

8_March_mongo_version

March 8, 2021

```
[152]: import numpy as np
import math
import random
import json
import requests
from matplotlib import pyplot as plt
from pymongo import MongoClient
import copy
```

```
[175]: # 460 queries
NUM_FEATURES=11
LB_LIMIT=-10
UB_LIMIT=10
MAX_ITR=11
MIN_COST=-999999 # ??/
POP_SIZE=36
MUT_RATE=0.4
RETENTION_RATE=0.25 # selection rate from prev generation
TODAY = "PROPER 8th March, STINT_2 CHECK AGAIN"
```

```
[154]: client = MongoClient("mongodb+srv://Raj:mongodb123@cluster0.lnsqb.mongodb.net/
→ml-proj?retryWrites=true&w=majority")
db = client['ml-proj']
coll = db['main-coll']
details = db['details-2']
```

```
[155]: surviving_members_num=math.floor(POP_SIZE*RETENTION_RATE)
if surviving_members_num%2==1:
    surviving_members_num-=1
num_cells_mutate=math.ceil((POP_SIZE-1)*NUM_FEATURES*MUT_RATE) ## ??????
num_matings_per_itr=math.ceil((POP_SIZE-surviving_members_num)/2)
print("surviving members num is ", surviving_members_num)
```

surviving members num is 8

```
[156]: #print(locals())
```

```
global_storage=[]
```

```
[157]: API_ENDPOINT = 'http://10.4.21.156'
MAX_DEG = 11
SECRET_KEY = 'BKeUYuWnLNaT7N2zzbmzI9VktYLNGrwbMX2lBfiGksBb3m6mOR'
# SECRET_KEY = "none"

def urljoin(root, path=''):
    if path:
        root = '/' .join([root.rstrip('/'), path.rstrip('/')])
    return root

def send_request(id, vector, path):
    api = urljoin(API_ENDPOINT, path)
    vector = json.dumps(vector)
    response = requests.post(api, data={'id': id, 'vector': vector}).text
    if "reported" in response:
        print(response)
        exit()

    return response

def get_errors(id, vector):
    for i in vector:
        assert 0 <= abs(i) <= 10
    assert len(vector) == MAX_DEG

    return json.loads(send_request(id, vector, 'geterrors'))
```

```
[158]: anmol_arr=[]
```

```
[159]: def get_fitness_value(coeff_arr, curr_gen_num):
    #coeff_arr=coeff_arr.tolist()

    #return [1,2]

    #return random.random()

    assert(len(coeff_arr)==NUM_FEATURES)
    for i in range(0,NUM_FEATURES):
        if coeff_arr[i]>=10:
            coeff_arr[i] = 10
        elif i<=-10:
            coeff_arr[i] = -10
```

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    val = get_errors(SECRET_KEY, coeff_arr)
    #print(f"coeff arr is {coeff_arr}")
    #print("val is ", val)
    annol_arr.append({"array_stuff":coeff_arr, "errors_returned":val, "gen":
↪curr_gen_num})

    ↵
↪#print("-----")

    return val

```

```

[160]: def get_fitness_value_alt(coeff_arr, curr_gen_num):
    assert(len(coeff_arr)==NUM_FEATURES)
    x=coeff_arr[0]
    y=coeff_arr[1]
    '''x_add=x*math.sin(4*x)
    y_add= 1.1 * y * math.sin(2*y)'''

    '''
    x_add=x*math.sin(4*x)
    y_add= 1.1 * y * math.sin(2*y)
    '''

    # x_add=x
    # y_add=y
    # print(f"x and x_add is {x} : {x_add}")
    # print(f"y and y_add is {y} : {y_add}")
    assert(x>=LB_LIMIT and x<=UB_LIMIT)
    assert(y>=LB_LIMIT and y<=UB_LIMIT)
    # val=x_add+y_add

    # val=0.01*( x*x*(y-2)*(y-3) - (x+y)**3 + y*y*y*(y-2*x))
    val_arr=[x+y]*2
    #print(val)
    #coeff_arr=coeff_arr.tolist()
    annol_arr.append({"array_stuff":coeff_arr, "errors_returned":val_arr, "gen":
↪curr_gen_num})
    #res_ret=[val,val]
    #print("val returned is ", res_ret)
    return val_arr

```

```

[161]: def create_starting_population(num_members, num_features, lb, ub):
    # Adam and Eve
    sample_pop = np.random.uniform(low=lb, high=ub, ↵
↪size=(num_members,num_features))
    return sample_pop

```

```
[162]: def insert_single_member_into_db(gen_id, features, errors):
        coll.insert_one({
            'generation': gen_id,
            'try_vector': features,
            'errors': errors,
            'desc' : TODAY
        })
        details.update_one({"try_vector": features},
                           {"$set": {"errors": errors}})
```

```
[163]: global_json=[]
```

```
[164]: print(global_json)
```

```
[]
```

```
[165]: def calculate_fitness_for_curr_pop(members_list, curr_gen_num):
        '''receives a 2D array'''

        tot_len=len(members_list)
        fitness_arr=[]

        errors_traced=[]

        for i in range(0,tot_len):
            its_fitness_val = [0, 0]
            exist_vec = coll.find({'try_vector': members_list[i]}).count()

            print('exist? ', exist_vec)
            if exist_vec > 0:
                doc_found = coll.find_one({'try_vector': members_list[i]})
                its_fitness_val = doc_found['errors']
                details.update_one({"try_vector": members_list[i]},
                                   {"$set": {"errors": doc_found['errors']}})
                #print('DOC', doc_found)
                #print('VAL', its_fitness_val)
            else:
                its_fitness_val = get_fitness_value(members_list[i], curr_gen_num)
                insert_single_member_into_db(curr_gen_num,
                ↪members_list[i],its_fitness_val)

                ↪
                ↪#####

            fitness_val=0
            t=its_fitness_val[0]/(1e10)
            v=its_fitness_val[1]/(1e10)
```

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    punish = 0

    punish += 100 if t < 28 else 0

    punish += 100 if v > 10 else 0

    fitness_val = t + v + punish

    #####3

    fitness_arr.append(fitness_val)

    if type(its_fitness_val)!=list:
        raise TypeError("WEIRD TYPE GOLIATH ERROR")
    errors_traced.append(its_fitness_val)
    #print("fitness arr being sent is ")
    #print(*fitness_arr, sep="\t")
    return fitness_arr,errors_traced

```

```

[166]: def sort_generation_members(members_list, curr_gen_num):
#     print(f"type is {type(members_list)} and arg is ")
#     print(*members_list, sep='\n')
    tot_len=len(members_list)
    cost_arr , unsorted_errors_traced_here = np.
    ↪array(calculate_fitness_for_curr_pop(members_list, curr_gen_num))

    sort_indices = np.argsort(cost_arr)

    # Descending
    #sort_indices=sort_indices[::-1]

    if type(members_list[0])!=list:
        raise TypeError("Friday error")

    sorted_members_list=[]
    sorted_costs=[]
    # print("member is ", members_list)
    for num in range(0,tot_len):
        i=sort_indices[num]
        #print(f"here member for {i} is ", members_list[i])

        sorted_members_list.append(members_list[i])
        sorted_costs.append(cost_arr[i])

```



```

for i in range(num_genes):
    max_val=max(parent1[i], parent2[i])
    min_val=min(parent1[i], parent2[i])

    lb=min_val-alpha*(max_val-min_val)
    ub=max_val+alpha*(max_val-min_val)

    set_val_1=random.uniform(lb, ub)
    child1[i]=set_val_1

    set_val_2=random.uniform(lb, ub)
    child2[i]=set_val_2

for i in range(len(child1)):
    child1[i]=max(child1[i],LB_LIMIT)
    child1[i]=min(child1[i],UB_LIMIT)

for i in range(len(child2)):
    child2[i]=max(child2[i],LB_LIMIT)
    child2[i]=min(child2[i],UB_LIMIT)

#print(f"CHILD 1 is {child1}")
#print(f"CHILD 2 is {child2}")

print("#-----")

return child1.tolist(), child2.tolist()

```

```

[169]: def crossover(parent1, parent2):

    '''
    Deb and Agrawal [196] developed the simulated binary crossover (SBX) to
    ↪simulate the
    behavior of the one-point crossover operator for binary representations.
    '''

    child1 = np.empty(NUM_FEATURES)
    child2 = np.empty(NUM_FEATURES)
    print(f"parent 1 is {parent1}")
    print(f"parent 2 is {parent2}")

    u = random.random()
    n_c = 3

    '''where  $r_j \sim U(0, 1)$ , and  $\eta > 0$  is the distribution index. Deb and Agrawal
    ↪suggested

```

```

    that = 1.

    '''The SBX operator generates offspring symmetrically about the parents,
    ↪which prevents
    bias towards any of the parents. For large values of there is a higher
    ↪probability that
    offspring will be created near the parents. For small values, offspring
    ↪will be more
    distant from the parents.'''

    if (u < 0.5):
        beta = (2 * u)**((n_c + 1)**-1)
    else:
        beta = ((2*(1-u))**(-1))**((n_c + 1)**-1)

    parent1 = np.array(parent1)
    parent2 = np.array(parent2)
    child1 = 0.5*((1 + beta) * parent1 + (1 - beta) * parent2)
    child2 = 0.5*((1 - beta) * parent1 + (1 + beta) * parent2)

    for i in range(len(child1)):
        child1[i]=max(child1[i],LB_LIMIT)
        child1[i]=min(child1[i],UB_LIMIT)

    for i in range(len(child2)):
        child2[i]=max(child2[i],LB_LIMIT)
        child2[i]=min(child2[i],UB_LIMIT)

    #child1=(parent1+parent2)/2
    #child2=(parent1-parent2)/2

    print(f"CHILD 1 is {child1}")
    print(f"CHILD 2 is {child2}")

    print("#-----")

    return child1.tolist(), child2.tolist()

```

```

[170]: def get_mutated_version(arr, really=False):
    mut_prob_now=0.7
    arr=arr.tolist().copy()
    if really:
        #arr=arr.tolist()
        #print(arr)
        len_arr=len(arr)
        for i in range(0,len_arr):

```



```

        probb=random.uniform(0, 1)
        if probb<=mut_prob_now:
            curr_val=arr[i]
            if curr_val==0:
                curr_val=1
            d_val=random.uniform(-abs(0.3*curr_val), abs(0.3*curr_val))
            arr[i]+=d_val
            arr[i]=min(arr[i],UB_LIMIT)
            arr[i]=max(arr[i],LB_LIMIT)
            #print(f"{i} mutated {curr_val}->{arr[i]}")
    return arr
else:
    return arr

```

```

[171]: # Iterations
#parents_now=sorted_initial_pop.copy()

CURR_GEN_NUM=1
init_arr=np.array(
[
    [-0.1427695714633879, -1.4351758102671513e-12, -8.23952024928039e-14, 3.
    ↪9792353931611e-11, -2.2891737891652097e-10, -1.2741372955243258e-15, 8.
    ↪498419408139292e-16, 2.2978273844682766e-05, -1.8661056044695021e-06, -9.
    ↪19468573928787e-09, 7.519936353791697e-10],
    [0.07144470438737868, -1.024341258927964e-12, -2.234254875776415e-14, 7.
    ↪518054647321033e-11, -1.801621324121818e-10, -1.3903926150219416e-15, 1.
    ↪0363630046234666e-15, 1.972934634335282e-05, -1.8376799350638052e-06, -7.
    ↪682037245173995e-09, 7.433548643729261e-10],
    [-0.12826988257084007, -1.3783500660791644e-12, -6.618301505877671e-14, 4.
    ↪627780406755569e-11, -1.7964979058119056e-10, -1.3330380203323678e-15, 7.
    ↪763006729384186e-16, 2.2757658578306265e-05, -1.9193275505106666e-06, -8.
    ↪894106807593951e-09, 7.758133607867065e-10],
    [0.0, -9.875299804205226e-13, -5.3944821589819837e-14, 7.
    ↪930563099592005e-11, -2.0984549655895666e-10, -1.4378337510064146e-15, 8.
    ↪060220128248057e-16, 2.2757658578306265e-05, -1.989031728863744e-06, -8.
    ↪908335865469784e-09, 8.161584966021705e-10]
]

)
#init_arr = np.array([5,5])

print(init_arr.shape)

#init_arr=np.array([LB_LIMIT+0.1,UB_LIMIT-0.1])

