wine数据集分类结果

Grid Search

> *best parameters: {'algorithm': 'SAMME', 'learning_rate': 0.3593813663804626, 'n_estimators': 60}*
> *best score: 0.9720634920634922*
> *Time Elapse: 113.00295925140381*

Grid Search Based GA

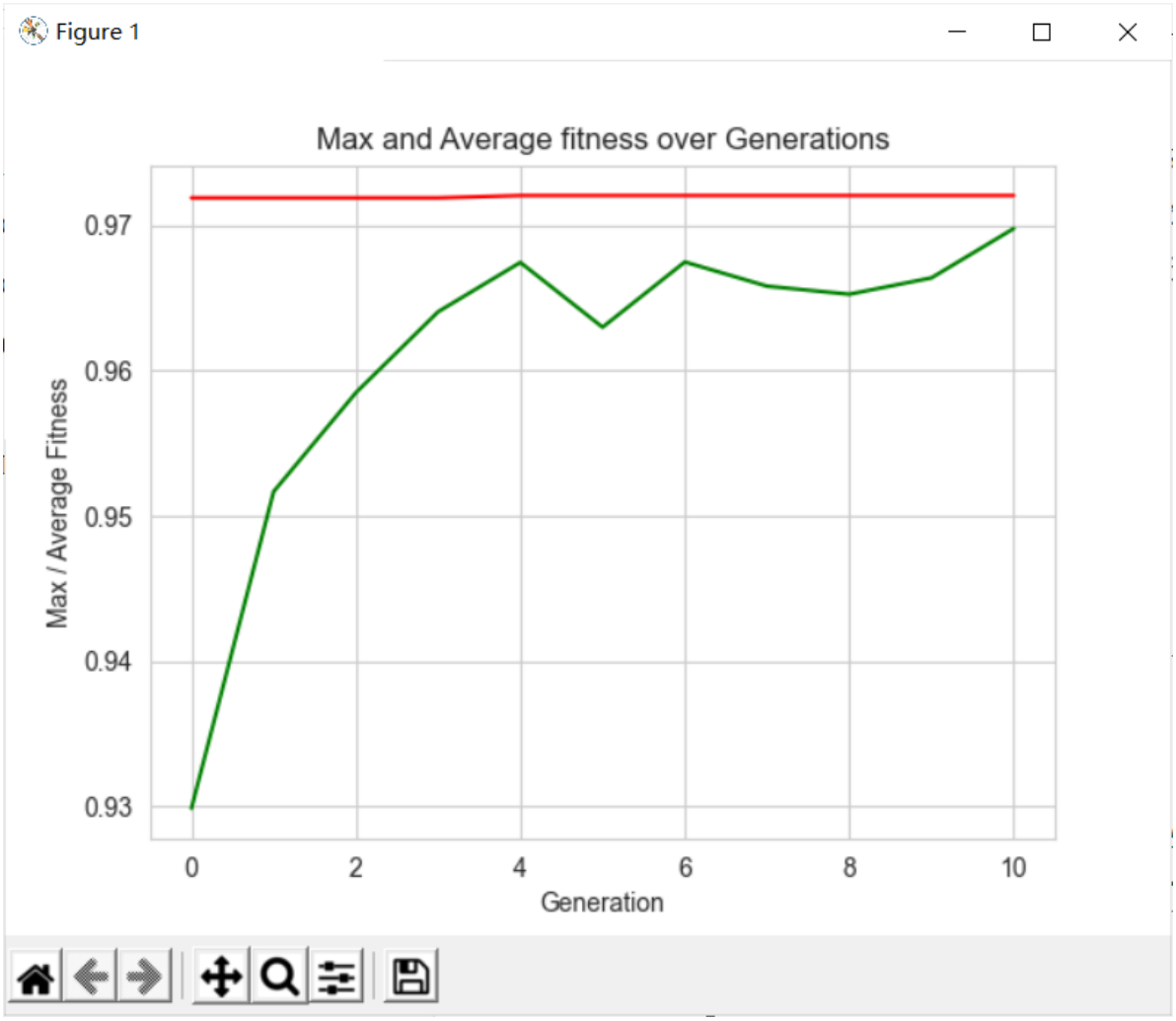
> *Best individual is: {'n_estimators': 100, 'learning_rate': 0.3593813663804626, 'algorithm': 'SAMME'}*
> *with fitness: 0.9719101123595506*
> *Time Elapsed = 46.56487488746643*

