In [ ]:
```
1
```
executed in 11.6s, finished 16:21:01 2020-10-07

In [1]:
```
1  from GlucoCheck.glucoCheck import glucoCheckOps
2  import pandas as pd
3  import random
4  import numpy as np
5  from tqdm.auto import tqdm
6
7  from scipy import stats
8
9  import random
10 import re
11 from dateutil.parser import parse
12
13 import warnings
14 warnings.filterwarnings('ignore')
15
16 import os
17
```
executed in 12.8s, finished 12:22:58 2020-10-28

```
Using TensorFlow backend.
```

In [2]:
```
1  def createGap(df,start,end):
2      """
3      Creating a Gap
4      input:
5          start: seed
6          end: seed + gap
7      output:
8          df: dataframe with index => DisplayTime value => GlucoseValue
9      """
10
11     #df = readData()
12     l = len(df.index)
13     if end>l:
14         end = l
15
16     for i in range(start,end):
17         df['GlucoseValue'][i]=float("NaN")
18
19     return df
```
executed in 43ms, finished 12:22:58 2020-10-28

In [3]:
```
#Extract Data
data = pd.read_csv("~/Desktop/NCSA_genomics/Python - notebooks/Data/O
data = data[data['subjectId']=='OD552']
data = data.reset_index(drop=True)
data
```
executed in 524ms, finished 12:22:58 2020-10-28

Out[3]:

	subjectId	Display Time	GlucoseValue
0	OD552	4/16/25 11:17	95
1	OD552	4/16/25 11:22	86
2	OD552	4/16/25 11:27	81
3	OD552	4/16/25 11:32	81
4	OD552	4/16/25 11:37	82
...	...	...	...
11439	OD552	6/7/25 16:49	238
11440	OD552	6/7/25 16:54	233
11441	OD552	6/7/25 16:59	229
11442	OD552	6/7/25 17:04	224
11443	OD552	6/7/25 17:09	215

11444 rows × 3 columns

In [ ]:
```
1
```
executed in 50ms, finished 15:27:50 2020-10-16

In [106]:
```
#1 week after : 1890, 1974, 2003, 2196, 2378, 2581, 2751, 3190, 3223,
#2 weeks after: 3600, 3797, 3828, 3939, 4210, 4353, 4567, 4890, 5102,
#3 weeks after: 5500, 5681, 5727, 5893, 5919, 6060, 6143, 6250, 6492,
#4 weeks after: 7000, 7296, 7384, 7557, 7572, 7698, 7839, 7934, 8190,
#5 weeks after: 8500, 8670, 8792, 8810, 8972, 9009, 9380, 9592, 9715,
#6 weeks after: 10100, 10274, 10453, 10679, 10712, 10890, 109100, 110
seed_points = [10100, 10274, 10453, 10679, 10712, 10890, 10910, 11069

#
```
executed in 7ms, finished 15:52:05 2020-10-28

In [107]:
```
# obj = glucoCheckOps()
```
executed in 22ms, finished 15:52:05 2020-10-28

In [ ]:
```
1
```
executed in 5ms, finished 00:11:30 2020-10-23

In [108]:

```
#for gap size 50
ioa_gap50 = list()


for seed in tqdm(seed_points):
    start = seed
    end = seed+49

    dataWithMissing = data.copy()
    dataWithMissing = createGap(dataWithMissing,start,end)

    dataBeforeGap = dataWithMissing[:seed]

    obj = glucoCheckOps()
#     obj.train(dataBeforeGap);
    imputed_data = obj.impute(dataWithMissing)

    ioa = obj.index_agreement(np.asarray(imputed_data['GlucoseValue']

    del obj

    ioa_gap50.append(ioa)

ioa_gap50
```

executed in 34m 10s, finished 16:26:16 2020-10-28

```
100%                                              10/10 [43:45<00:00, 262.56s/it]

Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...
```

```
Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
```

Out[108]:
```
[0.6152307064249909,
 0.42340234137098764,
 0.31026570895699146,
 0.806537720973527,
 0.0881566266364906,
 0.40890147884062344,
 0.45974380624878497,
 0.08291213593607172,
 0.07768133944301148,
 0.90984842839771]
```

