Analysis_Out

June 7, 2022

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

```python
[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

```python
[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

```python
[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 0x7fec7215ce20>

```
MEDIAN:
MSE                  0.005936
MAE                  0.060762
Euclidean Distance   0.342953
Manhattan Distance   1.215234
dtype: float64
0.06076171525809913
```

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,:]))
```

```
[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	0.07855	1.36006	0.11787
1	1	1	0.15301	1.08836	0.10816
2	1	1	0.14898	1.12789	0.90731
3	1	1	0.19753	1.18692	0.11900
4	1	1	0.11723	0.85215	0.88979
5	1	1	0.15040	1.20445	0.09598
6	1	1	0.15466	0.95156	0.31636

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.03983	0.04973
1	0.05588	0.06058
2	0.07048	0.05416
3	0.07974	0.04311
4	0.09667	0.08456
5	0.06731	0.05081
6	0.09388	0.05459

```
Variance                        1.000000
Bias                            1.000000
Prior Model MAE                 0.150399
ABC pre-generator MAE           1.127885
Skip Node weight                0.118999
ABC GAN MAE                     0.070475
ABC_GAN MAE (skip connection)   0.054163
dtype: float64
------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight
0	1	0.1	0.08664	1.08078	0.22811
1	1	0.1	0.12254	0.96230	0.07545

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight
2	1	0.1	0.09482	0.99885	0.08496
3	1	0.1	0.20895	0.96605	0.62171
4	1	0.1	0.25964	1.14851	0.15538
5	1	0.1	0.10261	1.02987	0.06901
6	1	0.1	0.24933	0.96000	0.07279

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.06467	0.05341
1	0.09036	0.08981
2	0.08375	0.05871
3	0.08128	0.11557
4	0.11147	0.12880
5	0.05347	0.05544
6	0.14778	0.15382

```
Variance                        1.000000
Bias                            0.100000
Prior Model MAE                 0.122537
ABC pre-generator MAE           0.998852
Skip Node weight                0.084956
ABC GAN MAE                     0.083755
ABC_GAN MAE (skip connection)   0.089808
dtype: float64
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	1	0.01	0.10032	1.04452	0.07525	
1	1	0.01	0.15789	0.95218	0.86445	
2	1	0.01	0.06501	0.99964	0.19704	
3	1	0.01	0.10682	0.98862	0.75384	
4	1	0.01	0.14664	1.01787	0.07657	
5	1	0.01	0.14552	0.97122	0.30354	
6	1	0.01	0.10720	0.99729	0.06635	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.07946	0.09370
1	0.11203	0.11231
2	0.06338	0.04880
3	0.05058	0.04444
4	0.04879	0.13630
5	0.08534	0.12470
6	0.07713	0.09104

```
Variance                        1.000000
Bias                            0.010000
Prior Model MAE                 0.107199
ABC pre-generator MAE           0.997293
Skip Node weight                0.197037
ABC GAN MAE                     0.077132
```

```
ABC_GAN MAE (skip connection)    0.093695
dtype: float64
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	0.1	1	0.10274	0.60203	0.15046	
1	0.1	1	0.18400	0.82051	0.18788	
2	0.1	1	0.13537	0.64484	0.25334	
3	0.1	1	0.21186	0.80396	0.53652	
4	0.1	1	0.22005	0.76347	0.38458	
5	0.1	1	0.10358	0.79639	0.12453	
6	0.1	1	0.19467	0.89972	0.12335	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.07749	0.06772
1	0.07663	0.04705
2	0.06205	0.07666
3	0.09125	0.06858
4	0.08745	0.05504
5	0.04788	0.04351
6	0.08848	0.07529

```
Variance                         0.100000
Bias                             1.000000
Prior Model MAE                  0.184000
ABC pre-generator MAE            0.796394
Skip Node weight                 0.187885
ABC GAN MAE                      0.077491
ABC_GAN MAE (skip connection)    0.067721
dtype: float64
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	0.1	0.1	0.14531	0.21265	0.08516	
1	0.1	0.1	0.19443	0.26237	0.24546	
2	0.1	0.1	0.19176	0.22195	0.07296	
3	0.1	0.1	0.18345	0.29532	0.04840	
4	0.1	0.1	0.10016	0.17115	0.49182	
5	0.1	0.1	0.16224	0.18113	0.05279	
6	0.1	0.1	0.09559	0.17334	0.38276	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.09433	0.09047
1	0.08817	0.11063
2	0.05922	0.08006
3	0.06654	0.10326
4	0.07579	0.06508
5	0.05404	0.06656
6	0.08216	0.07818