GA

结果：

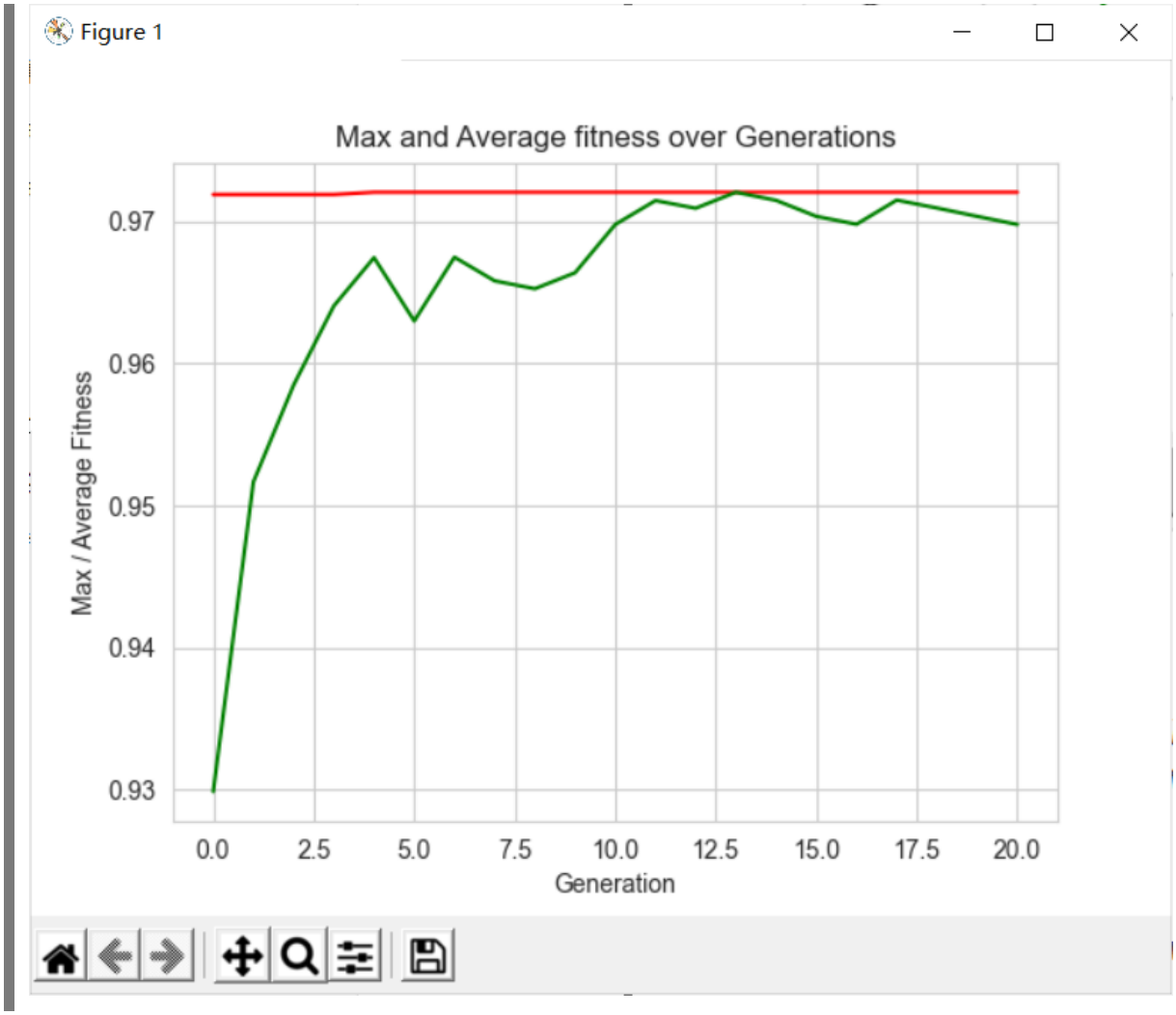
1.
```
POPULATION_SIZE = 10
P_CROSSOVER = 0.9  # probability for crossover
P_MUTATION = 0.5   # probability for mutating an individual
MAX_GENERATIONS = 10
HALL_OF_FAME_SIZE = 5
CROWDING_FACTOR = 20.0  # crowding factor for crossover and mutation
```