```

```

# # Create the initial population
starting_population_mat=create_starting_population(POP_SIZE, NUM_FEATURES,
↳LB_LIMIT, UB_LIMIT)

for i in range(0,POP_SIZE):
    if i<4:
        starting_population_mat[i]=get_mutated_version(np.array(init_arr[i%4]),
↳False)
    else:
        starting_population_mat[i]=get_mutated_version(np.
↳array(init_arr[i%4]),True)

'''starting_population_mat = np.array([
])
'''

starting_population_mat=starting_population_mat
print("\nStarting pop is \n")
print(*starting_population_mat, sep="\n\n")

generation_info=[]
generation_info.append({"members":starting_population_mat.tolist(),
↳"avg_fitness":0, "min_fitness":0})
#print(generation_info)

```

(4, 11)

Starting pop is

```

[-1.42769571e-01 -1.43517581e-12 -8.23952025e-14  3.97923539e-11
 -2.28917379e-10 -1.27413730e-15  8.49841941e-16  2.29782738e-05
 -1.86610560e-06 -9.19468574e-09  7.51993635e-10]

[ 7.14447044e-02 -1.02434126e-12 -2.23425488e-14  7.51805465e-11
 -1.80162132e-10 -1.39039262e-15  1.03636300e-15  1.97293463e-05
 -1.83767994e-06 -7.68203725e-09  7.43354864e-10]

[-1.28269883e-01 -1.37835007e-12 -6.61830151e-14  4.62778041e-11
 -1.79649791e-10 -1.33303802e-15  7.76300673e-16  2.27576586e-05
 -1.91932755e-06 -8.89410681e-09  7.75813361e-10]

[ 0.00000000e+00 -9.87529980e-13 -5.39448216e-14  7.93056310e-11
 -2.09845497e-10 -1.43783375e-15  8.06022013e-16  2.27576586e-05
 -1.98903173e-06 -8.90833587e-09  8.16158497e-10]

[-1.26328023e-01 -1.03911548e-12 -8.23952025e-14  4.10657615e-11
 -2.28917379e-10 -1.30074708e-15  1.05406250e-15  2.29782738e-05

```

-2.09295718e-06 -9.19468574e-09 8.39483349e-10]

[6.28602405e-02 -1.02434126e-12 -1.70381471e-14 8.14268440e-11
-1.80162132e-10 -1.06101455e-15 1.03780080e-15 1.42807542e-05
-2.14288340e-06 -7.68203725e-09 5.37958284e-10]

[-1.18728315e-01 -1.44349138e-12 -6.61830151e-14 5.54897865e-11
-2.28897230e-10 -1.33303802e-15 6.41114656e-16 2.03279969e-05
-1.44450281e-06 -7.65324190e-09 9.10494156e-10]

[2.44596100e-01 -9.87529980e-13 -5.42480262e-14 6.69386879e-11
-2.64613183e-10 -1.65719161e-15 7.76708293e-16 2.27576586e-05
-1.98903173e-06 -8.90833587e-09 9.38805607e-10]

[-1.32761172e-01 -1.26379918e-12 -8.23952025e-14 4.61920747e-11
-2.28917379e-10 -1.27413730e-15 7.82375755e-16 2.06113479e-05
-1.86610560e-06 -9.17316073e-09 5.37446202e-10]

[6.71655313e-02 -7.43477602e-13 -2.23425488e-14 7.90737804e-11
-2.33991914e-10 -1.39039262e-15 1.03636300e-15 2.03430378e-05
-1.36581357e-06 -6.64932715e-09 8.10236133e-10]

[-1.28708718e-01 -1.15254269e-12 -7.31282719e-14 4.62778041e-11
-1.79649791e-10 -1.31965030e-15 5.99861919e-16 2.44007369e-05
-1.91932755e-06 -7.55453216e-09 9.68098551e-10]

[-2.86143054e-01 -1.21194099e-12 -3.99003750e-14 7.93056310e-11
-2.19101320e-10 -1.43783375e-15 8.06022013e-16 2.27576586e-05
-1.85496297e-06 -8.90833587e-09 8.16158497e-10]

[-1.53963512e-01 -1.14489802e-12 -7.92218950e-14 3.41126646e-11
-2.28917379e-10 -1.06037170e-15 6.52738483e-16 1.87196410e-05
-1.93618132e-06 -9.19468574e-09 5.60114356e-10]

[6.48279679e-02 -1.02434126e-12 -2.62754443e-14 6.10443384e-11
-1.80162132e-10 -1.39039262e-15 1.21551440e-15 2.19642676e-05
-1.83767994e-06 -7.68203725e-09 9.28155540e-10]

[-1.28269883e-01 -1.37835007e-12 -7.84372370e-14 4.62778041e-11
-1.66546127e-10 -1.33303802e-15 9.85922586e-16 1.90512128e-05
-1.91932755e-06 -8.89410681e-09 6.57775232e-10]

[2.66314628e-01 -9.72885417e-13 -5.55357938e-14 6.56981745e-11
-2.42411282e-10 -1.83976835e-15 1.04646124e-15 1.77773585e-05
-1.49960561e-06 -6.66570969e-09 9.13939270e-10]

[-1.11719303e-01 -1.29428587e-12 -8.23952025e-14 4.47879958e-11
-2.28917379e-10 -1.10977602e-15 8.49841941e-16 1.89274323e-05

-1.98890484e-06 -1.07071698e-08 7.51993635e-10]

[5.85201602e-02 -1.02434126e-12 -2.44203272e-14 8.66813962e-11
-1.80162132e-10 -1.12937001e-15 1.26222759e-15 2.25767339e-05
-1.56250421e-06 -7.68203725e-09 7.42614489e-10]

[-1.33415254e-01 -1.76854320e-12 -6.61830151e-14 3.35804208e-11
-1.79649791e-10 -1.33303802e-15 9.13772986e-16 2.61674410e-05
-2.38668489e-06 -7.49135637e-09 7.75813361e-10]

[-2.44250109e-01 -9.87529980e-13 -6.60378211e-14 7.89789184e-11
-2.30325483e-10 -1.02289518e-15 8.06022013e-16 2.27956154e-05
-2.51198212e-06 -1.13417965e-08 8.12696235e-10]

[-1.42769571e-01 -1.43517581e-12 -8.23952025e-14 4.30267807e-11
-1.84536624e-10 -1.00964632e-15 1.04324379e-15 1.61387347e-05
-1.86610560e-06 -7.38728609e-09 8.79008516e-10]

[5.67589386e-02 -1.16599477e-12 -2.74043261e-14 7.62533673e-11
-2.04825033e-10 -1.39039262e-15 1.30824198e-15 2.18459331e-05
-2.32384851e-06 -7.68203725e-09 6.48047889e-10]

[-1.07267105e-01 -1.37835007e-12 -6.61830151e-14 5.18200837e-11
-1.87733704e-10 -1.29694826e-15 7.76300673e-16 2.62330734e-05
-1.91932755e-06 -7.93272976e-09 6.47707379e-10]

[-1.31965450e-01 -7.64314199e-13 -7.00010279e-14 6.95762776e-11
-2.09845497e-10 -1.52507240e-15 8.37357658e-16 1.94576298e-05
-2.48121086e-06 -6.33566711e-09 6.13318589e-10]

[-1.70292789e-01 -1.14701121e-12 -9.22814542e-14 4.56029380e-11
-1.72617617e-10 -1.00911194e-15 1.01785473e-15 1.95932450e-05
-1.41101226e-06 -6.84662471e-09 9.36104172e-10]

[7.07264321e-02 -1.02434126e-12 -2.23425488e-14 6.20598066e-11
-1.60243074e-10 -9.94196667e-16 8.38984691e-16 2.06360932e-05
-1.83767994e-06 -9.05514419e-09 8.76171207e-10]

[-1.12694336e-01 -9.69058829e-13 -6.61830151e-14 5.43274418e-11
-2.20856614e-10 -1.33303802e-15 7.76300673e-16 2.65862454e-05
-1.91932755e-06 -8.89410681e-09 8.24061279e-10]

[9.07732055e-02 -9.87529980e-13 -4.91961586e-14 7.93056310e-11
-2.09845497e-10 -1.43783375e-15 9.77177080e-16 2.27576586e-05
-1.98903173e-06 -8.90833587e-09 8.50567223e-10]

[-1.69565538e-01 -1.39140995e-12 -6.71616169e-14 3.97923539e-11
-2.71952040e-10 -1.51575173e-15 8.49841941e-16 2.26112460e-05

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-1.86610560e-06 -1.01697846e-08 7.61202867e-10]

[ 7.14447044e-02 -1.02434126e-12 -1.77258724e-14 7.51805465e-11
-2.21005370e-10 -1.30803810e-15 1.34494694e-15 1.97293463e-05
-1.83767994e-06 -8.46500664e-09 7.43354864e-10]

[-1.28269883e-01 -1.22665800e-12 -8.41238744e-14 4.62778041e-11
-1.45231121e-10 -1.42838909e-15 7.76300673e-16 2.27576586e-05
-2.46154287e-06 -8.89410681e-09 7.75813361e-10]

[ 1.45640540e-01 -1.22423312e-12 -5.39448216e-14 7.93056310e-11
-2.56911107e-10 -1.64838740e-15 1.02903366e-15 2.30597853e-05
-1.98845916e-06 -7.80153363e-09 8.16158497e-10]

[-1.02352568e-01 -1.85388343e-12 -1.03009622e-13 4.83630161e-11
-2.16284964e-10 -1.27413730e-15 8.49841941e-16 2.29782738e-05
-1.86610560e-06 -9.69624057e-09 7.51993635e-10]

[ 7.17022280e-02 -1.02434126e-12 -2.22414937e-14 7.51805465e-11
-1.83811492e-10 -1.26341450e-15 1.03636300e-15 1.97293463e-05
-1.83767994e-06 -8.25358650e-09 8.42556140e-10]

[-1.30414022e-01 -1.41094566e-12 -8.08025976e-14 5.75984379e-11
-1.81878770e-10 -1.51656877e-15 8.33829035e-16 2.27576586e-05
-1.91932755e-06 -1.00627312e-08 6.42131226e-10]

[-2.77094368e-01 -1.01371773e-12 -6.18052411e-14 7.93056310e-11
-1.76333501e-10 -1.43783375e-15 7.77470888e-16 2.27576586e-05
-2.28718915e-06 -8.90833587e-09 8.16158497e-10]

```

```

[172]: for member in starting_population_mat:
        member=member.tolist()
        details.insert_one({
            'generation': CURR_GEN_NUM,
            'try_vector': member, #after mutation
            'errors': [-1,-1],
            'mother_vec': member,
            'father_vec': member,
            'before_mutation': member,
            'beta': -1,
            'cross_over_point': -1,
            'desc' : TODAY
        })

```