```
Variance                      0.100000
Bias                          0.100000
Prior Model MAE               0.162240
ABC pre-generator MAE         0.212655
Skip Node weight              0.085163
ABC GAN MAE                   0.075793
ABC_GAN MAE (skip connection) 0.080061
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	0.1	0.01	0.14108	0.20592	0.58303	
1	0.1	0.01	0.14328	0.18772	0.32514	
2	0.1	0.01	0.12463	0.14043	0.03141	
3	0.1	0.01	0.16789	0.18361	0.19254	
4	0.1	0.01	0.06525	0.11418	0.03785	
5	0.1	0.01	0.11773	0.14043	0.52496	
6	0.1	0.01	0.11736	0.15207	0.03082	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.09983	0.14749
1	0.08184	0.12781
2	0.10935	0.13028
3	0.12760	0.16063
4	0.05233	0.06712
5	0.11588	0.10306
6	0.09748	0.11824

```
Variance                      0.100000
Bias                          0.010000
Prior Model MAE               0.124627
ABC pre-generator MAE         0.152072
Skip Node weight              0.192537
ABC GAN MAE                   0.099832
ABC_GAN MAE (skip connection) 0.127806
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	0.01	1	0.14403	0.74114	0.72776	
1	0.01	1	0.11802	0.82910	0.47447	
2	0.01	1	0.15333	0.63561	0.87911	
3	0.01	1	0.13681	1.03887	0.64891	
4	0.01	1	0.15148	0.75239	0.89693	
5	0.01	1	0.16064	0.86782	0.10019	
6	0.01	1	0.11206	0.84647	0.18724	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.07486	0.07345

```
1        0.05623                        0.04519
2        0.09225                        0.06239
3        0.05432                        0.04067
4        0.06319                        0.05484
5        0.08251                        0.06306
6        0.05780                        0.05984

Variance                       0.010000
Bias                           1.000000
Prior Model MAE                0.144034
ABC pre-generator MAE          0.829097
Skip Node weight               0.648910
ABC GAN MAE                    0.063192
ABC_GAN MAE (skip connection)  0.059837
dtype: float64
--------------------------------------------------------------
   Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0      0.01   0.1          0.08611                0.10014           0.11448
1      0.01   0.1          0.14182                0.16452           0.38924
2      0.01   0.1          0.08366                0.13291           0.85842
3      0.01   0.1          0.15718                0.19995           0.58195
4      0.01   0.1          0.08675                0.14506           0.03570
5      0.01   0.1          0.14809                0.15994           0.15341
6      0.01   0.1          0.17979                0.24141           0.09049

   ABC GAN MAE  ABC_GAN MAE (skip connection)
0      0.03919                        0.04223
1      0.07521                        0.08046
2      0.06312                        0.03845
3      0.09116                        0.09086
4      0.04680                        0.04430
5      0.08700                        0.08208
6      0.09387                        0.06309

Variance                       0.010000
Bias                           0.100000
Prior Model MAE                0.141818
ABC pre-generator MAE          0.159936
Skip Node weight               0.153409
ABC GAN MAE                    0.075211
ABC_GAN MAE (skip connection)  0.063094
dtype: float64
--------------------------------------------------------------
   Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0      0.01  0.01          0.19134                0.18994           0.00039
1      0.01  0.01          0.23222                0.23572           0.01917
2      0.01  0.01          0.15958                0.16099           0.65389
3      0.01  0.01          0.07425                0.07819           0.01657
```

```
4      0.01  0.01         0.19488              0.19595              0.00000
5      0.01  0.01         0.13120              0.13433              0.01152
6      0.01  0.01         0.11860              0.12004              0.06184

    ABC GAN MAE   ABC_GAN MAE (skip connection)
0      0.11355                         0.19216
1      0.15256                         0.22942
2      0.12704                         0.14181
3      0.05087                         0.06998
4      0.10992                         0.19472
5      0.10145                         0.13048
6      0.08086                         0.12044

Variance                          0.010000
Bias                              0.010000
Prior Model MAE                   0.159576
ABC pre-generator MAE             0.160987
Skip Node weight                  0.016569
ABC GAN MAE                       0.109923
ABC_GAN MAE (skip connection)     0.141806
dtype: float64
------------------------------------------------------------
```