> *Best solution is:*
> *params = (67, 0.34684801135281196, 'SAMME')*
> *Accuracy = 0.97206*



2. *POPULATION_SIZE = 10*
P_CROSSOVER = 0.9 # probability for crossover
P_MUTATION = 0.5 # probability for mutating an individual
MAX_GENERATIONS = 10
HALL_OF_FAME_SIZE = 5
CROWDING_FACTOR = 20.0 # crowding factor for crossover and mutation

Best solution is:
params = (67, 0.34684801135281196, 'SAMME')
Accuracy = 0.97206



PSO

算法大致步骤：

- 初始化
- 更新

可参考的blog：[(87条消息) 智能优化算法——粒子群算法原理与仿真程序子木呀的博客-CSDN博客粒子群优化算法原理]

代码实现设置的条件：

```
MAX_Generation = 10      #迭代次数
Population = 10          #种群数量
dimension = 3
v_low = -1
v_high = 1
pso = PSO(dimension, MAX_Generation, Population,
              BOUNDS_LOW, BOUNDS_HIGH, v_low, v_high) #实现的class
```

更新步骤的核心代码:

网上搜一下，其中w自身权重系数（记不清了），c1是个体学习系数，c2是群落学习系数

```
c1 = 2.0  # 学习因子
c2 = 2.0
w = 0.8
# 更新速度(核心公式)
self.v[i] = w * self.v[i] + c1 * random.uniform(0, 1) * (
    self.p_best[i] - self.x[i]) + c2 * random.uniform(0, 1) *
(self.g_best - self.x[i])
# 速度限制
for j in range(self.dimension):
    if self.v[i][j] < self.v_low:
        self.v[i][j] = self.v_low
    if self.v[i][j] > self.v_high:
        self.v[i][j] = self.v_high

# 更新位置
self.x[i] = self.x[i] + self.v[i]
# 位置限制
for j in range(self.dimension):
    if self.x[i][j] < self.bound[0][j]:
        self.x[i][j] = self.bound[0][j]
    if self.x[i][j] > self.bound[1][j]:
        self.x[i][j] = self.bound[1][j]
```

大致的意思就是通过公式更新速度和位置，同时对更新后的速度与位置进行修正，因为更新的位置一定是在一定的范围之内的。

结果:

1. *MAX_Generation = 10* #迭代次数
   Population = 10 #种群数量

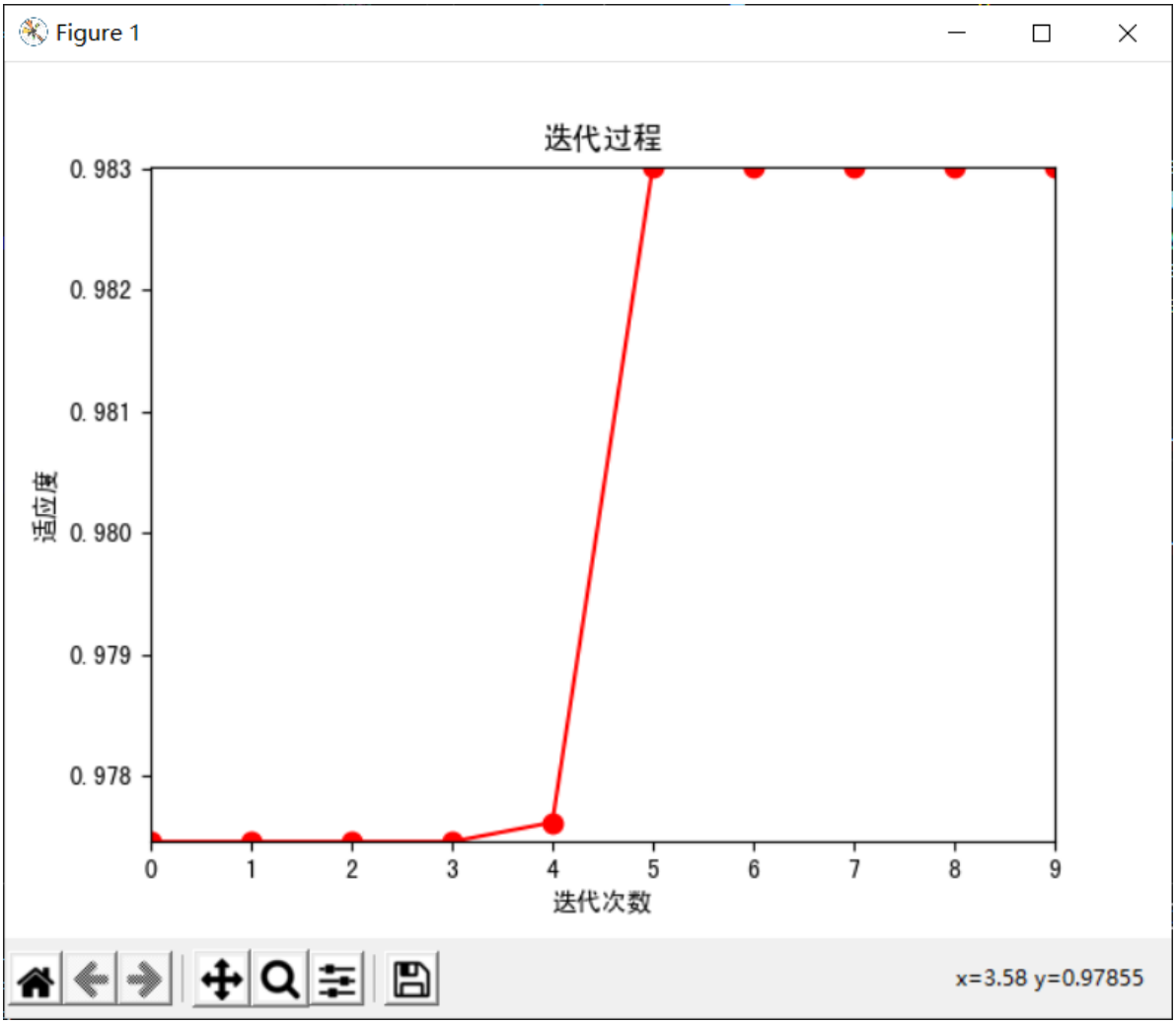
   v_low = -1

   v_high = 1

   c1 = 2.0 # 学习因子
   c2 = 2.0
   w = 0.8

---

n_estimators'=97.59544738, 'learning_rate'=0.93788895, 'algorithm'=SAMME
0.9830158730158731
当前的最佳适应度：*0.9830158730158731*
time cost: 175.3606903553009



2.