In [109]:

```
#for gap size 30
ioa_gap30 = list()

for seed in tqdm(seed_points):
    start = seed
    end = start+29

    dataWithMissing = data.copy()
    dataWithMissing = createGap(dataWithMissing,start,end)

    dataBeforeGap = dataWithMissing[:seed]

    obj = glucoCheckOps()
#     obj.train(dataBeforeGap);
    imputed_data = obj.impute(dataWithMissing)

    ioa = obj.index_agreement(np.asarray(imputed_data['GlucoseValue']

    del obj

    ioa_gap30.append(ioa)

ioa_gap30

```

executed in 32m 44s, finished 16:58:59 2020-10-28

```
100%                                                10/10 [32:43<00:00, 196.35s/it]

Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...
```

```
Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
Gap < 50; We use LSTM imputations
Training Model...


Model trained successfully!
```

Out[109]:
```
[0.8983005655518829,
 0.8735163999963007,
 0.37900225738549065,
 0.09353003263493753,
 0.40855898540860325,
 0.24242437136162764,
 0.6123195380173243,
 0.09244300748201295,
 0.14972946341148086,
 0.38613779765781253]
```

In [110]:
```
#for gap size 12
ioa_gap15 = list()


for seed in tqdm(seed_points):
    start = seed
    end = start+12

    dataWithMissing = data.copy()
    dataWithMissing = createGap(dataWithMissing,start,end)

    dataBeforeGap = dataWithMissing[:seed]

    obj = glucoCheckOps()
#     obj.train(dataBeforeGap);
    imputed_data = obj.impute(dataWithMissing)

    ioa = obj.index_agreement(np.asarray(imputed_data['GlucoseValue']

    del obj

    ioa_gap15.append(ioa)

ioa_gap15
```

executed in 37.2s, finished 16:59:36 2020-10-28

100% 10/10 [00:37<00:00, 3.72s/it]

```
Gap < 15; We use the spline imputations
Gap < 15; We use the spline imputations
Gap < 15; We use the spline imputations
Gap < 15; We use the spline imputations
Gap < 15; We use the spline imputations
Gap < 15; We use the spline imputations
Gap < 15; We use the spline imputations
Gap < 15; We use the spline imputations
Gap < 15; We use the spline imputations
Gap < 15; We use the spline imputations
```

Out[110]:
```
[0.9668900387262722,
 0.24783741102589452,
 0.7624034268936788,
 0.5209199471105266,
 0.9994900926846296,
 0.4824631657548668,
 0.43213295341056934,
 0.6234693379819551,
 0.7120380460765696,
 0.4403790006745705]
```

In [111]:

```
#for gap size 100
ioa_gap100 = list()

for seed in tqdm(seed_points):
    start = seed
    end = seed+99

    dataWithMissing = data.copy()
    dataWithMissing = createGap(dataWithMissing,start,end)

    dataBeforeGap = dataWithMissing[:seed]

    obj = glucoCheckOps()
#     obj.train(dataBeforeGap);
    imputed_data = obj.impute(dataWithMissing)

    if isinstance(imputed_data, pd.DataFrame):
        ioa = obj.index_agreement(np.asarray(imputed_data['GlucoseVal
        ioa_gap100.append(ioa)
    else:
        ioa_gap100.append(0)

    del obj



ioa_gap100
```

executed in 223ms, finished 16:59:37 2020-10-28

100% 10/10 [00:00<00:00, 32.00it/s]

```
We cannot impute this data
We cannot impute this data
We cannot impute this data
We cannot impute this data
We cannot impute this data
We cannot impute this data
We cannot impute this data
We cannot impute this data
We cannot impute this data
We cannot impute this data
```

Out[111]: [0, 0, 0, 0, 0, 0, 0, 0, 0, 0]

In [112]:

```
#for gap size 5
ioa_gap5 = list()
# fb_gap5 = list()
# mad_gap5 = list()
# rmse_gap5 = list()
# mape_gap5 = list()

for seed in tqdm(seed_points):
    start = seed
    end = start+4

    dataWithMissing = data.copy()
    dataWithMissing = createGap(dataWithMissing,start,end)

    dataBeforeGap = dataWithMissing[:seed]

    obj = glucoCheckOps()
#     obj.train(dataBeforeGap);
    imputed_data = obj.impute(dataWithMissing)

    ioa = obj.index_agreement(np.asarray(imputed_data['GlucoseValue']

    del obj

    ioa_gap5.append(ioa)



ioa_gap5
```

executed in 253ms, finished 16:59:37 2020-10-28

```
100%                                    10/10 [00:00<00:00, 10.71it/s]

Gap < 5; We use the linear imputations
Gap < 5; We use the linear imputations
Gap < 5; We use the linear imputations
Gap < 5; We use the linear imputations
Gap < 5; We use the linear imputations
Gap < 5; We use the linear imputations
Gap < 5; We use the linear imputations
Gap < 5; We use the linear imputations
Gap < 5; We use the linear imputations
Gap < 5; We use the linear imputations
```

