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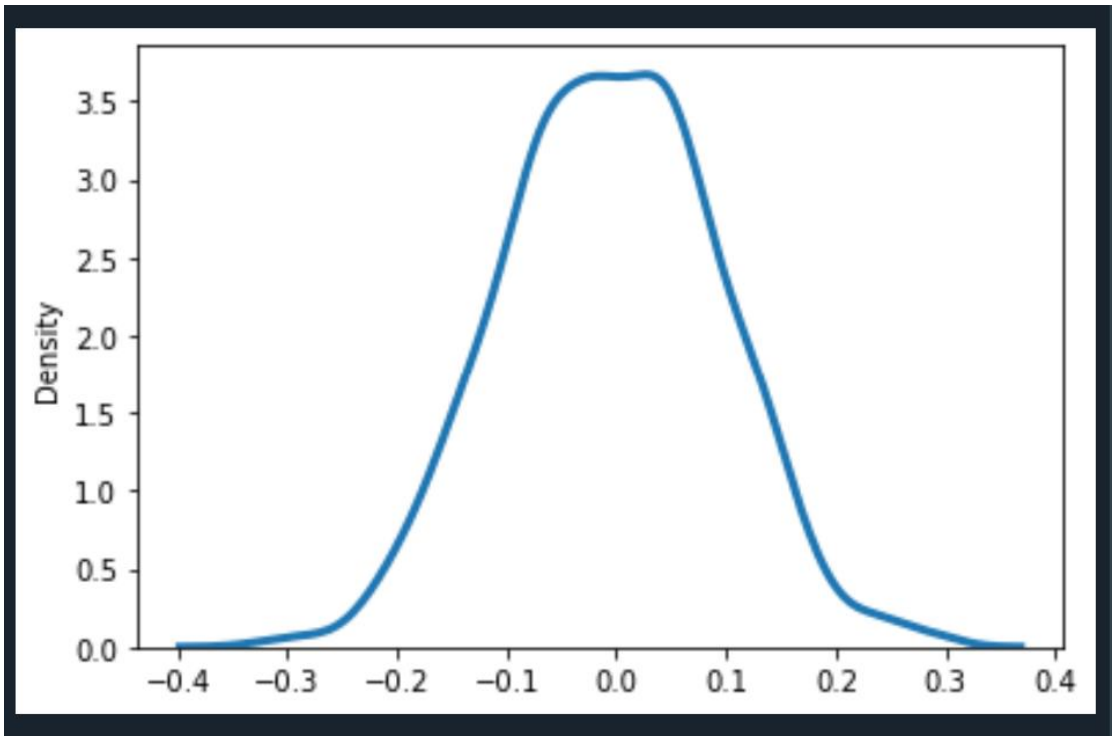