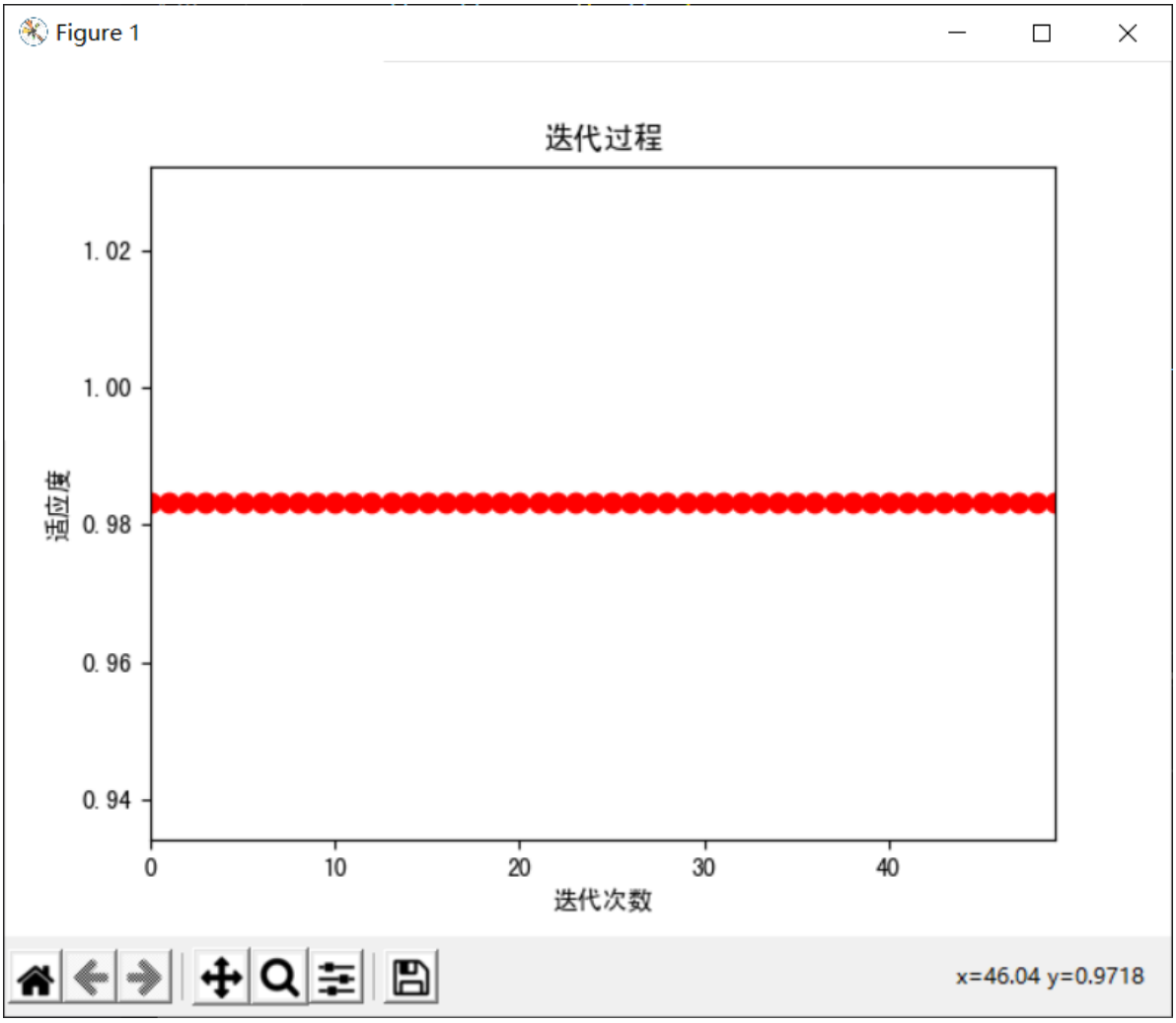
```
################## 改变迭代次数和种群大小
#########################
MAX_Generation = 50     #迭代次数
Population = 20         #种群数量

v_low = -1

v_high = 1

c1 = 2.0  # 学习因子
c2 = 2.0
w = 0.8
```

```
当前最佳位置：[22.63664273  0.7580015   0.39425009]
0.9831746031746033
当前的最佳适应度：0.9831746031746033
time cost:      1097.9579124450684     s
```