```
[7]: # 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   0.03605          1.12789  0.07048  0.05416
1      1.00  0.10   0.03605          0.99885  0.08375  0.08981
2      1.00  0.01   0.03605          0.99729  0.07713  0.09370
3      0.10  1.00   0.03605          0.79639  0.07749  0.06772
4      0.10  0.10   0.03605          0.21265  0.07579  0.08006
5      0.10  0.01   0.03605          0.15207  0.09983  0.12781
6      0.01  1.00   0.03605          0.82910  0.06319  0.05984
7      0.01  0.10   0.03605          0.15994  0.07521  0.06309
8      0.01  0.01   0.03605          0.16099  0.10992  0.14181

   Skip Node weight
0           0.11900
1           0.08496
```

```
2          0.19704
3          0.18788
4          0.08516
5          0.19254
6          0.64891
7          0.15341
8          0.01657
```

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	0.23813	1.28106	0.80094
1	1	1	0.22102	1.14056	0.99307
2	1	1	0.27459	1.08816	0.98481
3	1	1	0.28813	1.31808	0.83078
4	1	1	0.34480	1.12133	0.91197
5	1	1	0.24110	1.03853	0.89858
6	1	1	0.33800	1.08370	0.85938
7	1	1	0.33133	1.30251	0.87432
8	1	1	0.27649	1.56975	0.86954
9	1	1	0.24126	1.44175	0.84671

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.05578	0.03611
1	0.08598	0.04595
2	0.07290	0.05594
3	0.08666	0.05056
4	0.10008	0.06026
5	0.06163	0.06707
6	0.10560	0.07152
7	0.09254	0.05680
8	0.08778	0.05912
9	0.10785	0.06424

```
Variance                        1.000000
Bias                            1.000000
Prior Model MAE                 0.275544
ABC pre-generator MAE           1.210808
Skip Node weight                0.871929
ABC GAN MAE                     0.087218
ABC_GAN MAE (skip connection)   0.057961
dtype: float64
-------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight
0	0.1	1	0.25161	1.00356	0.80055
1	0.1	1	0.23106	0.97778	0.94645
2	0.1	1	0.19174	0.85203	0.90555
3	0.1	1	0.32052	0.85877	0.84012
4	0.1	1	0.35152	1.15790	0.96313
5	0.1	1	0.26972	0.88087	0.89831
6	0.1	1	0.22885	1.01589	0.92057
7	0.1	1	0.24305	0.72427	0.97428

```
8       0.1     1       0.29900                 0.72984                 0.88633
9       0.1     1       0.25311                 0.99157                 0.83004

    ABC GAN MAE  ABC_GAN MAE (skip connection)
0       0.10176                        0.07265
1       0.08995                        0.06388
2       0.06332                        0.05827
3       0.09127                        0.05755
4       0.12788                        0.07187
5       0.15212                        0.04405
6       0.13595                        0.06548
7       0.05745                        0.04699
8       0.07252                        0.06855
9       0.07409                        0.06332

Variance                        0.100000
Bias                            1.000000
Prior Model MAE                 0.252361
ABC pre-generator MAE           0.929323
Skip Node weight                0.901929
ABC GAN MAE                     0.090611
ABC_GAN MAE (skip connection)   0.063601
dtype: float64
--------------------------------------------------------------

    Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0       0.01     1       0.32042                 1.04047                 0.81824
1       0.01     1       0.28806                 0.95742                 0.83305
2       0.01     1       0.29300                 0.82354                 0.83751
3       0.01     1       0.26589                 0.70296                 0.99301
4       0.01     1       0.34727                 0.83058                 0.94527
5       0.01     1       0.28665                 0.94167                 0.85447
6       0.01     1       0.19762                 0.93788                 0.85314
7       0.01     1       0.33222                 0.96593                 0.90723
8       0.01     1       0.31160                 0.93358                 0.90637
9       0.01     1       0.26259                 1.09724                 0.90015

    ABC GAN MAE  ABC_GAN MAE (skip connection)
0       0.15056                        0.05376
1       0.09888                        0.06393
2       0.09255                        0.05515
3       0.08804                        0.07910
4       0.11802                        0.11185
5       0.13636                        0.12575
6       0.08796                        0.05882
7       0.17413                        0.06964
8       0.04920                        0.04424
9       0.11388                        0.05591
```

```
Variance                        0.010000
Bias                            1.000000
Prior Model MAE                 0.290531
ABC pre-generator MAE           0.939773
Skip Node weight                0.877308
ABC GAN MAE                     0.106381
ABC_GAN MAE (skip connection)   0.061378
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight \
0	1	0.1	0.15848	1.02515	0.35960
1	1	0.1	0.28747	1.03234	0.48291
2	1	0.1	0.38027	0.95697	0.41503
3	1	0.1	0.27555	1.03413	0.36314
4	1	0.1	0.26304	0.94752	0.40510
5	1	0.1	0.16404	1.03105	0.45740
6	1	0.1	0.25512	0.88285	0.39486
7	1	0.1	0.27934	0.84238	0.33649
8	1	0.1	0.34714	0.94914	0.37754
9	1	0.1	0.30716	0.93222	0.56371

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.09791	0.05751
1	0.05833	0.05602
2	0.14355	0.03443
3	0.16415	0.03652
4	0.09546	0.06707
5	0.04868	0.04967
6	0.07134	0.04868
7	0.09671	0.09255
8	0.16875	0.05799
9	0.07879	0.04365

