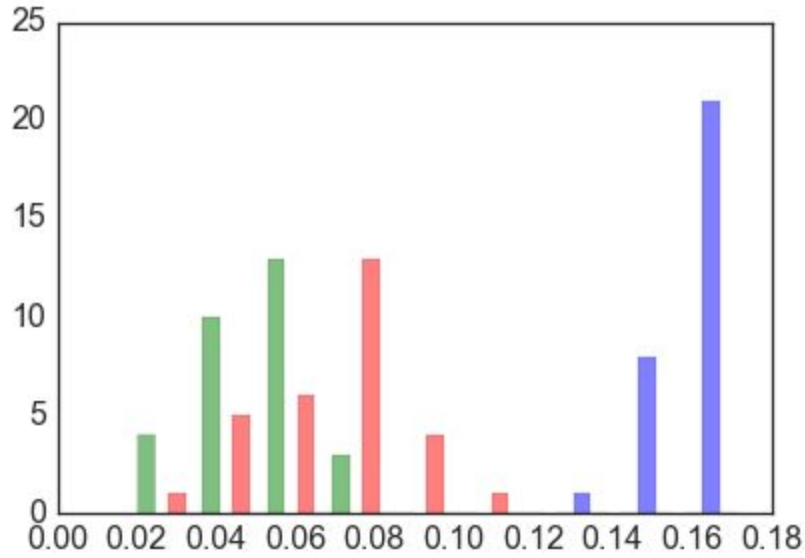
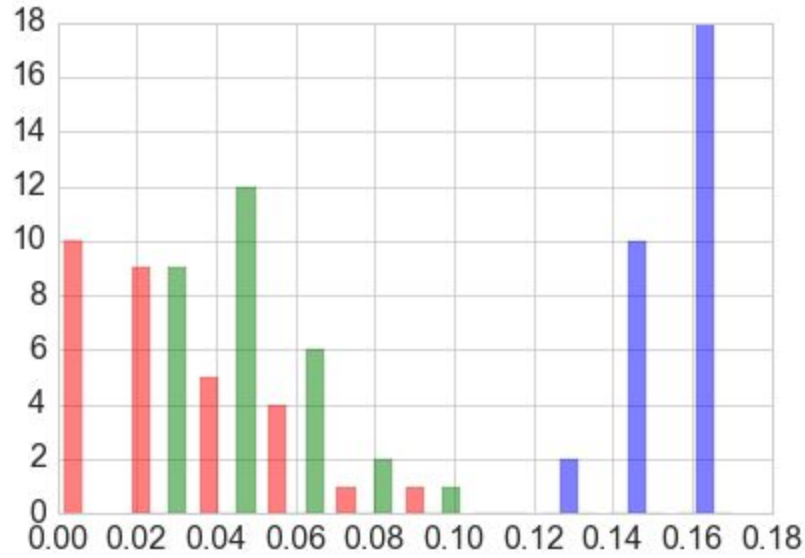
ECI289I Homework 6
Juran Zhang
1.
a.



For this question, I choose NSGAII, NSGAIII and GDE3 as the algorithms. They are depicted in the histogram above as in red, blue and green, respectively. NFE = 1000
Yes. They look very similar to gaussian distribution. GDE3 has the best result since most of the hypervolume results converge in the smaller intervals, which means faster convergence than the other two.



I also compare MOEA/D with NSGAIII and GDE3. NFE = 1000
This time it seems MOEA/D has better result than the previous three, in terms of average.

b.
Case I:
NFE=1000
data[0], data[1] and data[2] denotes NSGAII, NSAGAIII and GDE3, respectively.

U,p = stats.mannwhitneyu(data[0],data[1],alternative='greater')
fail to reject
Indicates NSGAIII is better than NSGAII

U,p = stats.mannwhitneyu(data[2],data[1],alternative='greater')
fail to reject
Indicates GDE3 is better than NSGAIII

U,p = stats.mannwhitneyu(data[0],data[2],alternative='less')
fail to reject
Indicates GDE3 is better than NSGAII

Case II:
NFE=1000
data[0], data[1] and data[2] denotes MOEA/D, NSAGAIII and GDE3, respectively.

U,p = stats.mannwhitneyu(data[0],data[1],alternative='greater')
fail to reject
Indicates NSGAIII is better than MOEA/D

U,p = stats.mannwhitneyu(data[2],data[1],alternative='greater')
fail to reject
Indicates GDE3 is better than NSGAIII

U,p = stats.mannwhitneyu(data[0],data[2],alternative='less')
Reject the null hypothesis
Indicates GDE3 is worse than MOEA/D

Case II:
NFE=5000
data[0], data[1] and data[2] denotes MOEA/D, NSAGAIII and GDE3, respectively.

U,p = stats.mannwhitneyu(data[0],data[1],alternative='greater')
Reject the null hypothesis
Indicates NSGAIII is worse than MOEA/D

U,p = stats.mannwhitneyu(data[2],data[1],alternative='greater')
Reject the null hypothesis

Indicates GDE3 is worse than NSGAIII

U,p = stats.mannwhitneyu(data[0],data[2],alternative='less')
Reject the null hypothesis
Indicates GDE3 is worse than MOEA/D

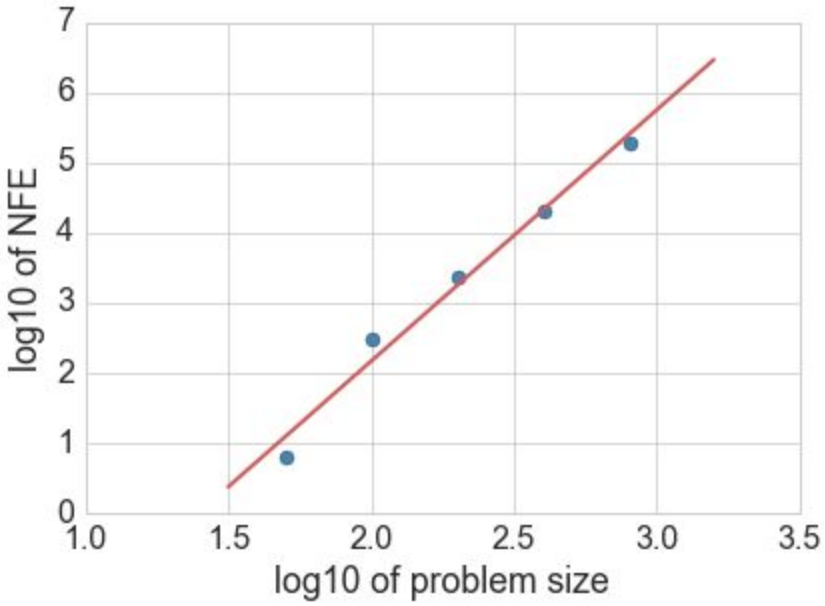
The surprising result shows that with NFE=5000, NSGAIII becomes the most preferred choice over GDE3 and MOEA/D

2.
a.

```
def get_random_cities(N):
  return np.random.rand(N,2)
```

b.
Attached in the email

c.



The result does look linear. The slope is estimated to be 3.6. As an inexact result this is better comparing to the exact solution.