      0.24476                     58.47750

Variance                         0.010000
Bias                             0.010000
Prior Model MAE                  0.401518
ABC pre-generator MAE            0.401684
Skip Node weight                 0.148480
ABC GAN MAE                      0.295540
ABC_GAN MAE (skip connection)   53.183891
dtype: float64
----------------------------------------------------------------
```

```python
# Display Stats Summary Tables
data = np.array(data)
catboostData = []
for i in range(9):
    catboostData.append([paramVal[i][0], paramVal[i][1],stats,median(data[i][:
    ↪,3]),median(data[i][:,5]),median(data[i][:,6]),median(data[i][:,4])])
df = pd.DataFrame(catboostData, columns = ['Variance','Bias','Stats','Prior␣
    ↪Model MAE','mGAN','skipGAN','Skip Node weight'])
display(df.round(5))
```

```
   Variance  Bias    Stats  Prior Model MAE     mGAN   skipGAN  \
0      1.00  1.00  0.37071          1.23792  0.24173   0.21557
1      0.10  1.00  0.37071          0.96490  0.29798   0.18676
2      0.01  1.00  0.37071          0.87651  0.28883   0.20893
3      1.00  0.10  0.37071          0.95353  0.31103   0.21609
4      0.10  0.10  0.37071          0.42238  0.32164   0.17583
5      0.01  0.10  0.37071          0.44698  0.32177   0.21889
6      1.00  0.01  0.37071          1.03357  0.27937   0.25924
7      0.10  0.01  0.37071          0.38277  0.29141   0.29126
8      0.01  0.01  0.37071          0.40168  0.29554  53.18389

   Skip Node weight
0           0.97861
```

1	0.96863
2	0.98516
3	0.43709
4	0.22227
5	0.17109
6	0.29994
7	0.15800
8	0.14848