3. ################## 改变速度大小##########################

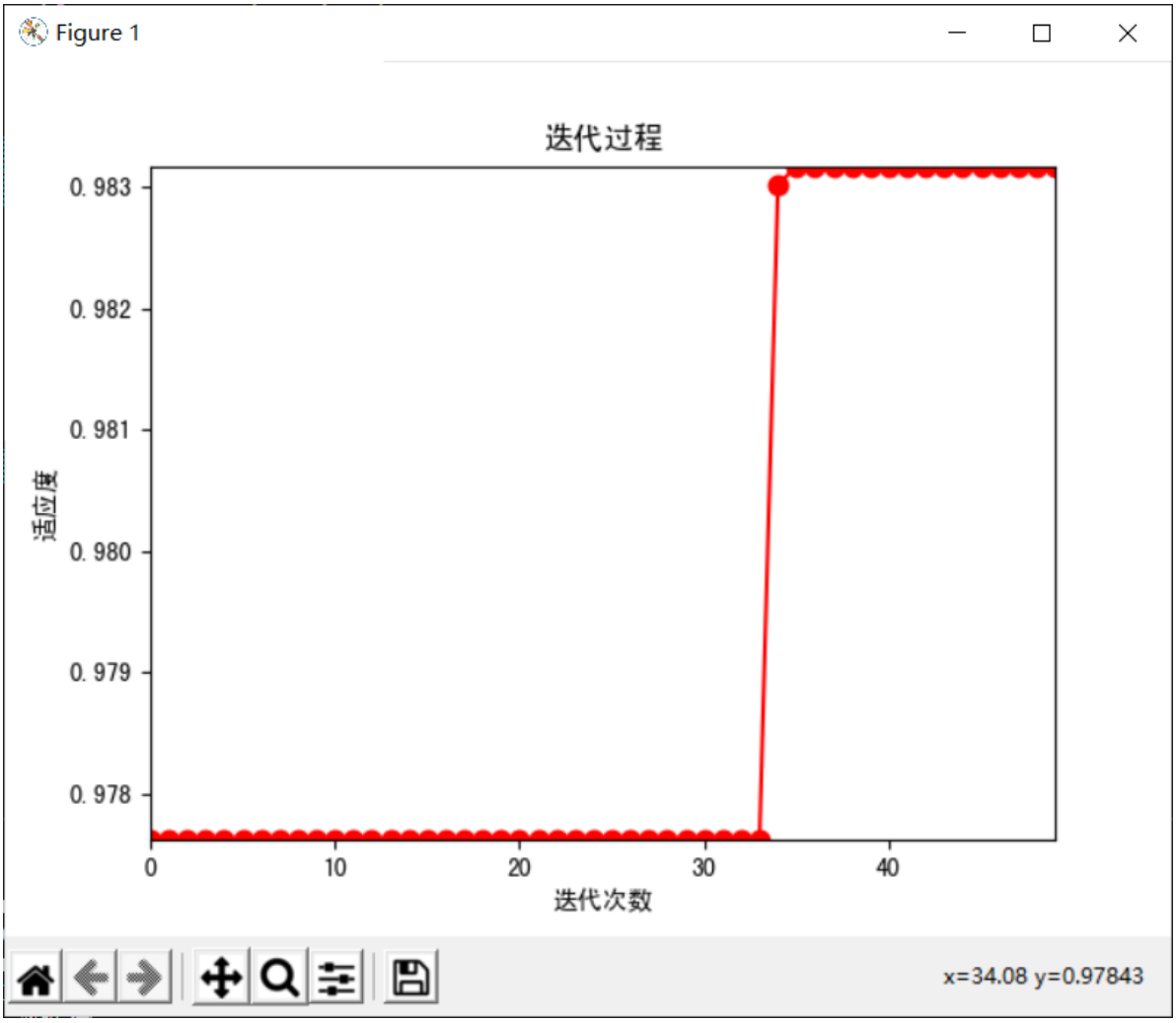
MAX_Generation = 50　　#迭代次数
Population = 20　　#种群数量