Out[112]:

```
[0.5696846388606309,
 0.5805958747135238,
 0.5314991402219784,
 0.40090681302947107,
 0.9984563431923048,
 0.5106697708037422,
 0.6563584727043223,
```

```
0.9923385625684057,
0.8811609360700743,
0.39981224951558103]
```

In [ ]:
```
1
```

In [113]:
```
OA1= pd.DataFrame({'Seeds':seed_points, 'Gap:5':ioa_gap5, 'Gap:12':ioa_gap15
OA2
3
```

executed in 28ms, finished 16:59:37 2020-10-28

Out[113]:

	Seeds	Gap:5	Gap:12	Gap:30	Gap:50	Gap:100
0	10100	0.569685	0.966890	0.898301	0.615231	0
1	10274	0.580596	0.247837	0.873516	0.423402	0
2	10453	0.531499	0.762403	0.379002	0.310266	0
3	10679	0.400907	0.520920	0.093530	0.806538	0
4	10712	0.998456	0.999490	0.408559	0.088157	0
5	10890	0.510670	0.482463	0.242424	0.408901	0
6	10910	0.656358	0.432133	0.612320	0.459744	0
7	11069	0.992339	0.623469	0.092443	0.082912	0
8	11170	0.881161	0.712038	0.149729	0.077681	0
9	11200	0.399812	0.440379	0.386138	0.909848	0

In [ ]:
```
1
```

In [114]:
```
1 IOA.to_csv("~/Desktop/6week.csv")
```

executed in 13ms, finished 16:59:37 2020-10-28

In [ ]:
```
1
```

In [ ]:
```
1
```

In [115]:
```
1 import matplotlib.pyplot as plt
2 import matplotlib.ticker as ticker
3 import seaborn as sns
```

executed in 15ms, finished 16:59:37 2020-10-28

In [116]:
```
1 # IOA
```

executed in 7ms, finished 16:59:37 2020-10-28

In [117]:
```
gaps = [5,15,30,50,100]
ioa = []
ioa.append(IOA['Gap:5'].mean())
ioa.append(IOA['Gap:12'].mean())
ioa.append(IOA['Gap:30'].mean())
ioa.append(IOA['Gap:50'].mean())
ioa.append(IOA['Gap:100'].mean())
ioa
```

