Abstract

Genetic algorithm is one of a class of algorithms that searches a solution space for the optimal solution to a problem. This search is done in a fashion that mimics the operation of evolution – a "population" of possible solutions is formed, and new solutions are formed by "breeding" the best solutions from the population's members to form a new generation. The population evolves for many generations; when the algorithm finishes the best solution is returned. Genetic algorithms are particularly useful for problems where it is extremely difficult or impossible to get an exact solution, or for difficult problems where an exact solution may not be required. They offer an interesting alternative to the typical algorithmic methods, and are highly customizable.

Introduction

Smart Cracker is a project in which we reveal or decode the password. This project is built using the Genetic algorithm technique to see how long it takes the algorithm to crack the password. Through this project, we can easily crack alpha-numeric Password. Also, we can get a Fitness and Generation Graph of each attempt where we will see the status of fitness as we move toward next generation and so on.

Packages

We have used following Packages for this project:

- Random
- String
- Numpy
- Pyplot
- Getpass

Code

```
import random
import numpy as np
import matplotlib.pyplot as plt
import time
import string
import matplotlib.animation as animation
from getpass import getpass

character_list = ['0', '1', '2', '3', '4', '5', '6', '7', '8', '9', 'a', 'b', 'c', 'd', 'e',
'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm', 'n', 'o', 'p', 'q', 'r', 's', 't', 'u', 'v', 'w', 'x',
'y', 'z', 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P', 'Q',
'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', '!', '#', '$', '&', '*', '+',  '-', '/',  '<',
'=', '>', '?', '@', '[', ']', '^', '_', '`']

secret_pass=getpass("Type your Password Here: ")
secret_password=list(secret_pass)

password_length = len(secret_password)

population_size = 100

num_parents = 20

elite_size = 2

population = []
for i in range(population_size):

    chromosome = []
    for x in range(password_length):
        chromosome.append(random.choice(character_list))

    population.append(chromosome)



# fitness scoring
def fitness(population):
    fitness_scores = []
    for chromosome in population:
        matches = 0
        for index in range(password_length):
            if secret_password[index] == chromosome[index]:
                matches += 1
        result = [chromosome,matches]
        fitness_scores.append(result)
    return fitness_scores

# parent selection
def select_parents(fitness_scores):
    parents_list = []
    for chromosome in sorted(fitness_scores, key=lambda x: x[1], reverse =
True)[:num_parents]:
        parents_list.append(chromosome[0])
```

```
    return(parents_list)

# breeding logic
def breed(parent1,parent2):
    child = []

    parent1 = parents[0]
    parent2 = parents[1]

    geneA = int(random.random() * password_length)
    geneB = int(random.random() * password_length)

    startGene = min(geneA, geneB)
    endGene = max(geneA, geneB)

    for i in range(0,password_length):
        if (i < startGene) or (i > endGene):
            child.append(parent1[i])
        else:
            child.append(parent2[i])
    return child

# breeding and elitism
def create_children(parents_pool):
    children = []
    num_new_children = len(population) - elite_size

    for i in range(0,elite_size):
        children.append(parents_pool[i])

    for i in range(0,num_new_children):
        parent1 = parents_pool[int(random.random() * len(parents_pool))]
        parent2 = parents_pool[int(random.random() * len(parents_pool))]
        children.append(breed(parent1,parent2))
    return children

# mutation
def mutation(children_set):
    for i in range(len(children_set)):
        if random.random() > 0.1:
            continue
        else:
            mutated_position = int(random.random() * password_length)
            mutation = random.choice(character_list)
            children_set[i][mutated_position] = mutation
    return children_set




# run Algorithm


fitness_tracker = []
solutions = []
generations = 0
t0 = time.time()
```

```
while True:

    fitness_scores = fitness(population)
    fitness_tracker.append(max([i[1] for i in fitness_scores]))
    solutions.append(''.join([i[0] for i in fitness_scores if i[1] == max([i[1] for i in
fitness_scores])][0]))
    print(''.join([i[0] for i in fitness_scores if i[1] == max([i[1] for i in
fitness_scores])][0]))
    if max([i[1] for i in fitness_scores]) == password_length:
        print("Cracked in {} generations, and {} seconds! \nSecret passcode = {} \nDiscovered
passcode = {}".format(generations,time.time() - t0,''.join(secret_password),''.join([i[0] for
i in fitness_scores if i[1] == password_length][0])))
        break
    parents = select_parents(fitness_scores)
    children = create_children(parents)
    population = mutation(children)
    generations += 1
```

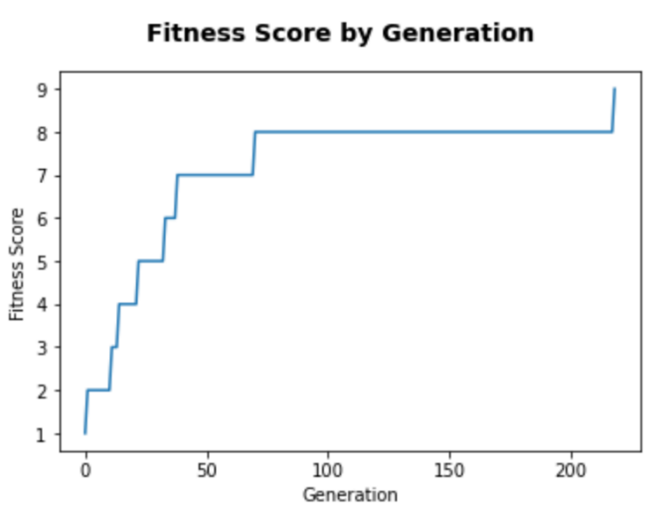
```
fig = plt.figure()
plt.plot(list(range(generations+1)), fitness_tracker)
fig.suptitle('Fitness Score by Generation', fontsize=14, fontweight='bold')
ax = fig.add_subplot(111)
ax.set_xlabel('Generation')
ax.set_ylabel('Fitness Score')
plt.show()
```

Result

```
Type your Password Here: ••••••••••
```

```
]:
```

```
Cracked in 218 generations, and 0.4727447032928467 seconds!
Secret passcode = AIProjecT
Discovered passcode = AIProjecT
```



Thank You 😊