```

[173]: trace_arr=[]
        trace_now=[]

```

```

for i in range(0,POP_SIZE):
    vec=copy.deepcopy(starting_population_mat[i])
    vec=vec.tolist()
    obj_to_store={
        'generation': CURR_GEN_NUM,
        'try_vector': vec, #after mutation
        'errors': [-1,-1],
        'mother_vec':vec,
        'father_vec': vec,
        'before_mutation':vec,
        'beta': -1,
        'cross_over_point': -1,
        'desc' : TODAY,
        'survived':False
    }
    trace_now.append(obj_to_store)

print(*trace_now, sep='\n\n')

```

```

{'generation': 1, 'try_vector': [-0.1427695714633879, -1.4351758102671513e-12,
-8.23952024928039e-14, 3.9792353931611e-11, -2.2891737891652097e-10,
-1.2741372955243258e-15, 8.498419408139292e-16, 2.2978273844682766e-05,
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'survived': False}

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March, STINT_2 CHECK AGAIN', 'survived': False}
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'survived': False}
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'before_mutation': [0.07170222803280825, -1.024341258927964e-12,  
-2.224149367400207e-14, 7.518054647321033e-11, -1.8381149179040615e-10,  
-1.263414495548608e-15, 1.0363630046234666e-15, 1.972934634335282e-05,  
-1.8376799350638052e-06, -8.253586497636434e-09, 8.425561396979906e-10], 'beta':  
-1, 'cross_over_point': -1, 'desc': 'PROPER 8th March, STINT_2 CHECK AGAIN',  
'survived': False}
```

```
{'generation': 1, 'try_vector': [-0.13041402170949926, -1.4109456635548133e-12,  
-8.080259759040498e-14, 5.759843794475859e-11, -1.8187876983227486e-10,  
-1.5165687688965358e-15, 8.338290346322176e-16, 2.2757658578306265e-05,  
-1.9193275505106666e-06, -1.0062731222536244e-08, 6.421312263041254e-10],  
'errors': [-1, -1], 'mother_vec': [-0.13041402170949926,  
-1.4109456635548133e-12, -8.080259759040498e-14, 5.759843794475859e-11,  
-1.8187876983227486e-10, -1.5165687688965358e-15, 8.338290346322176e-16,
```

```
2.2757658578306265e-05, -1.9193275505106666e-06, -1.0062731222536244e-08,
6.421312263041254e-10], 'father_vec': [-0.13041402170949926,
-1.4109456635548133e-12, -8.080259759040498e-14, 5.759843794475859e-11,
-1.8187876983227486e-10, -1.5165687688965358e-15, 8.338290346322176e-16,
2.2757658578306265e-05, -1.9193275505106666e-06, -1.0062731222536244e-08,
6.421312263041254e-10], 'before_mutation': [-0.13041402170949926,
-1.4109456635548133e-12, -8.080259759040498e-14, 5.759843794475859e-11,
-1.8187876983227486e-10, -1.5165687688965358e-15, 8.338290346322176e-16,
2.2757658578306265e-05, -1.9193275505106666e-06, -1.0062731222536244e-08,
6.421312263041254e-10], 'beta': -1, 'cross_over_point': -1, 'desc': 'PROPER 8th
March, STINT_2 CHECK AGAIN', 'survived': False}
```

```
{'generation': 1, 'try_vector': [-0.2770943682630941, -1.0137177301180374e-12,
-6.180524109381058e-14, 7.930563099592005e-11, -1.7633350091946644e-10,
-1.4378337510064146e-15, 7.774708882332625e-16, 2.2757658578306265e-05,
-2.2871891506355226e-06, -8.908335865469784e-09, 8.161584966021705e-10],
'errors': [-1, -1], 'mother_vec': [-0.2770943682630941, -1.0137177301180374e-12,
-6.180524109381058e-14, 7.930563099592005e-11, -1.7633350091946644e-10,
-1.4378337510064146e-15, 7.774708882332625e-16, 2.2757658578306265e-05,
-2.2871891506355226e-06, -8.908335865469784e-09, 8.161584966021705e-10],
'father_vec': [-0.2770943682630941, -1.0137177301180374e-12,
-6.180524109381058e-14, 7.930563099592005e-11, -1.7633350091946644e-10,
-1.4378337510064146e-15, 7.774708882332625e-16, 2.2757658578306265e-05,
-2.2871891506355226e-06, -8.908335865469784e-09, 8.161584966021705e-10],
'before_mutation': [-0.2770943682630941, -1.0137177301180374e-12,
-6.180524109381058e-14, 7.930563099592005e-11, -1.7633350091946644e-10,
-1.4378337510064146e-15, 7.774708882332625e-16, 2.2757658578306265e-05,
-2.2871891506355226e-06, -8.908335865469784e-09, 8.161584966021705e-10], 'beta':
-1, 'cross_over_point': -1, 'desc': 'PROPER 8th March, STINT_2 CHECK AGAIN',
'survived': False}
```

```
[174]: verified=input("Have you taken care of get_fitness_vals, \nexist_vec!=0 ,\n
↪\ncollection name,\ndetails name ?\n\
Have you switched on VPN ?\n JSON file name\n\n\
HAVE YOU CHANGED METRIC IN FITNESS VALUE APPEND FUNCTION ?\
")
if verified!='y':
    raise TypeError
```

```
Have you taken care of get_fitness_vals,
exist_vec!=0 ,
collection name,
details name ?
Have you switched on VPN ?
JSON file name
```

```
HAVE YOU CHANGED METRIC IN FITNESS VALUE APPEND FUNCTION ?y
```

```
[128]: MUT_RATE
```

```
[128]: 0.4
```

```
[176]: mut_magnitude=0.05
tot_crosses=0
same_crosses=0

if type(starting_population_mat)!=np.ndarray:
    raise TypeError("Mismatch of starting pop mat")

for itr_num in range(0, MAX_ITR+1):
    #print("args being sent are \n")
    #print(*generation_info[-1]["members"],sep='\n')
    parents_now, sorted_fitness_vals, unsorted_errors_main, sorted_indices = \
    ↪sort_generation_members(generation_info[-1]["members"], CURR_GEN_NUM)

    for i in range(POP_SIZE):
        trace_now[i]["errors"]=unsorted_errors_main[i]

        '''if unsorted_errors_main[i]!=list:
            raise TypeError("Pitts ERROR")'''

    trace_tmp=copy.deepcopy(trace_now)

    for i in range(0,POP_SIZE):
        trace_now[i]=copy.deepcopy(trace_tmp[sorted_indices[i]])

    trace_arr.append(copy.deepcopy(trace_now))

    #[{obj}] -> obj -> errors -> fitness value

    generation_info[-1]["avg_fitness"]=np.average(sorted_fitness_vals)
    generation_info[-1]["min_fitness"]=np.min(sorted_fitness_vals)
    generation_info[-1]["gen_number"]=CURR_GEN_NUM
    generation_info[-1]["fitness_vals_stored"]=sorted_fitness_vals
```

```

print(f'Avg fitness is {generation_info[-1]["avg_fitness"]}' )
print(f'MIN fitness is {generation_info[-1]["min_fitness"]}' )
print(f"fitness vals are: -> \n")
print(*sorted_fitness_vals, sep='\n')

stop_or_not = input("Enter y to continue.")
#stop_or_not = 'y'
if stop_or_not!='y' or itr_num==MAX_ITR:
    break

↳ #####

CURR_GEN_NUM+=1
# https://stackoverflow.com/a/7851237/6427607
matings_pending=num_matings_per_itr
probs=get_probabilities(POP_SIZE)
cum_probs=np.cumsum(probs)
# https://numpy.org/doc/stable/reference/generated/numpy.hstack.html
cum_probs=np.hstack(([0],cum_probs))
#print(f"Probs are {probs}\nCumProbs are {cum_probs}")

'''Selection
'''

pick_1=np.random.uniform(low=0, high=1, size=(matings_pending))
pick_2=np.random.uniform(low=0, high=1, size=(matings_pending))

#print(f"PICK_1 is {pick_1} \n AND \nPICK_2 is {pick_2} ")
mother_idx=[]
father_idx=[]

for ic in range(0,matings_pending):
    tot_crosses+=1
    for idx in range(1,POP_SIZE+1):

        if pick_1[ic]<=cum_probs[idx] and pick_1[ic]>cum_probs[idx-1]:
            mother_idx.append(idx-1)
        if pick_2[ic]<=cum_probs[idx] and pick_2[ic]>cum_probs[idx-1]:
            father_idx.append(idx-1)
        if mother_idx[-1]==father_idx[-1]:
            father_idx[-1]=((mother_idx[-1])+1)%POP_SIZE

new_parents=parents_now.copy()
for i in range(0, surviving_members_num):
    details.insert_one({

```

```

'generation': CURR_GEN_NUM,
'try_vector': new_parents[i], #after mutation
'errors': [-1,-1],
'mother_vec': new_parents[i],
'father_vec': new_parents[i],
'before_mutation': new_parents[i],
#'beta': -1,
#'cross_over_point': -1,
'desc' : TODAY
})
#trace_now=copy.deepcopy(trace_prev)

for mating_num in range(0, matings_pending):
    par_one_idx=mother_idx[mating_num]
    par_two_idx=father_idx[mating_num]

    child_one=parents_now[par_one_idx].copy()
    child_two=parents_now[par_two_idx].copy()

    child_one, child_two=crossover(child_one, child_two)

    '''CrossOver
    '''
    '''special_cell_idx=random.randint(0,NUM_FEATURES-1)

    beta=random.random()

    xy=parents_now[par_one_idx][special_cell_idx]-\
        parents_now[par_two_idx][special_cell_idx]

    child_one[special_cell_idx]=parents_now[par_one_idx][special_cell_idx]_
↪ - beta*xy
    child_two[special_cell_idx]=parents_now[par_two_idx][special_cell_idx]_
↪ + beta*xy

    if special_cell_idx!=NUM_FEATURES-1:
        #print("CHILD ONE IS ", child_one)
        #print("CHILD TWO IS ", child_two)
        child_one[:] = np.hstack((child_one[:special_cell_idx] \
                                   , child_two[special_cell_idx:] ))

        child_two[:] = np.hstack((child_two[:special_cell_idx] \
                                   , child_one[special_cell_idx:] ))'''

```

```

new_parents[surviving_members_num + 2* mating_num] = child_one
new_parents[surviving_members_num + 2* mating_num + 1] = child_two

if type(child_one)!=list:
    raise TypeError("NOT A LIST")

if type(parents_now[par_one_idx])!=list:
    raise TypeError("IT ALSO NOT A LIST")

obj_one={
'generation': CURR_GEN_NUM,
'try_vector': child_one, #after mutation
'errors': [-1,-1],
'mother_vec':parents_now[par_one_idx],
'father_vec': parents_now[par_two_idx],
'before_mutation': child_one,
#'beta': beta,
#'cross_over_point': special_cell_idx,
'desc' : TODAY,
'survived':False,
"mut_rate":MUT_RATE
}

obj_two={
'generation': CURR_GEN_NUM,
'try_vector': child_two, #after mutation
'errors': [-1,-1],
'mother_vec':parents_now[par_one_idx],
'father_vec': parents_now[par_two_idx],
'before_mutation': child_two,
#'beta': beta,
# 'cross_over_point': special_cell_idx,
'desc' : TODAY,
'survived':False,
"mut_rate":MUT_RATE
}

trace_now[surviving_members_num + 2* mating_num]=obj_one
trace_now[surviving_members_num + 2* mating_num + 1] =obj_two
details.insert_one(copy.deepcopy(obj_one))
details.insert_one(copy.deepcopy(obj_two))

#print("OLD Parents are \n")
#print(*parents_now, sep='\n')
#print("NEW Parents are \n")

```