```
Variance                        1.000000
Bias                            0.100000
Prior Model MAE                 0.277444
ABC pre-generator MAE           0.953058
Skip Node weight                0.399979
ABC GAN MAE                     0.096082
ABC_GAN MAE (skip connection)   0.052843
dtype: float64
----------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight \
0	0.1	0.1	0.37586	0.42114	0.21063
1	0.1	0.1	0.39242	0.39813	0.27957
2	0.1	0.1	0.26563	0.26669	0.22720
3	0.1	0.1	0.22658	0.23648	0.24648

```
4       0.1    0.1         0.25406                0.26922              0.25468
5       0.1    0.1         0.42598                0.44634              0.17733
6       0.1    0.1         0.31496                0.37584              0.22558
7       0.1    0.1         0.35132                0.39539              0.25233
8       0.1    0.1         0.32082                0.32711              0.23721
9       0.1    0.1         0.24014                0.31500              0.26480

    ABC GAN MAE   ABC_GAN MAE (skip connection)
0      0.05882                     0.06852
1      0.10479                     0.07413
2      0.13789                     0.05510
3      0.07450                     0.02703
4      0.06654                     0.02957
5      0.11375                     0.06301
6      0.13400                     0.07093
7      0.19819                     0.04794
8      0.11179                     0.04555
9      0.12667                     0.05867

Variance                      0.100000
Bias                          0.100000
Prior Model MAE               0.317887
ABC pre-generator MAE         0.351473
Skip Node weight              0.241844
ABC GAN MAE                   0.112774
ABC_GAN MAE (skip connection) 0.056883
dtype: float64
-------------------------------------------------------------
    Variance  Bias  Prior Model MAE  ABC pre-generator MAE  Skip Node weight  \
0      0.01   0.1        0.30467                0.28774              0.24639
1      0.01   0.1        0.22587                0.21911              0.21452
2      0.01   0.1        0.27178                0.30247              0.20897
3      0.01   0.1        0.30021                0.27567              0.22110
4      0.01   0.1        0.29109                0.30339              0.19463
5      0.01   0.1        0.20596                0.21351              0.14792
6      0.01   0.1        0.21403                0.24400              0.22088
7      0.01   0.1        0.20590                0.21720              0.14589
8      0.01   0.1        0.24217                0.30607              0.19146
9      0.01   0.1        0.22632                0.24834              0.25322

    ABC GAN MAE   ABC_GAN MAE (skip connection)
0      0.07274                     0.06261
1      0.09361                     0.04098
2      0.06501                     0.02836
3      0.05942                     0.05442
4      0.06220                     0.05267
5      0.14155                     0.02506
6      0.10826                     0.04503
```

```
7       0.18608                           0.04297
8       0.07680                           0.06166
9       0.08007                           0.04421

Variance                          0.010000
Bias                              0.100000
Prior Model MAE                   0.234245
ABC pre-generator MAE             0.262001
Skip Node weight                  0.211749
ABC GAN MAE                       0.078435
ABC_GAN MAE (skip connection)     0.044621
dtype: float64
---------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	1	0.01	0.36826	0.91115	0.28229	
1	1	0.01	0.34647	1.16487	0.41372	
2	1	0.01	0.43305	0.82060	0.30517	
3	1	0.01	0.25925	1.12263	0.29223	
4	1	0.01	0.26498	0.99650	0.35846	
5	1	0.01	0.33890	1.12079	0.31348	
6	1	0.01	0.40582	1.08497	0.29170	
7	1	0.01	0.28917	0.97165	0.30808	
8	1	0.01	0.27076	0.95222	0.35593	
9	1	0.01	0.28392	0.99834	0.31930	

	ABC GAN MAE	ABC_GAN MAE (skip connection)
0	0.07102	0.12064
1	0.06715	0.08955
2	0.09859	0.06751
3	0.10683	0.03557
4	0.06766	0.04818
5	0.14320	0.06844
6	0.11948	0.04632
7	0.05702	0.05320
8	0.10192	0.04222
9	0.15118	0.07821