executed in 21ms, finished 16:59:37 2020-10-28

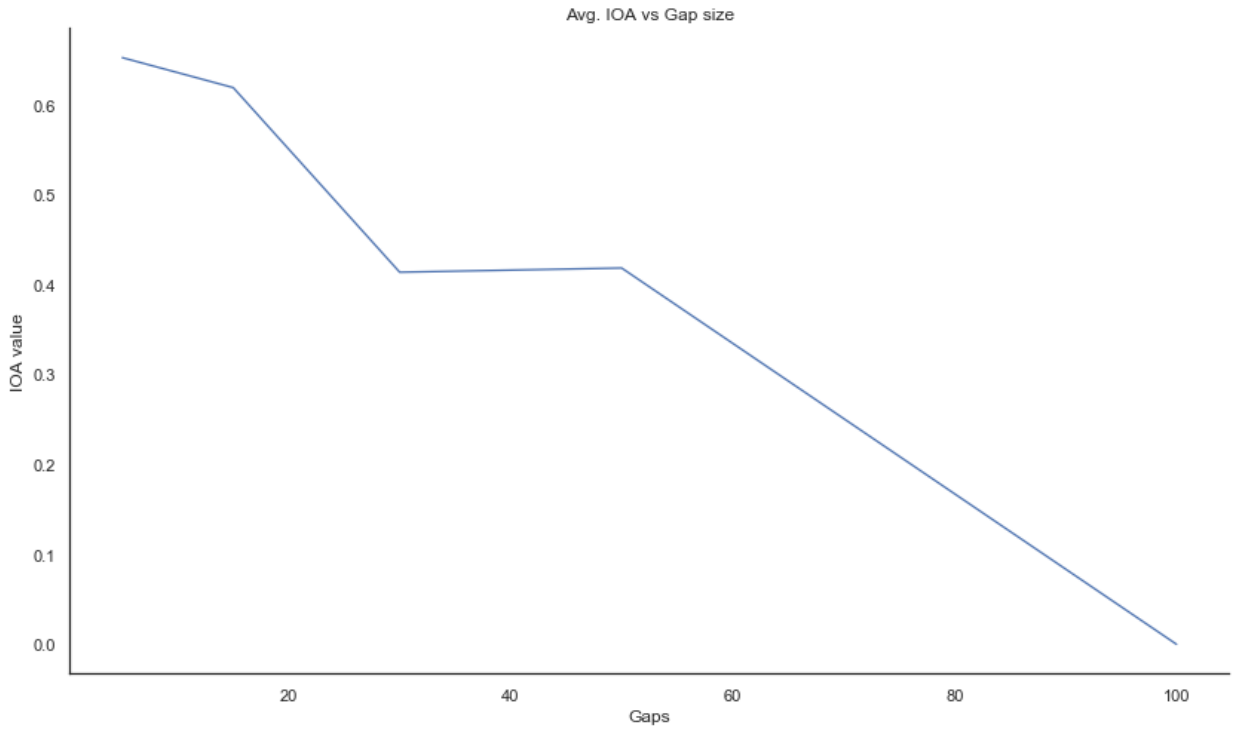
Out[117]:
```
[0.6521482801680035,
 0.6188023420339535,
 0.41359624189074734,
 0.41826802932291895,
 0.0]
```

In [118]:
```
plt.figure(figsize=(14,8))
plt.title("Avg. IOA vs Gap size")
sns.set(style="white")
fig = sns.lineplot(x = gaps, y = ioa, palette="tab10", linewidth=1.25
sns.despine()

fig.set_xlabel('Gaps')
fig.set_ylabel('IOA value')
```

executed in 653ms, finished 16:59:38 2020-10-28

Out[118]: Text(0, 0.5, 'IOA value')