v_low = -0.5

v_high = 0.5

c1 = 2.0　# 学习因子
c2 = 2.0
w = 0.8

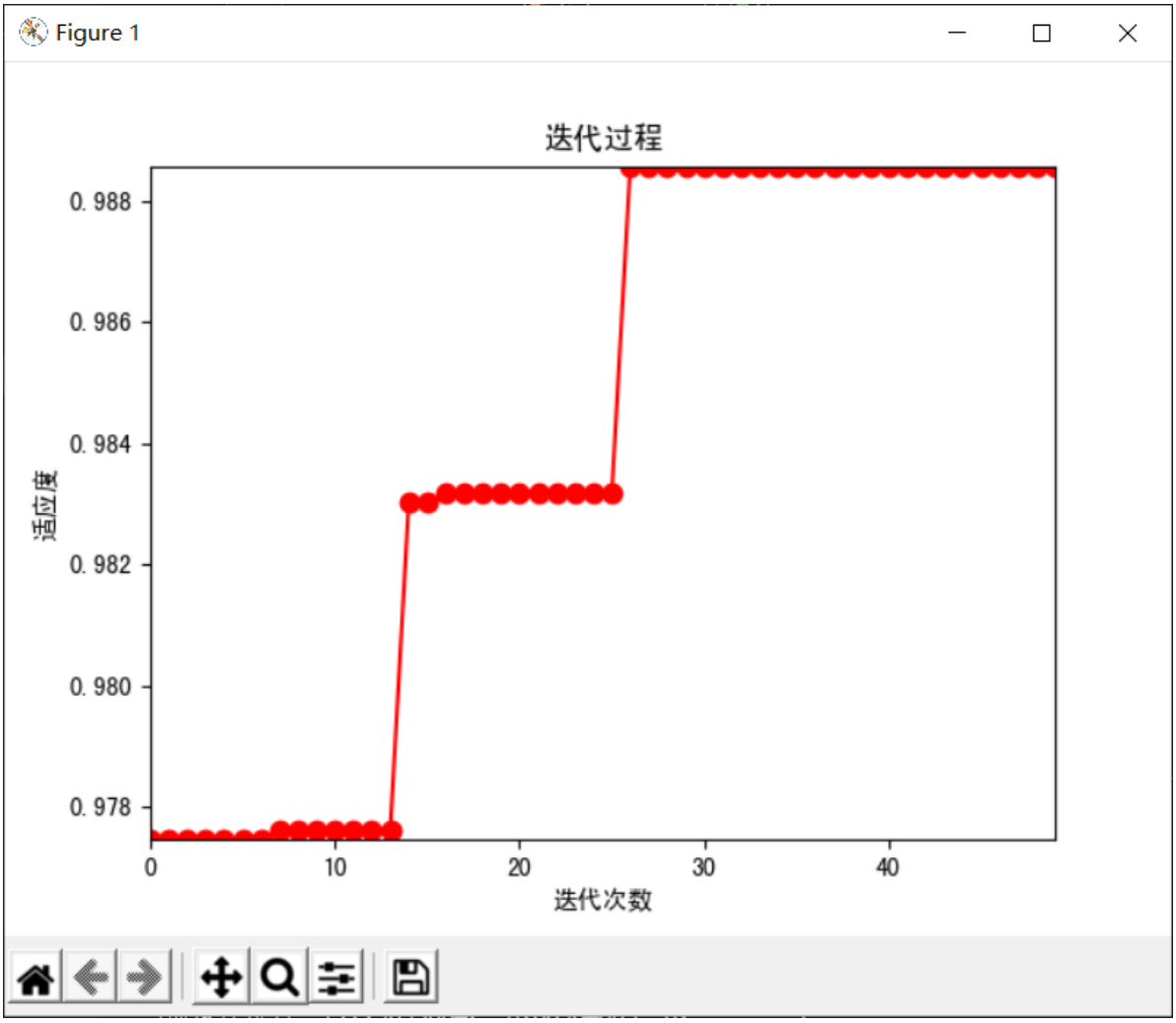
当前最佳位置：*[7.49302006e+01 6.20588351e-01 2.87210702e-02]*
0.9831746031746033
当前的最佳适应度：*0.9831746031746033*
time cost:　　1510.600219488144　　s



4.

```
################## 改变速度范围#########################
MAX_Generation = 50     #迭代次数
Population = 20         #种群数量
v_low = [-10, -0.1, -0.5]
v_high = [10, 0.1, 0.5]
c1 = 2.0  # 学习因子
c2 = 2.0
w = 0.8
```

```
当前最佳位置：[17.96950042  0.88984003  0.        ]
0.9885714285714287
当前的最佳适应度：0.9885714285714287
time cost:      1343.2985899448395     s
```



5. 改变初始化

当前最佳位置：*[58.67594087 0.40936569 0.]*
0.9776190476190475
当前的最佳适应度：*0.9776190476190475*
time cost: 2636.623948097229 s