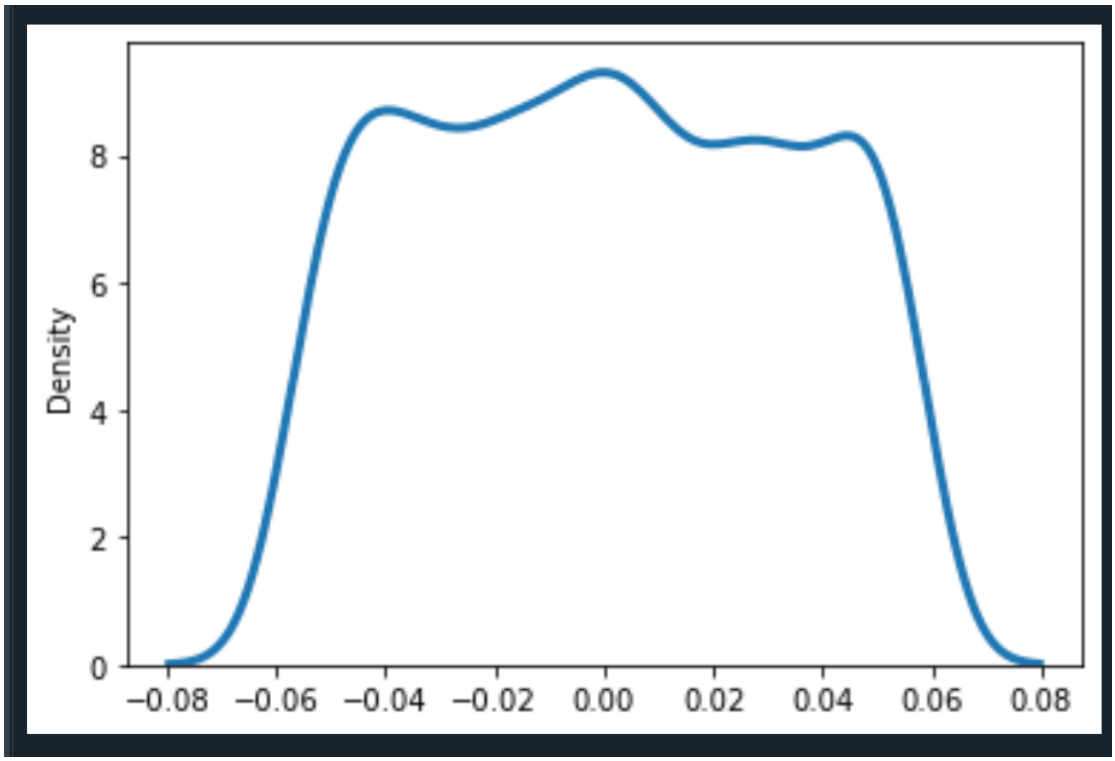
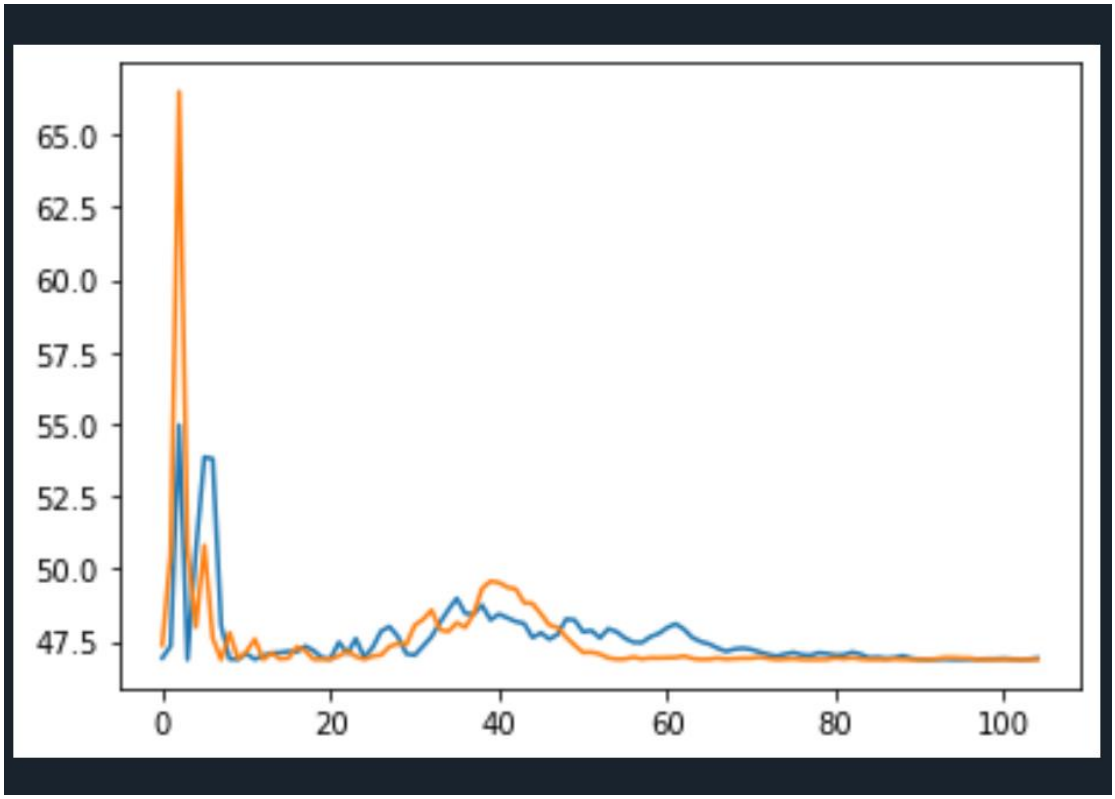
Task1:

Test distribution:



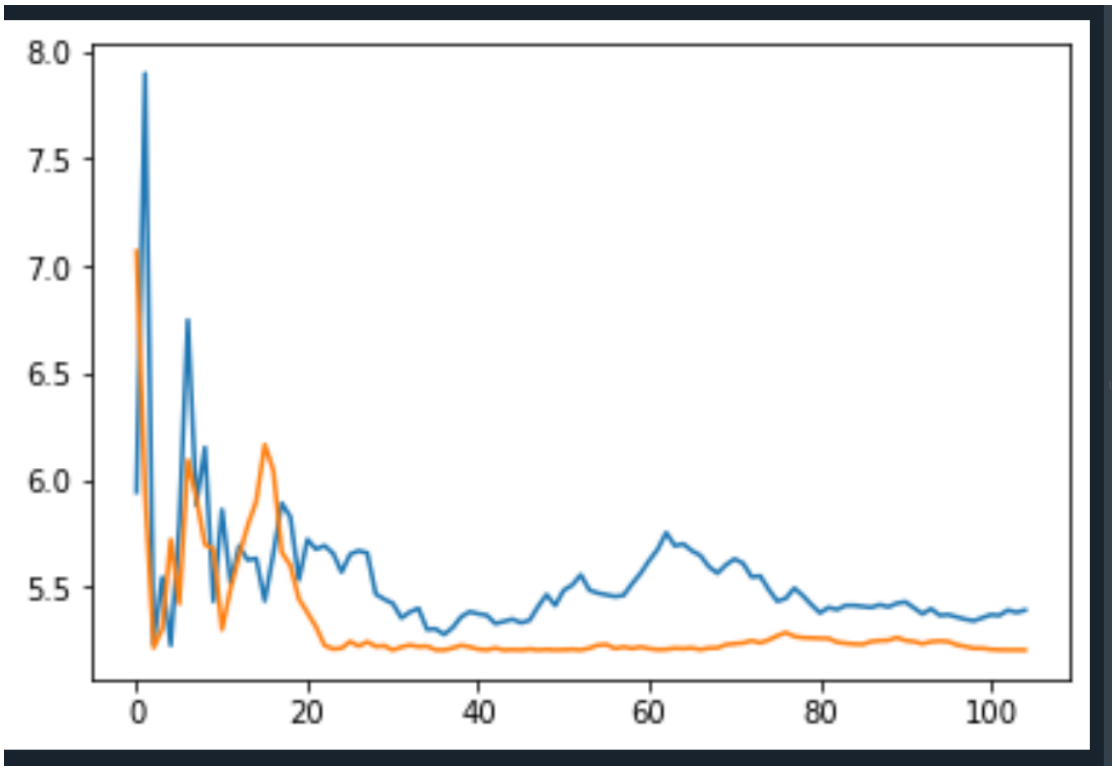


IGD: for the normal distribution



Xk_norm_1: 0.5535598182086459
Xk_norm_2: 0.5216169817907977

IGD for the uniform distribution:



Xk_uniform_1: 0.5658370784582423
Xk_uniform_2: 0.5063676327702041

Conclusion and breifly prove:

According to the plot, we found the 'without_replacement' method can generate better result of the task1.

Because of multiple times of randomization, IGD_wo_task1 can always converge to the mean of y and

the value of the objective result is more steady

Proof of convergence:

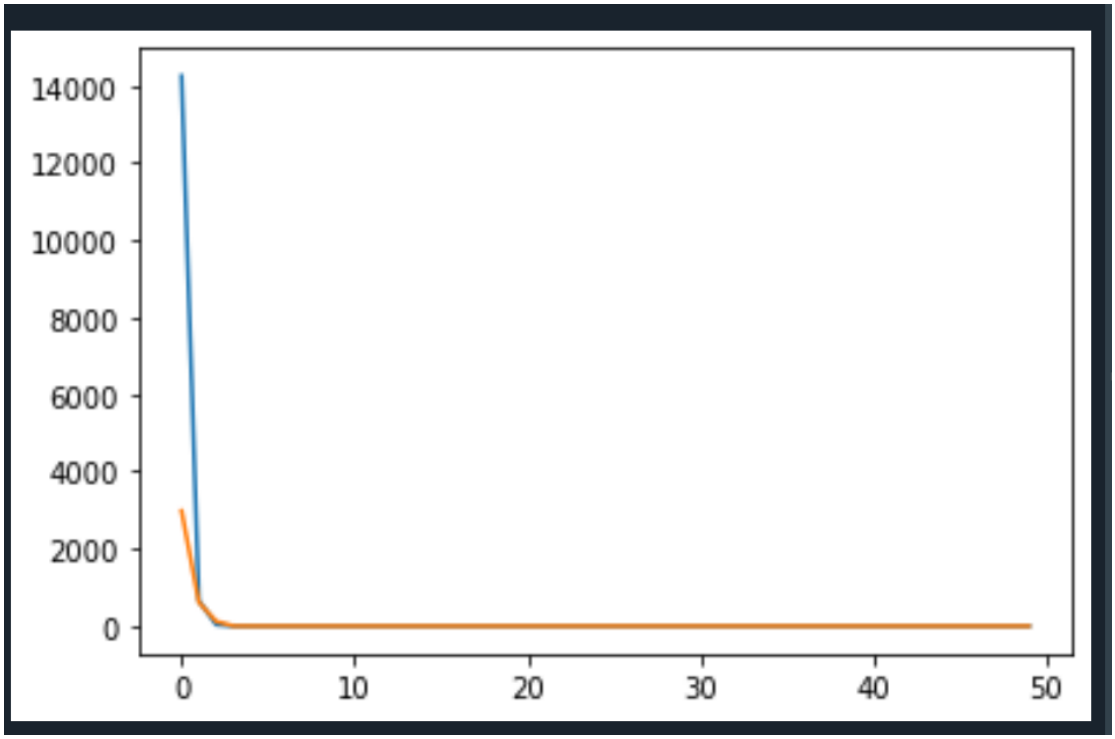
y_mean-x_{k+1}=y_mean-x_k+gamman_k(x_k-y_{ik})=y_mean-k/(k+1)*x_k-1/(k+1)*y_{ik}=

y_mean-k/(k+1)*((k-1)/k*x_{k-1}+1/k*y_{ik-1})-1/(k+1)*y_{ik}=

y_mean-(k-1)/(k+1)*x_{k-1}-1/(k+1)(y_{ik}+y_{ik-1})=.....

=y_mean-0-1/(k+1)*(k)*y_mean...0 when k is sufficiently large

Task2:

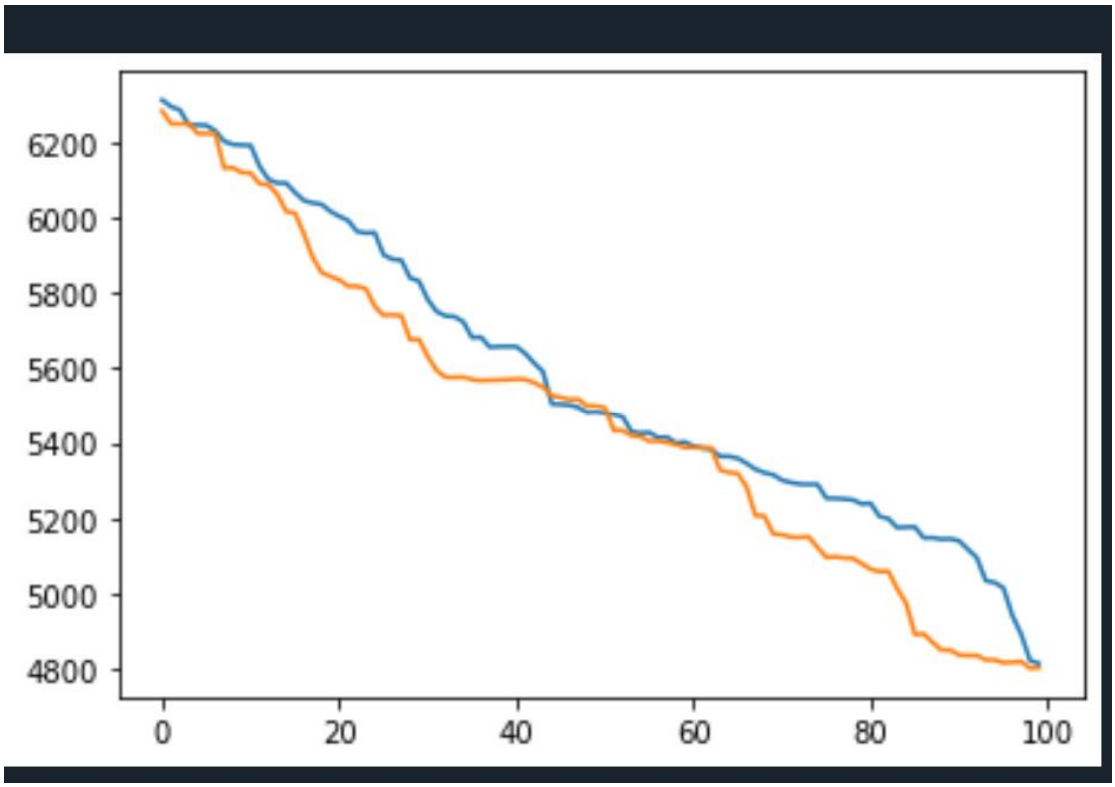


Xk_1=xk_2=50.00

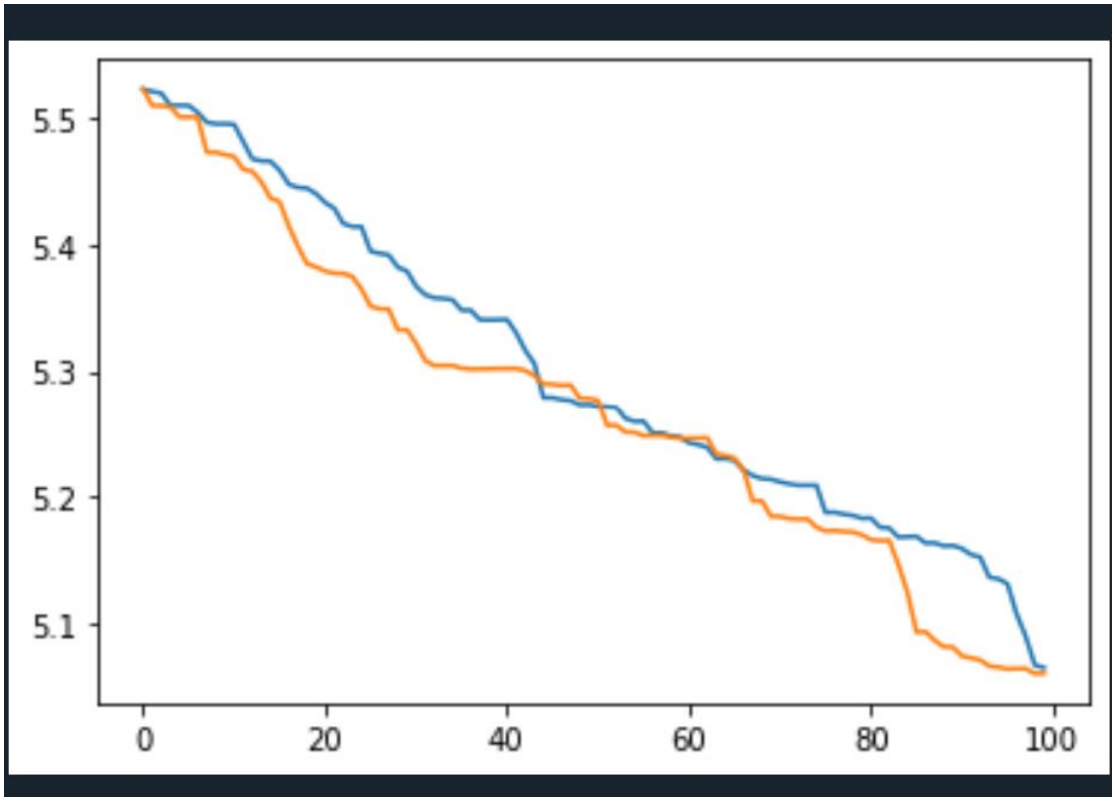
Conclusion:

The "without replacement" method is more robust, so that it is better

Task 3:



|x-xsatr|:



Conclusion:

Actually in this case,the two methods are quite similar, but if we try more time, we find the method without

replacement is still a little bit better