In [ ]:
```
1
```

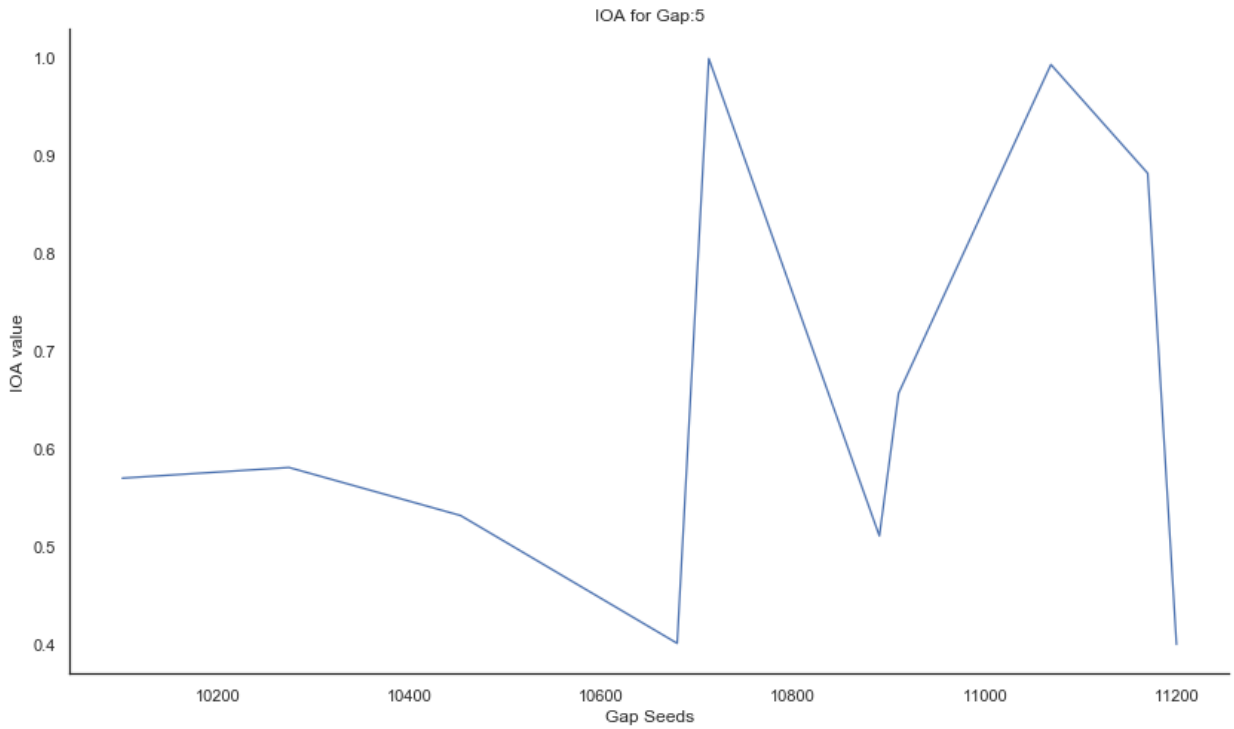
In [ ]:
```
1
```

executed in 8ms, finished 14:05:45 2020-10-14

In [119]:
```
1
2  plt.figure(figsize=(14,8))
3  plt.title("IOA for Gap:5")
4  sns.set(style="white")
5  fig = sns.lineplot(x = seed_points, y = IOA['Gap:5'], data = IOA, pal
6  sns.despine()
7
8  fig.set_xlabel('Gap Seeds')
9  fig.set_ylabel('IOA value')
```

executed in 513ms, finished 16:59:38 2020-10-28

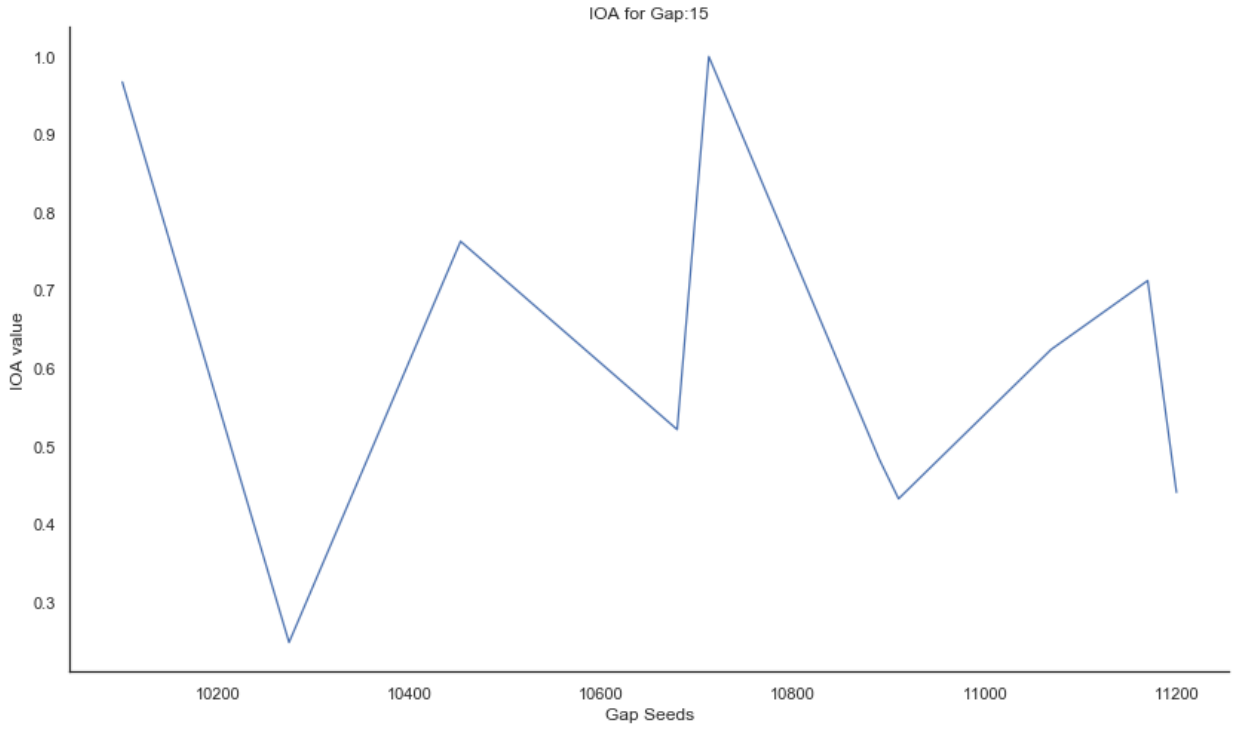
Out[119]: Text(0, 0.5, 'IOA value')