```
Variance                          1.000000
Bias                              0.010000
Prior Model MAE                   0.314033
ABC pre-generator MAE             0.997419
Skip Node weight                  0.310780
ABC GAN MAE                       0.100257
ABC_GAN MAE (skip connection)     0.060356
dtype: float64
---------------------------------------------------------------
```

	Variance	Bias	Prior Model MAE	ABC pre-generator MAE	Skip Node weight	\
0	0.1	0.01	0.29040	0.30087	0.18846	

```
1        0.1   0.01          0.20689                    0.22834              0.12998
2        0.1   0.01          0.22965                    0.27914              0.20615
3        0.1   0.01          0.26198                    0.30295              0.30962
4        0.1   0.01          0.24439                    0.26979              0.17537
5        0.1   0.01          0.30451                    0.33510              0.21017
6        0.1   0.01          0.17371                    0.17706              0.13925
7        0.1   0.01          0.27235                    0.29969              0.14823
8        0.1   0.01          0.25453                    0.26400              0.16646
9        0.1   0.01          0.25111                    0.25722              0.10377

    ABC GAN MAE   ABC_GAN MAE (skip connection)
0      0.18791                       105.53128
1      0.09103                         0.05241
2      0.09268                         0.07924
3      0.12064                         0.11256
4      0.07644                         0.05179
5      0.11085                         0.05231
6      0.08194                         0.05806
7      0.08227                         0.07366
8      0.04820                         0.03724
9      0.13528                        43.47140

Variance                     0.100000
Bias                         0.010000
Prior Model MAE              0.252820
ABC pre-generator MAE        0.274466
Skip Node weight             0.170914
ABC GAN MAE                  0.091859
ABC_GAN MAE (skip connection)    0.065858
dtype: float64
----------------------------------------------------------------
    Variance   Bias   Prior Model MAE   ABC pre-generator MAE   Skip Node weight  \
0      0.01   0.01          0.27701                    0.27601              0.15135
1      0.01   0.01          0.33105                    0.33298              0.12219
2      0.01   0.01          0.25052                    0.25091              0.20049
3      0.01   0.01          0.24286                    0.24847              0.16389
4      0.01   0.01          0.26252                    0.26526              0.29397
5      0.01   0.01          0.31213                    0.31339              0.24219
6      0.01   0.01          0.20266                    0.20573              0.17417
7      0.01   0.01          0.26714                    0.26767              0.11562
8      0.01   0.01          0.38525                    0.37973              0.15593
9      0.01   0.01          0.38200                    0.38359              0.20646

    ABC GAN MAE   ABC_GAN MAE (skip connection)
0      0.21197                         0.09347
1      0.08594                         0.09629
2      0.14058                         0.05829
3      0.12005                         0.03961
```

```
4        0.10805                      0.10803
5        0.08427                      0.08858
6        0.10652                      0.05460
7        0.09334                      0.04925
8        0.10218                      0.10349
9        0.12734                      0.10027

Variance                    0.010000
Bias                        0.010000
Prior Model MAE             0.272074
ABC pre-generator MAE       0.271841
Skip Node weight            0.169029
ABC GAN MAE                 0.107284
ABC_GAN MAE (skip connection)  0.091025
dtype: float64
-------------------------------------------------------------
```

```
[10]:  # 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	0.26665	1.21081	0.08722	0.05796
1	0.10	1.00	0.26665	0.92932	0.09061	0.06360
2	0.01	1.00	0.26665	0.93977	0.10638	0.06138
3	1.00	0.10	0.26665	0.95306	0.09608	0.05284
4	0.10	0.10	0.26665	0.35147	0.11277	0.05688
5	0.01	0.10	0.26665	0.26200	0.07843	0.04462
6	1.00	0.01	0.26665	0.99742	0.10026	0.06036
7	0.10	0.01	0.26665	0.27447	0.09186	0.06586
8	0.01	0.01	0.26665	0.27184	0.10728	0.09103

	Skip Node weight
0	0.87193
1	0.90193
2	0.87731
3	0.39998
4	0.24184
5	0.21175
6	0.31078
7	0.17091
8	0.16903