```

#print(*new_parents, sep='\n')

'''
%-----
% Mutate the population
'''

#mut_rows=np.random.uniform(low=0, high=1, size=(num_cells_mutate))
#mut_rows*=(POP_SIZE-1)
# https://numpy.org/doc/stable/reference/random/generated/numpy.random.
→randint.html
mut_rows=np.random.randint(POP_SIZE, size=num_cells_mutate)
for i in range(0,len(mut_rows)):
    # mut_rows[i]=int(math.round(mut_rows[i]))
    assert(mut_rows[i]<POP_SIZE)
mut_rows.sort()

# mut_cols=np.random.uniform(low=0, high=1, size=(num_cells_mutate))
# mut_cols*=(NUM_FEATURES-1)

mut_cols=np.random.randint(NUM_FEATURES, size=num_cells_mutate)

for i in range(0,len(mut_cols)):
    #mut_cols[i]=int(math.round(mut_cols[i]))
    assert(mut_cols[i]<NUM_FEATURES)

for i in range(0,num_cells_mutate):
    row_c=int(mut_rows[i])
    col_c=int(mut_cols[i])
    #print(f"Contenders are {row_c}:{col_c}")
    #new_parents[row_c][col_c]=random.random()*(UB_LIMIT-LB_LIMIT)+LB_LIMIT
    CHNG = mut_magnitude * (new_parents[row_c][col_c])
    add=random.uniform(-CHNG,CHNG)
    #print(f"mut mag is {mut_magnitude}\tChange is {CHNG} and \tadd is_
→{add}")

    upd_val = new_parents[row_c][col_c] + add
    upd_val = max(LB_LIMIT, upd_val)
    upd_val = min(UB_LIMIT, upd_val)

    old_vec= copy.deepcopy(new_parents[row_c])
    new_parents[row_c][col_c] = upd_val
    details.update_one({"before_mutation": old_vec},
                      {"$set": {"try_vector": new_parents[row_c]}})

```

```

#####
→#####

for i in range(POP_SIZE):
    if type(new_parents[i])!=list:
        raise TypeError("Pegasus type error")
    #trace_now[i]["try_vector"]=new_parents[i]
    trace_now[i]["try_vector"]=copy.deepcopy(new_parents[i])
    if i< surviving_members_num:
        trace_now[i]["survived"]=True
    #####
→#####

print("Generation info is ", generation_info)

□
→#####3
x_c=[]
y_min=[]
y_avg=[]
#print(len(generation_info))
for j in range(0,len(generation_info)):
    x_c.append(j)
    y_min.append(generation_info[j]["min_fitness"])
    y_avg.append(generation_info[j]["avg_fitness"])

plt.figure(figsize=(8,8))
plt.plot(x_c, y_min, label="min")
plt.show()
plt.figure(figsize=(8,8))
plt.plot(x_c, y_avg, label="avg")
#print('Min: ',y_min[-1])
#print('Avg: ',y_avg[-1])
#print('Vector: ',generation_info[-1]["members"])
#print(*y_min,sep='\n')
plt.legend()
plt.show()
#####
print("-----")

```



```
exist? 0
exist? 0
exist? 0
exist? 0
exist? 0
exist? 0
exist? 0
exist? 0
exist? 0
exist? 0
exist? 0
Avg fitness is 5131.460146708814
MIN fitness is 37.66959541129176
fitness vals are: ->
```

```
37.66959541129176
45.5110447324014
45.929105439799876
152.43199131703398
172.94886695726368
175.69573943449987
199.67466779936476
224.57123489188925
251.6005402607385
349.8660665410795
647.9180722720346
980.061364917799
1022.7577858440703
1111.5943873214492
1504.5037435222655
1933.1621414834694
2125.43034071676
2126.927573066876
2177.980023055001
2867.8447571217516
2995.2707803878093
3243.1545976971624
3704.9963841789267
5437.164818437181
7188.92030281705
7640.827318602768
7831.587725221452
9155.220840059972
9371.559134613293
11149.43716621026
11353.052363798522
12437.295869926575
15227.231508813735
19215.88419172725
```