In [120]:
```
1
2  plt.figure(figsize=(14,8))
3  plt.title("IOA for Gap:15")
4  sns.set(style="white")
5  fig = sns.lineplot(x = seed_points, y = IOA['Gap:12'], data = IOA, pa
6  sns.despine()
7
8  fig.set_xlabel('Gap Seeds')
9  fig.set_ylabel('IOA value')
```

executed in 572ms, finished 16:59:39 2020-10-28

Out[120]: Text(0, 0.5, 'IOA value')

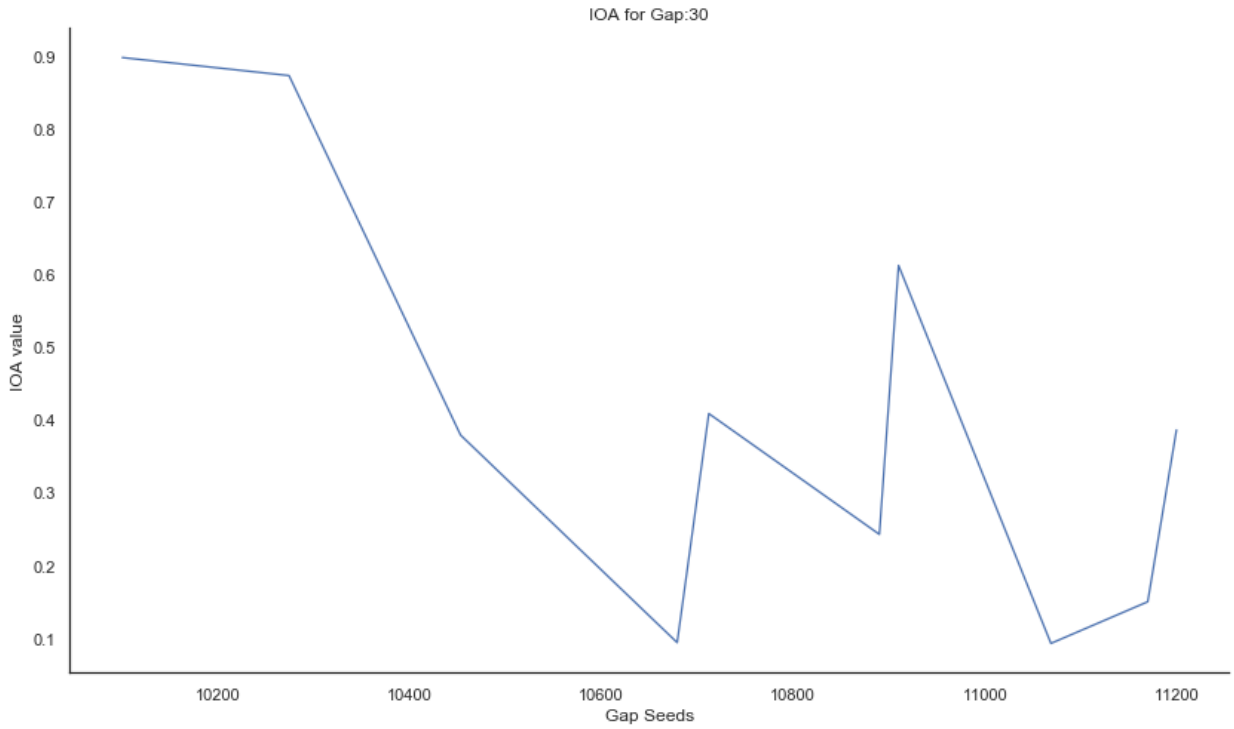


In [121]:

```
1
2  plt.figure(figsize=(14,8))
3  plt.title("IOA for Gap:30")
4  sns.set(style="white")
5  fig = sns.lineplot(x = seed_points, y = IOA['Gap:30'], data = IOA, pa
6  sns.despine()
7
8  fig.set_xlabel('Gap Seeds')
9  fig.set_ylabel('IOA value')
```