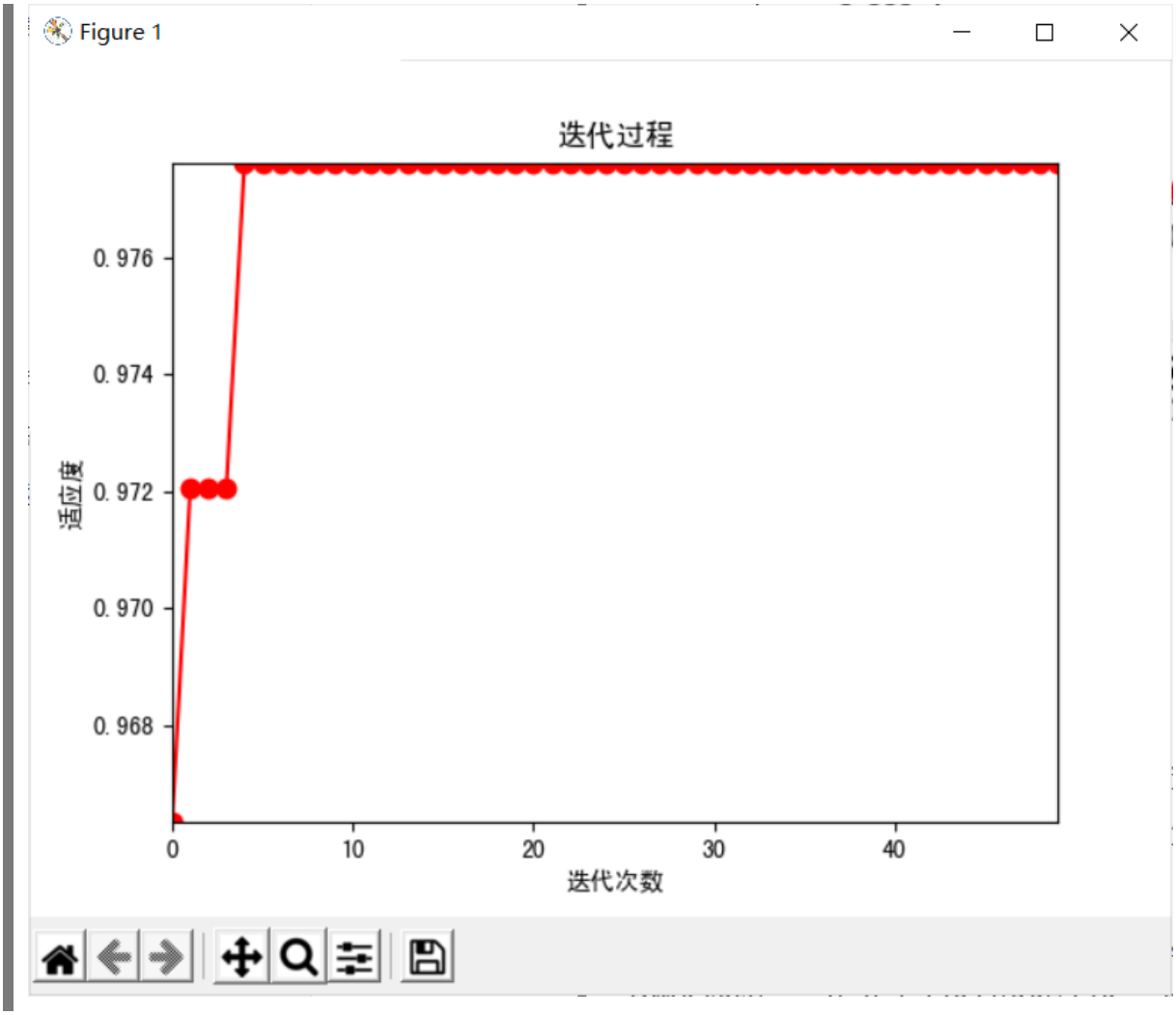


Figure 1
迭代过程
0.976
0.974
0.972
0.970
0.968
适应度
0
10
20
30
40
迭代次数