```

19913.195011414995
20713.688225503513
Enter y to continue.y
parent 1 is [-0.28614305433571585, -1.2119409946317276e-12,
-3.990037500460894e-14, 7.930563099592005e-11, -2.1910131974437998e-10,
-1.4378337510064146e-15, 8.060220128248057e-16, 2.2757658578306265e-05,
-1.8549629739120606e-06, -8.908335865469784e-09, 8.161584966021705e-10]
parent 2 is [-0.12870871762656094, -1.152542685981224e-12,
-7.312827191791195e-14, 4.627780406755569e-11, -1.7964979058119056e-10,
-1.3196503025465988e-15, 5.99861919097242e-16, 2.440073687206389e-05,
-1.9193275505106666e-06, -7.55453215848767e-09, 9.680985506696188e-10]
CHILD 1 is [-2.73142756e-01 -1.20703612e-12 -4.26442019e-14 7.65783250e-11
-2.15843570e-10 -1.42807463e-15 7.88998136e-16 2.28933374e-05
-1.86027794e-06 -8.79654417e-09 8.28705099e-10]
CHILD 2 is [-1.41709016e-01 -1.15744756e-12 -7.03844450e-14 4.90051100e-11
-1.82907540e-10 -1.32940942e-15 6.16885796e-16 2.42650580e-05
-1.91401258e-06 -7.66632386e-09 9.55551948e-10]
#-----
parent 1 is [0.05852016018660203, -1.024341258927964e-12,
-2.4420327193519113e-14, 8.668139621088872e-11, -1.801621324121818e-10,
-1.1293700149164052e-15, 1.2622275941633586e-15, 2.25767339027877e-05,
-1.5625042131037016e-06, -7.682037245173995e-09, 7.426144893853559e-10]
parent 2 is [-0.16956553778811417, -1.3914099463409795e-12,
-6.716161693510191e-14, 3.9792353931611e-11, -2.719520397483294e-10,
-1.5157517292351153e-15, 8.498419408139292e-16, 2.2611245998320236e-05,
-1.8661056044695021e-06, -1.0169784574124328e-08, 7.612028674265888e-10]
CHILD 1 is [ 5.95341353e-02 -1.02270942e-12 -2.42303170e-14 8.68898456e-11
-1.79754072e-10 -1.12765232e-15 1.26406089e-15 2.25765805e-05
-1.56115453e-06 -7.67097774e-09 7.42531853e-10]
CHILD 2 is [-1.70579513e-01 -1.39304178e-12 -6.73516271e-14 3.95839046e-11
-2.72360100e-10 -1.51746942e-15 8.48008644e-16 2.26113994e-05
-1.86745529e-06 -1.01808441e-08 7.61285504e-10]
#-----
parent 1 is [0.0, -9.875299804205226e-13, -5.3944821589819837e-14,
7.930563099592005e-11, -2.0984549655895666e-10, -1.4378337510064146e-15,
8.060220128248057e-16, 2.2757658578306265e-05, -1.989031728863744e-06,
-8.908335865469784e-09, 8.161584966021705e-10]
parent 2 is [0.24459610009058858, -9.875299804205226e-13,
-5.424802621454772e-14, 6.693868791745551e-11, -2.646131834714025e-10,
-1.6571916072621406e-15, 7.767082931069406e-16, 2.2757658578306265e-05,
-1.989031728863744e-06, -8.908335865469784e-09, 9.38805606996451e-10]
CHILD 1 is [ 2.58487119e-03 -9.87529980e-13 -5.39480258e-14 7.91749382e-11
-2.10424277e-10 -1.44015191e-15 8.05712228e-16 2.27576586e-05
-1.98903173e-06 -8.90833587e-09 8.17454621e-10]
CHILD 2 is [ 2.42011229e-01 -9.87529980e-13 -5.42448220e-14 6.70693807e-11
-2.64034403e-10 -1.65487345e-15 7.77018078e-16 2.27576586e-05
-1.98903173e-06 -8.90833587e-09 9.37509483e-10]
#-----

```

parent 1 is [-0.1427695714633879, -1.4351758102671513e-12,