executed in 505ms, finished 16:59:39 2020-10-28

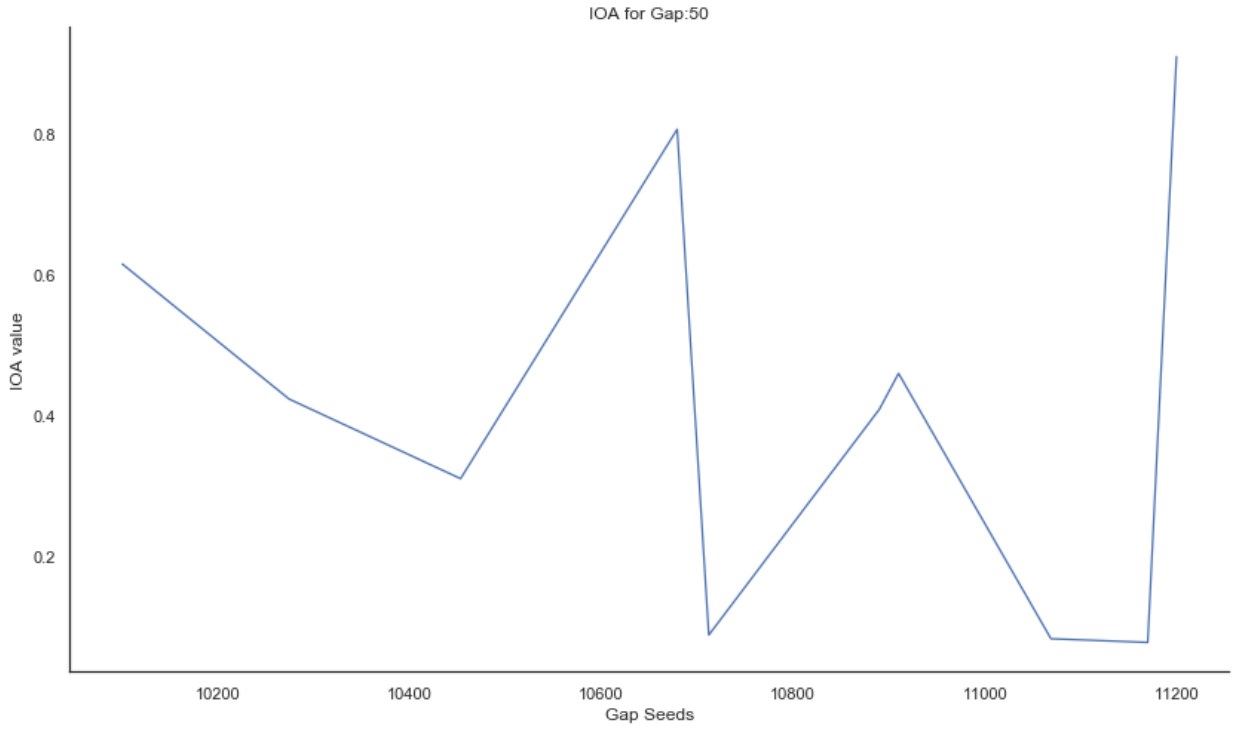
Out[121]: Text(0, 0.5, 'IOA value')



In [122]:
```
1
2  plt.figure(figsize=(14,8))
3  plt.title("IOA for Gap:50")
4  sns.set(style="white")
5  fig = sns.lineplot(x = seed_points, y = IOA['Gap:50'], data = IOA, pa
6  sns.despine()
7
8  fig.set_xlabel('Gap Seeds')
9  fig.set_ylabel('IOA value')
```

executed in 479ms, finished 16:59:40 2020-10-28

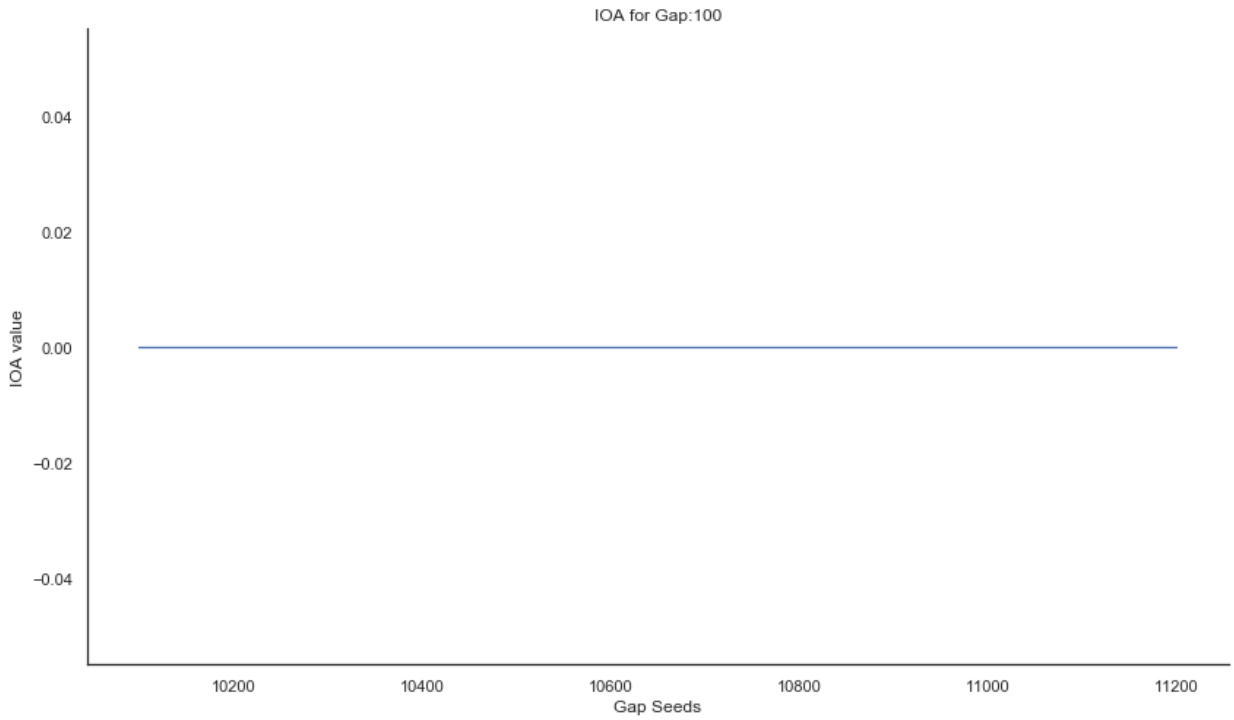
Out[122]: Text(0, 0.5, 'IOA value')



In [123]:
```
1
2  plt.figure(figsize=(14,8))
3  plt.title("IOA for Gap:100")
4  sns.set(style="white")
5  fig = sns.lineplot(x = seed_points, y = IOA['Gap:100'], data = IOA, p
6  sns.despine()
7  fig.set_xlabel('Gap Seeds')
8  fig.set_ylabel('IOA value')
```

executed in 556ms, finished 16:59:40 2020-10-28

Out[123]: Text(0, 0.5, 'IOA value')




```
1  ####
```

In [ ]:
```
1
```

In [22]:
```
1 ▾ # MAD = pd.DataFrame({'Gap:5':mad_gap5, 'Gap:15':mad_gap15, 'Gap:30':m
2   # MAD
```

executed in 7ms, finished 12:36:57 2020-10-28

In [23]:
```
1 ▾ # FB = pd.DataFrame({'Gap:5':fb_gap5, 'Gap:15':fb_gap15, 'Gap:30':fb_
2   # FB
```

executed in 7ms, finished 12:36:57 2020-10-28

In [24]:
```
1 ▾ # RMSE = pd.DataFrame({'Gap:5':rmse_gap5, 'Gap:15':rmse_gap15, 'Gap:3
2   # RMSE
```

executed in 8ms, finished 12:36:57 2020-10-28

In [25]:
```
# MAPE = pd.DataFrame({'Gap:5':mape_gap5, 'Gap:15':mape_gap15, 'Gap:3
# MAPE
```
executed in 55ms, finished 12:36:58 2020-10-28

In [26]:
```
# IOA.to_csv("~/Desktop/NCSA_genomics/Python - notebooks/GlucoCheck/M
# FB.to_csv("~/Desktop/NCSA_genomics/Python - notebooks/GlucoCheck/Me
# RMSE.to_csv("~/Desktop/NCSA_genomics/Python - notebooks/GlucoCheck/
# MAPE.to_csv("~/Desktop/NCSA_genomics/Python - notebooks/GlucoCheck/
# MAD.to_csv("~/Desktop/NCSA_genomics/Python - notebooks/GlucoCheck/M
```
executed in 11ms, finished 12:36:58 2020-10-28

In [ ]:
```
1
```