-8.23952024928039e-14, 4.302678071891675e-11, -1.8453662431901795e-10,
-1.0096463211213406e-15, 1.0432437869760487e-15, 1.613873470712094e-05,
-1.8661056044695021e-06, -7.387286090109029e-09, 8.790085163953154e-10]
parent 2 is [0.05852016018660203, -1.024341258927964e-12,
-2.4420327193519113e-14, 8.668139621088872e-11, -1.801621324121818e-10,
-1.1293700149164052e-15, 1.2622275941633586e-15, 2.25767339027877e-05,
-1.5625042131037016e-06, -7.682037245173995e-09, 7.426144893853559e-10]
CHILD 1 is [-1.27235751e-01 -1.40347111e-12 -7.79211973e-14 4.63956707e-11
-1.84199038e-10 -1.01888557e-15 1.06014308e-15 1.66355644e-05
-1.84267625e-06 -7.41003246e-09 8.68482792e-10]
CHILD 2 is [4.29863399e-02 -1.05604596e-12 -2.88943323e-14 8.33125063e-11
-1.80499718e-10 -1.12013076e-15 1.24532830e-15 2.20799042e-05
-1.58593357e-06 -7.65929087e-09 7.53140214e-10]
#-----
parent 1 is [-0.16956553778811417, -1.3914099463409795e-12,
-6.716161693510191e-14, 3.9792353931611e-11, -2.719520397483294e-10,
-1.5157517292351153e-15, 8.498419408139292e-16, 2.2611245998320236e-05,
-1.8661056044695021e-06, -1.0169784574124328e-08, 7.612028674265888e-10]
parent 2 is [-0.1427695714633879, -1.4351758102671513e-12,
-8.23952024928039e-14, 3.9792353931611e-11, -2.2891737891652097e-10,
-1.2741372955243258e-15, 8.498419408139292e-16, 2.2978273844682766e-05,
-1.8661056044695021e-06, -9.19468573928787e-09, 7.519936353791697e-10]
CHILD 1 is [-1.64867742e-01 -1.39908286e-12 -6.98323279e-14 3.97923539e-11
-2.64407320e-10 -1.47339254e-15 8.49841941e-16 2.26755923e-05
-1.86610560e-06 -9.99883289e-09 7.59588330e-10]
CHILD 2 is [-1.47467368e-01 -1.42750290e-12 -7.97244916e-14 3.97923539e-11
-2.36462099e-10 -1.31649648e-15 8.49841941e-16 2.29139275e-05
-1.86610560e-06 -9.36563742e-09 7.53608173e-10]
#-----
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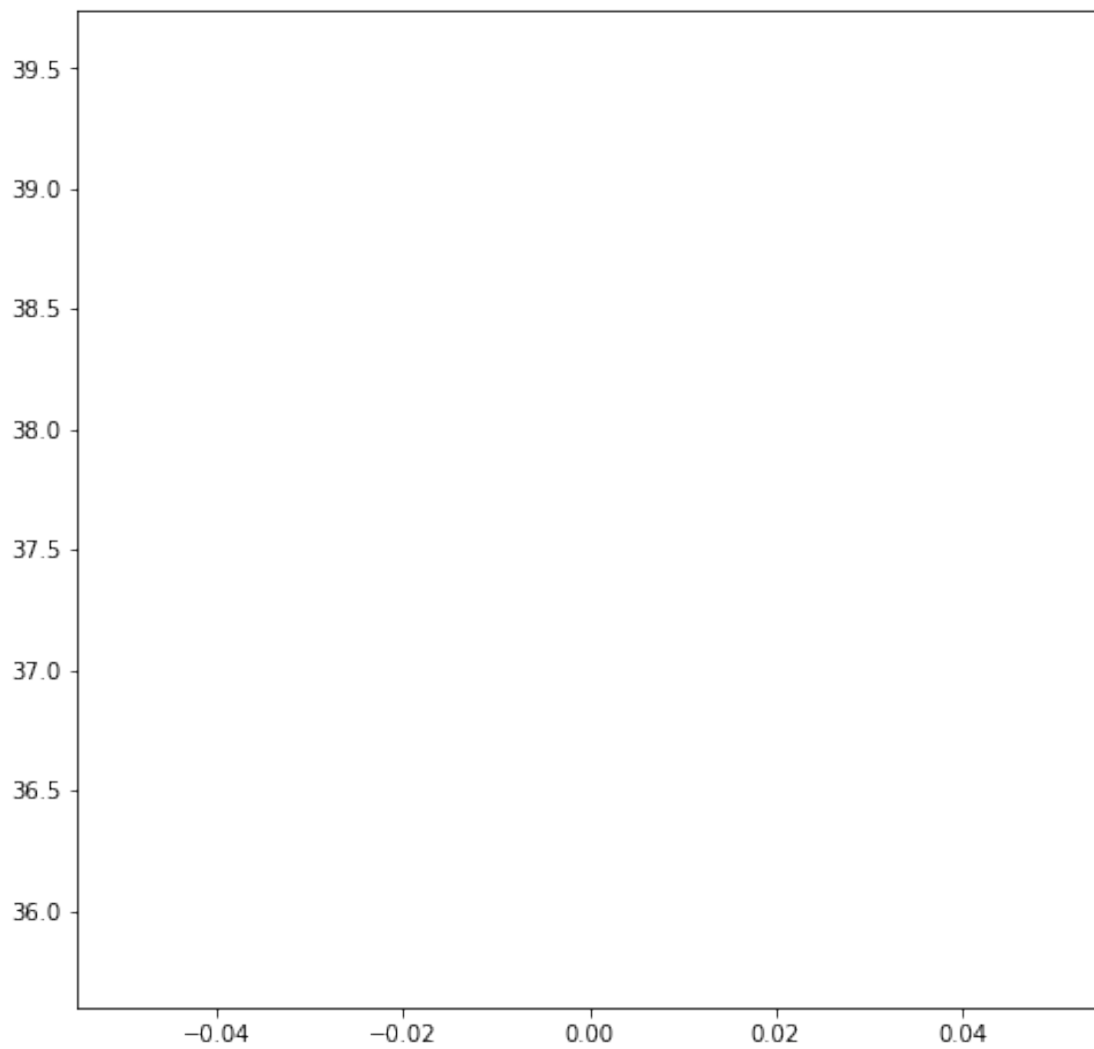
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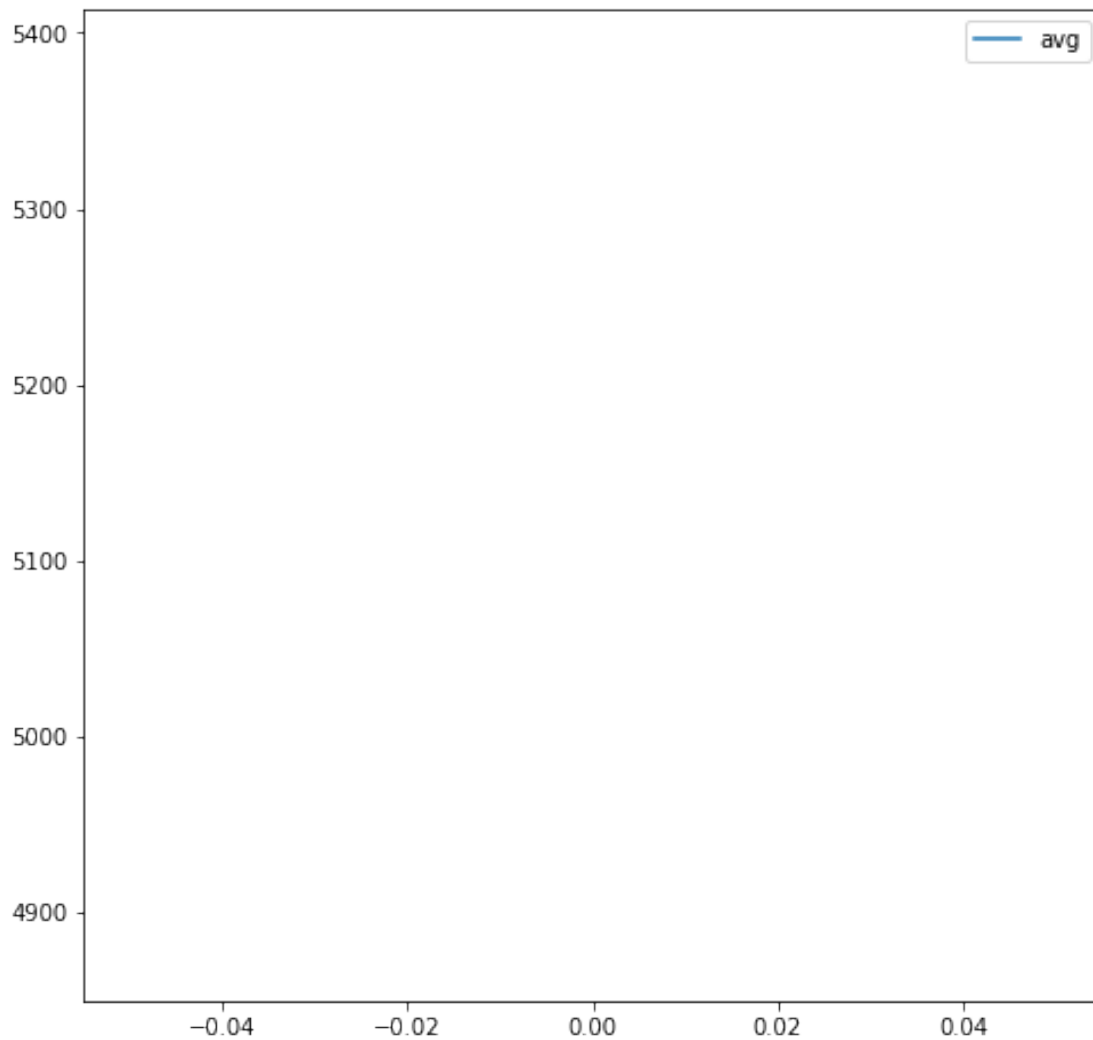
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Collection.count_documents instead.  
    # This is added back by InteractiveShellApp.init_path()  
  
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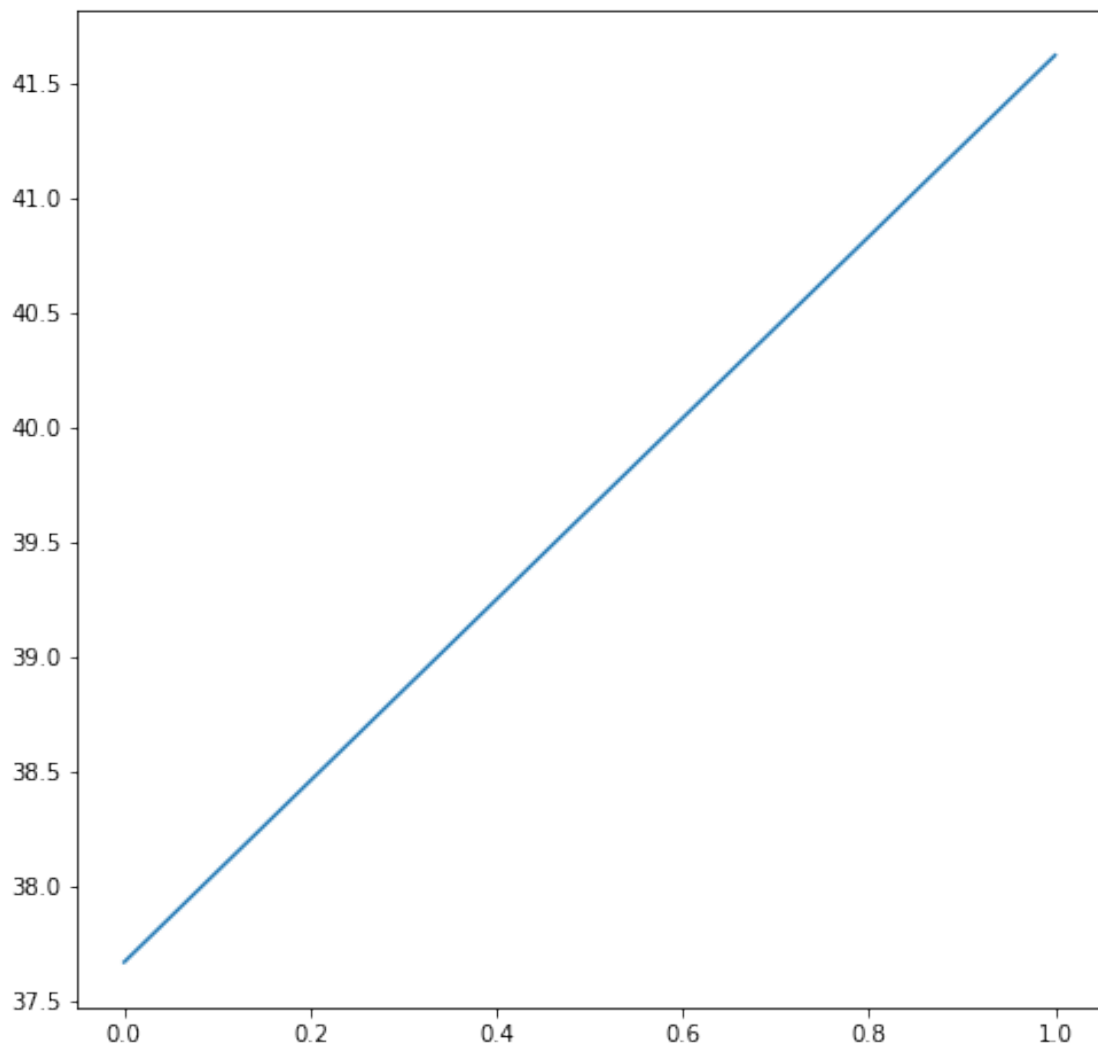
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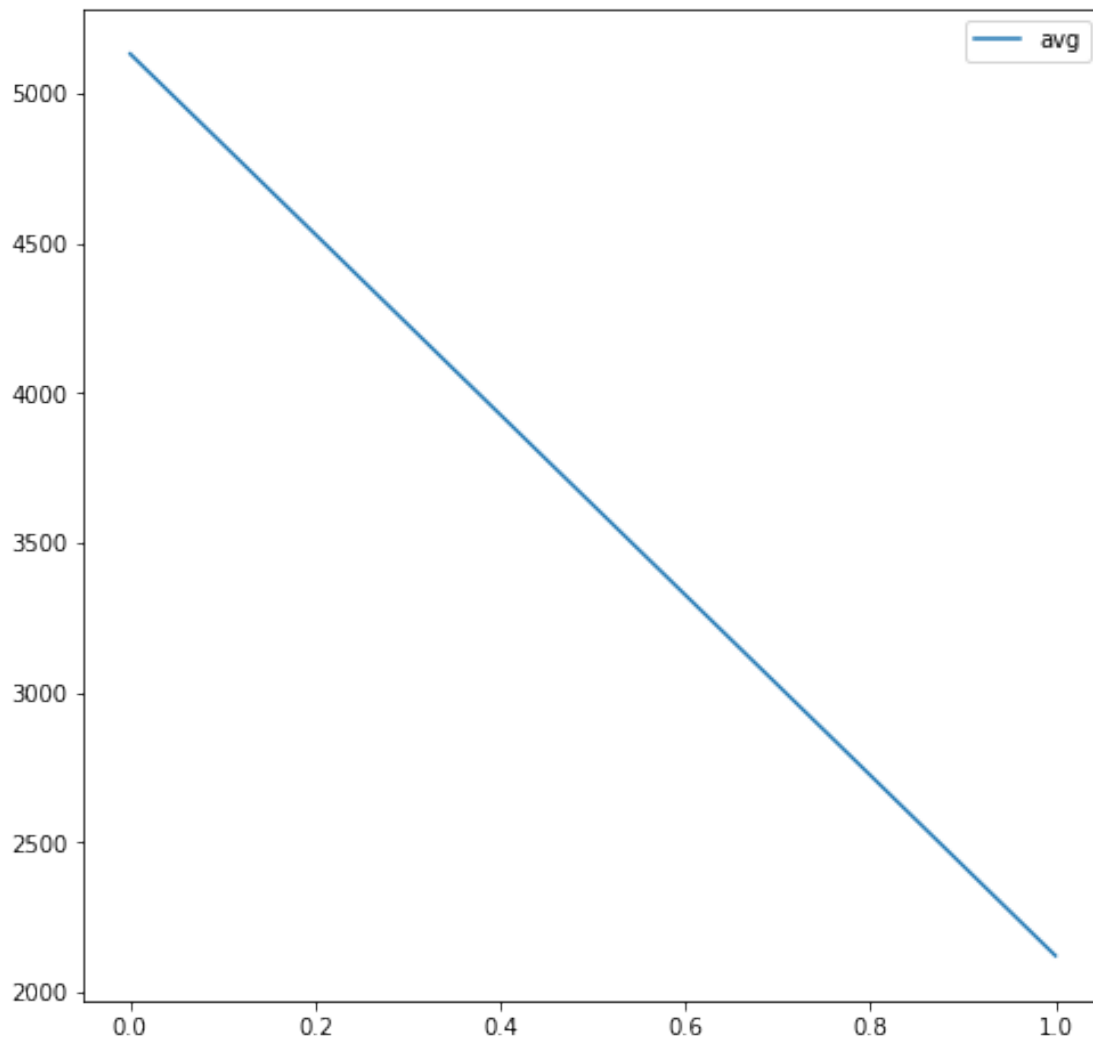
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Enter fraction of cells you want to mutate:0.6

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Collection.count_documents instead.
  # This is added back by InteractiveShellApp.init_path()

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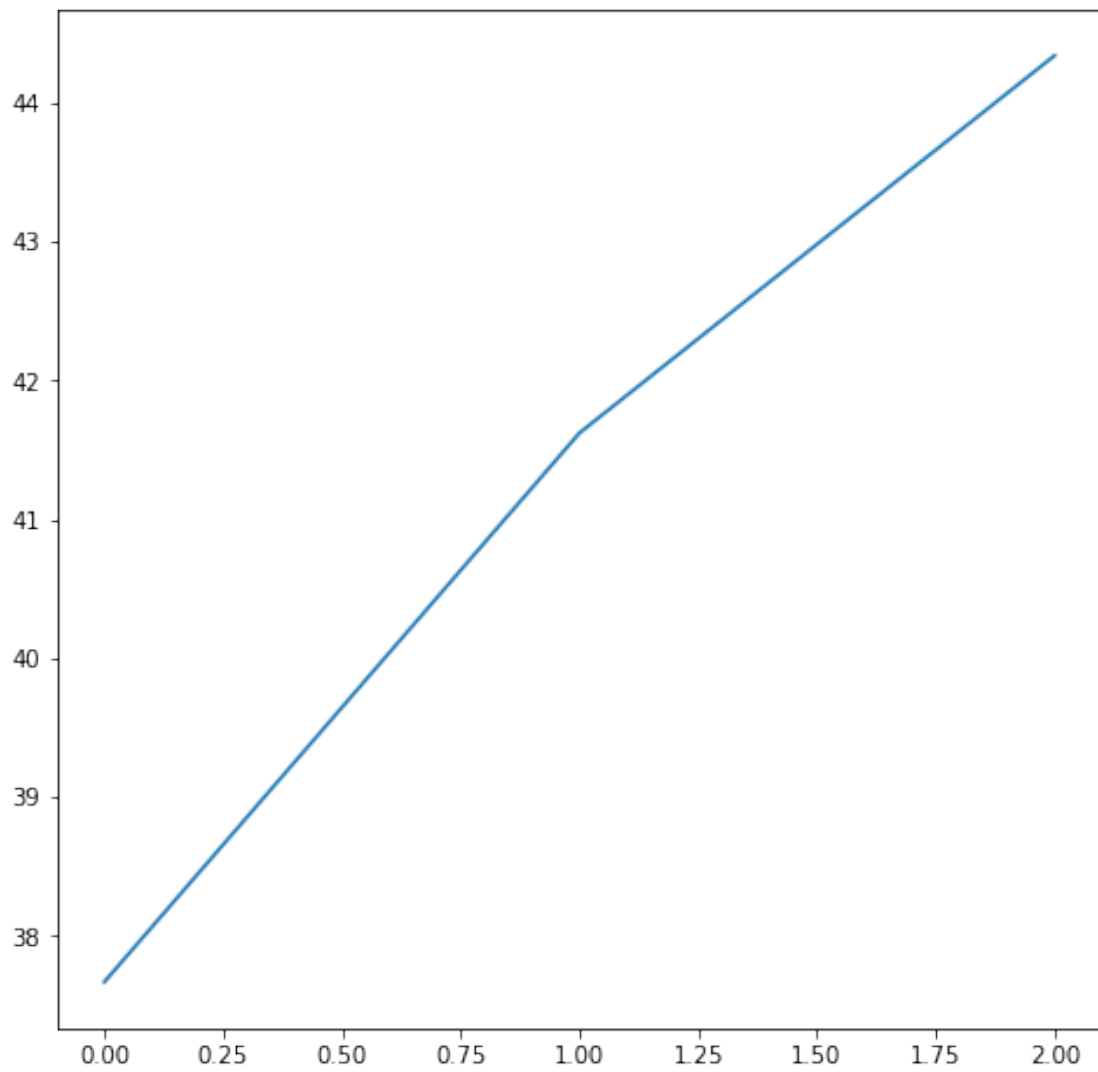
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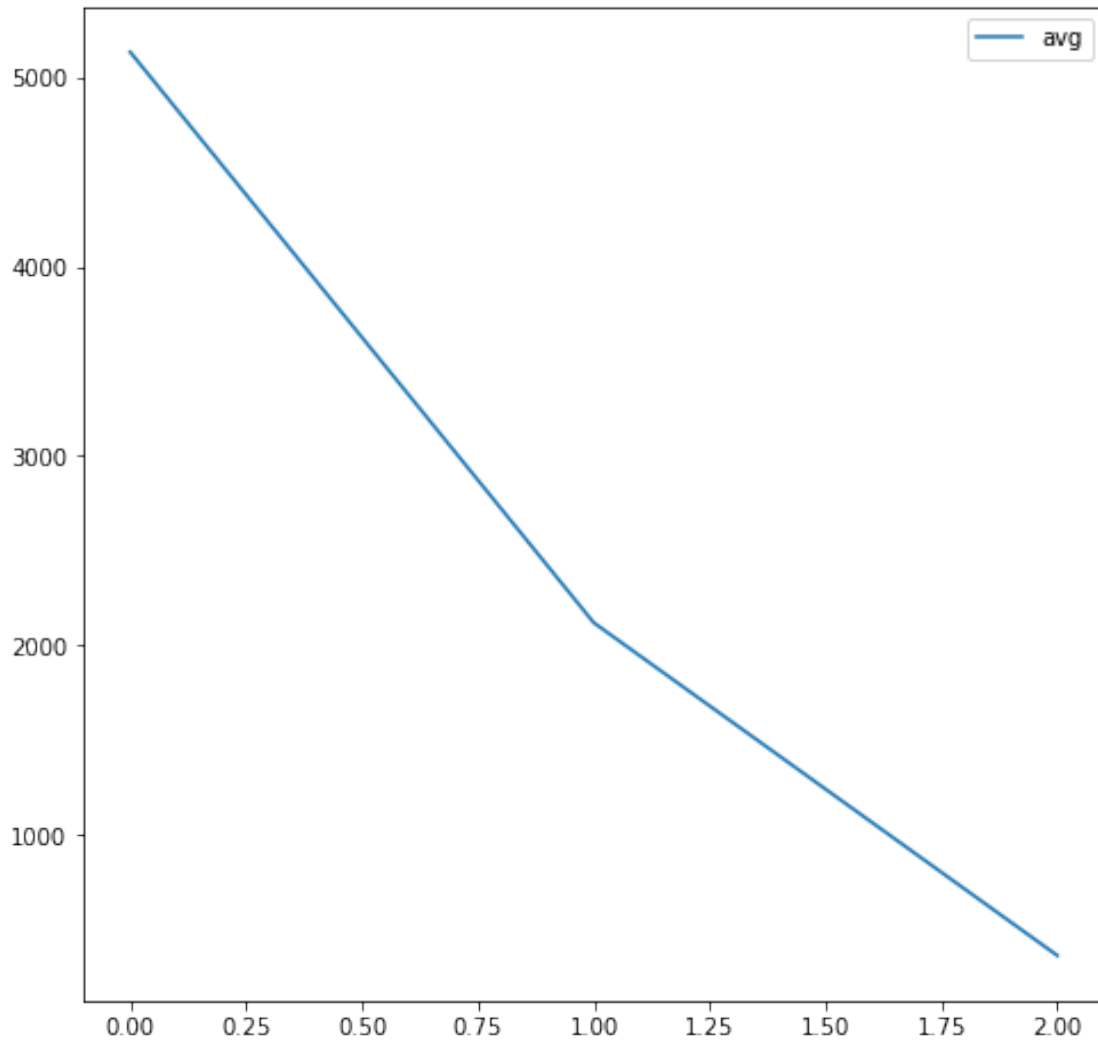
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MIN fitness is 40.8161264392485
fitness vals are: ->
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45.805720950771956
46.31127533504536
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51.03381326706802
176.01685598301958
176.1518167009697
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277.6454982674923
279.3423734125389
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286.03694099858126
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522.1833169402232
704.916804771627
725.1405143929856
798.5345877418811
901.8505768097632
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1266.5883279906764
1536.1524643940543
1791.1700218561016
2116.3163199892424
2712.3399989371965
Enter y to continue.y
parent 1 is [0.05362688150822829, -1.0925232355266055e-12,
-2.7682553743336584e-14, 7.310541931871785e-11, -1.839319263477129e-10,
-1.368590542017475e-15, 1.0184818974529961e-15, 2.042444498651585e-05,
-1.872337659995652e-06, -6.919892620689777e-09, 8.101085225905211e-10]
parent 2 is [0.042512406847062395, -1.0967602422206654e-12,
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-1.3364416020204134e-15, 1.0100839406625573e-15, 1.9459481136466698e-05,
-1.8387615302673101e-06, -7.491332310731817e-09, 7.131183578414681e-10]
CHILD 1 is [ 5.20874618e-02 -1.09311009e-12 -2.81682149e-14  7.30650708e-11
-1.84224289e-10 -1.36413773e-15  1.01731873e-15  2.02907919e-05
-1.86768717e-06 -6.99904036e-09  7.96674818e-10]
CHILD 2 is [ 4.40518266e-02 -1.09617339e-12 -3.07033233e-14  7.28544550e-11
-1.85750394e-10 -1.34089442e-15  1.01124711e-15  1.95931343e-05
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CHILD 1 is [ 7.84702373e-02 -1.06296857e-12 -2.24771446e-14  7.62348317e-11
-1.84510887e-10 -1.36395177e-15  1.05122572e-15  1.99966272e-05
-1.87589723e-06 -6.70447887e-09  8.26940210e-10]

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-1.79070830e-10 -1.40753879e-15 7.43556848e-16 2.40165063e-05
-1.84245068e-06 -8.72855845e-09 6.68785616e-10]
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parent 1 is [0.005978498080985874, -1.0260348570188458e-12,
-5.5590909063230837e-14, 8.435115062971694e-11, -1.8843042175641512e-10,
-1.5156239451506003e-15, 8.428812647261588e-16, 2.1704169728491025e-05,
-1.9898141323457707e-06, -8.771897700287741e-09, 8.356179088494524e-10]
parent 2 is [-0.1395408049644015, -1.3168898002745845e-12,
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-1.2492112713345872e-15, 7.330284808797269e-16, 2.225158501024201e-05,
-1.9145702828100157e-06, -9.576440318366939e-09, 7.474430887565198e-10]
CHILD 1 is [-8.31569287e-03 -1.05460520e-12 -5.65714413e-14 8.09358211e-11
-1.88845690e-10 -1.48945454e-15 8.32090554e-16 2.17579417e-05
-1.98242302e-06 -8.85092698e-09 8.26956599e-10]
CHILD 2 is [-1.25246614e-01 -1.28831946e-12 -6.45924992e-14 5.29973653e-11
-1.92242710e-10 -1.27538068e-15 7.43819191e-16 2.21978130e-05
-1.92196140e-06 -9.49741104e-09 7.56104398e-10]
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-1.3171678094879982e-15, 8.278164478552961e-16, 2.306706740844637e-05,
-1.8722844052321426e-06, -9.389888741473237e-09, 7.603334090925761e-10]
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-1.7782573164335806e-06, -8.065604870523611e-09, 7.772012153511485e-10]
CHILD 1 is [-1.10112653e-01 -1.79298724e-12 -9.91498109e-14 4.91058287e-11
-2.21729420e-10 -1.31704229e-15 8.32779405e-16 2.30341944e-05
-1.87143015e-06 -9.37785732e-09 7.60486657e-10]
CHILD 2 is [6.01203279e-02 -9.20534344e-13 -2.23062648e-14 7.67210661e-11
-2.22904955e-10 -1.30347771e-15 1.36912035e-15 1.94816490e-05
-1.77911157e-06 -8.07763629e-09 7.77047968e-10]
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-1.2578912069341933e-15, 8.108284603674524e-16, 2.209268432356758e-05,
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-1.2816817629397766e-15, 8.609271919984285e-16, 2.3558313333037156e-05,
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CHILD 1 is [-1.34622777e-01 -1.56012053e-12 -7.22480465e-14 4.12681729e-11
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-1.86293100e-06 -9.28359898e-09 7.85309866e-10]
CHILD 2 is [-1.00087786e-01 -1.86261242e-12 -1.00018945e-13 4.47950611e-11
-2.17863584e-10 -1.28269972e-15 8.63070822e-16 2.36210248e-05
-1.80076075e-06 -8.31866212e-09 7.49560684e-10]


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parent 2 is [-0.17925986618260803, -1.393639738209383e-12,
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CHILD 1 is [-1.36238011e-01 -1.41807529e-12 -8.40544373e-14  4.04665131e-11
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CHILD 2 is [-1.82954123e-01 -1.39154147e-12 -6.75587504e-14  4.08568582e-11
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CHILD 1 is [ 6.02325100e-02 -1.06575603e-12 -2.61810767e-14  7.59528975e-11
-1.80151618e-10 -1.34200145e-15  1.02343107e-15  1.92217767e-05
-1.83632429e-06 -7.37297566e-09  7.09227157e-10]
CHILD 2 is [-1.57652371e-01 -1.44698124e-12 -8.77578849e-14  3.73585901e-11
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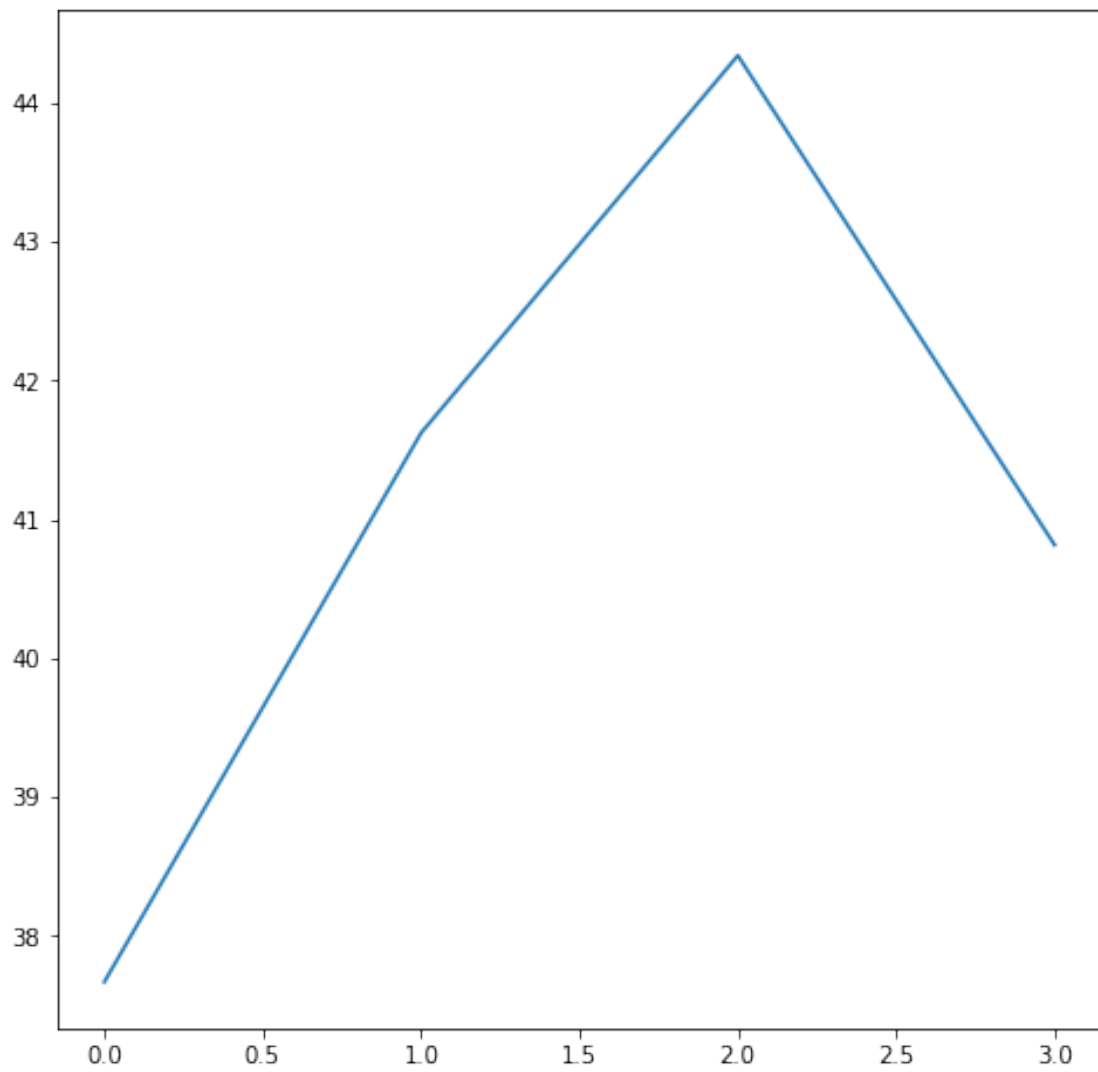
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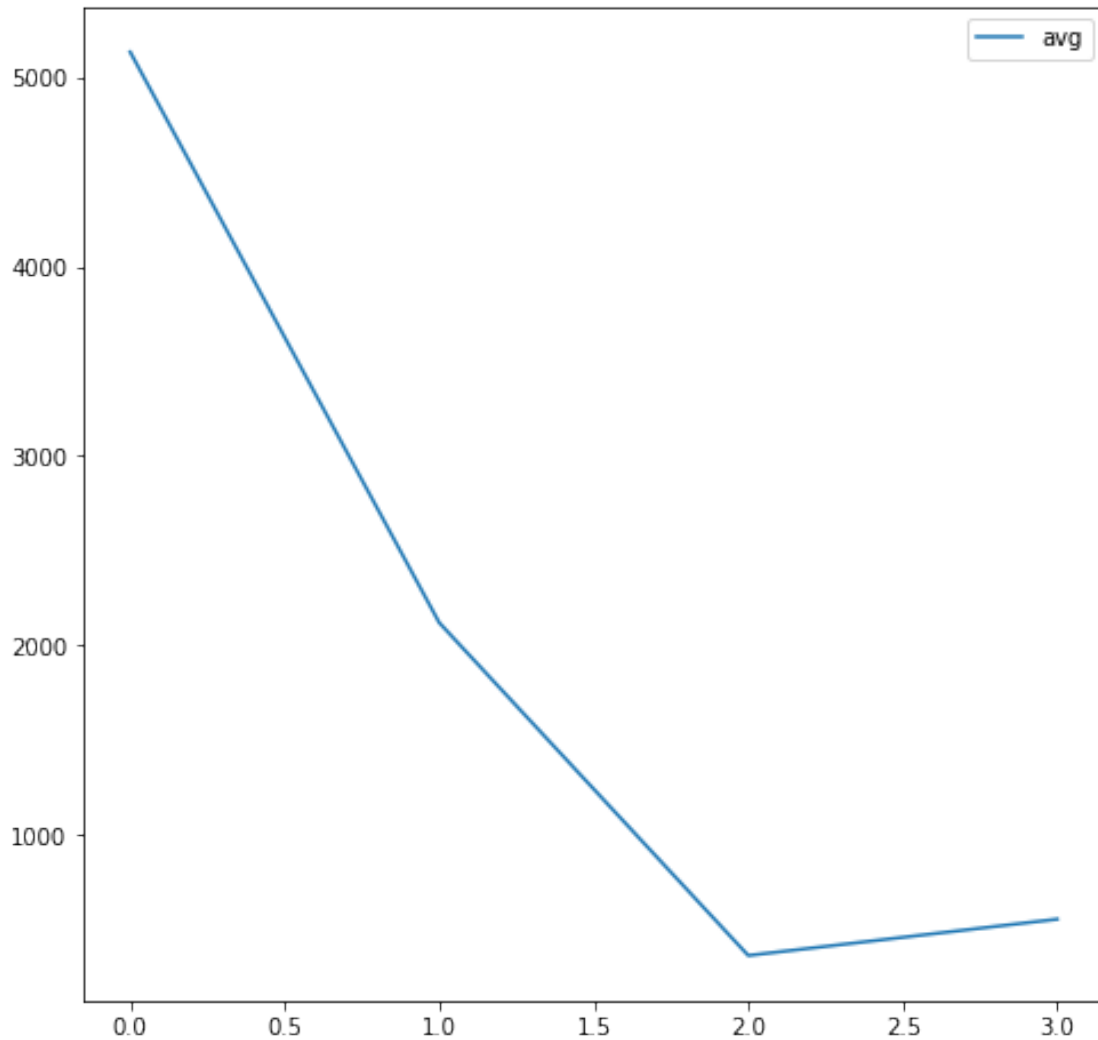
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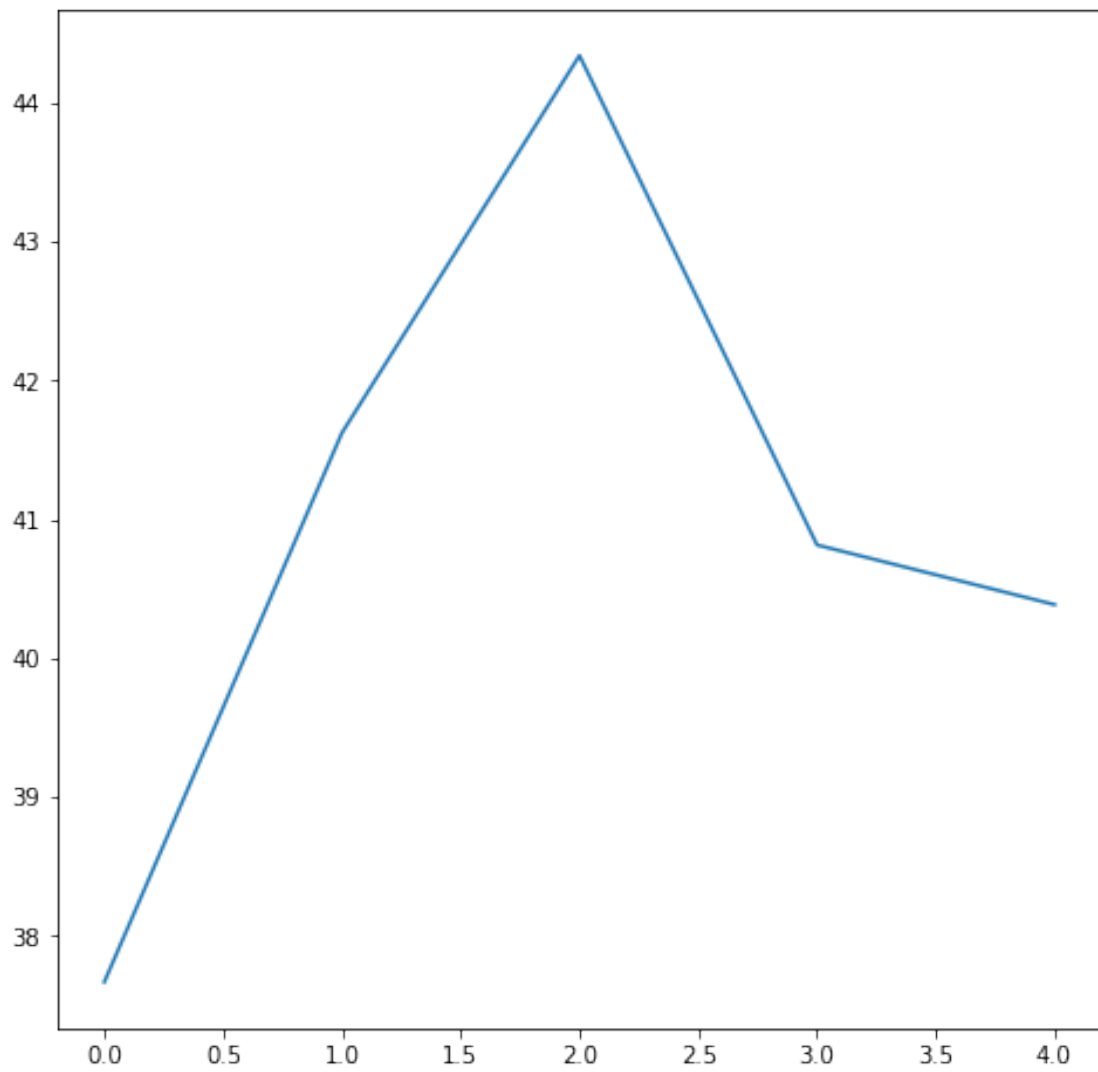
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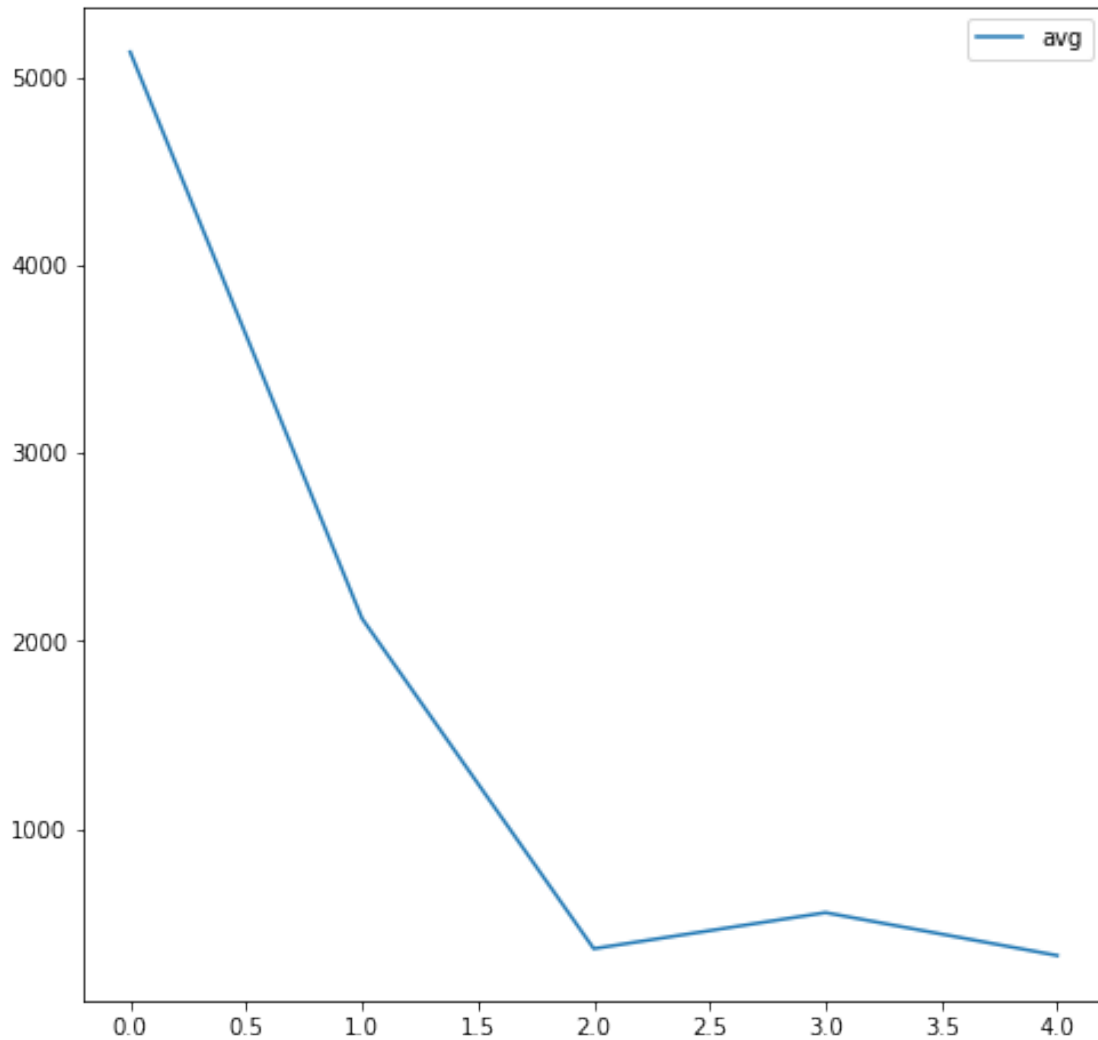
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Enter fraction of cells you want to mutate:0.7
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Collection.count_documents instead.
# This is added back by InteractiveShellApp.init_path()

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fitness vals are: ->

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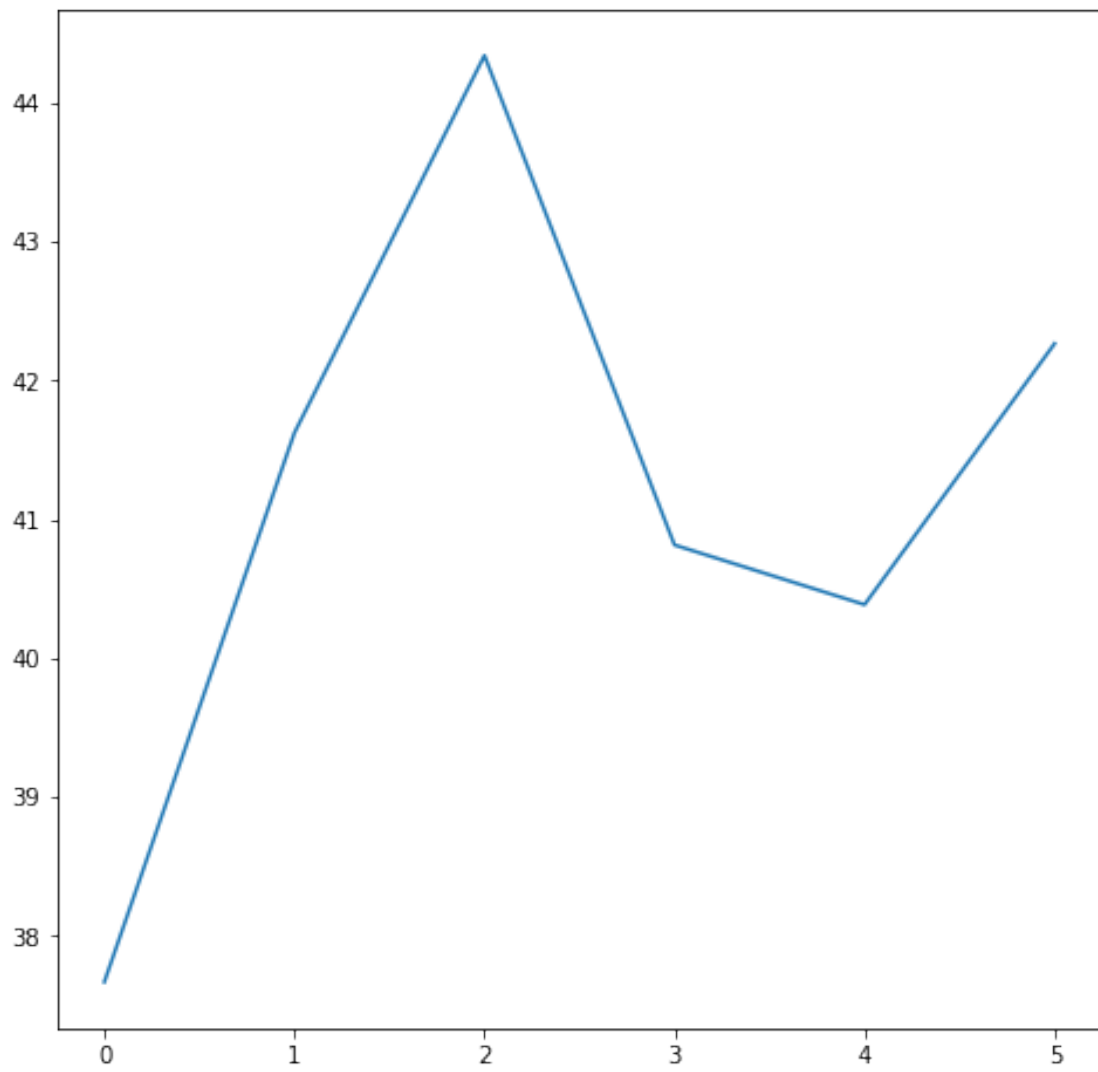
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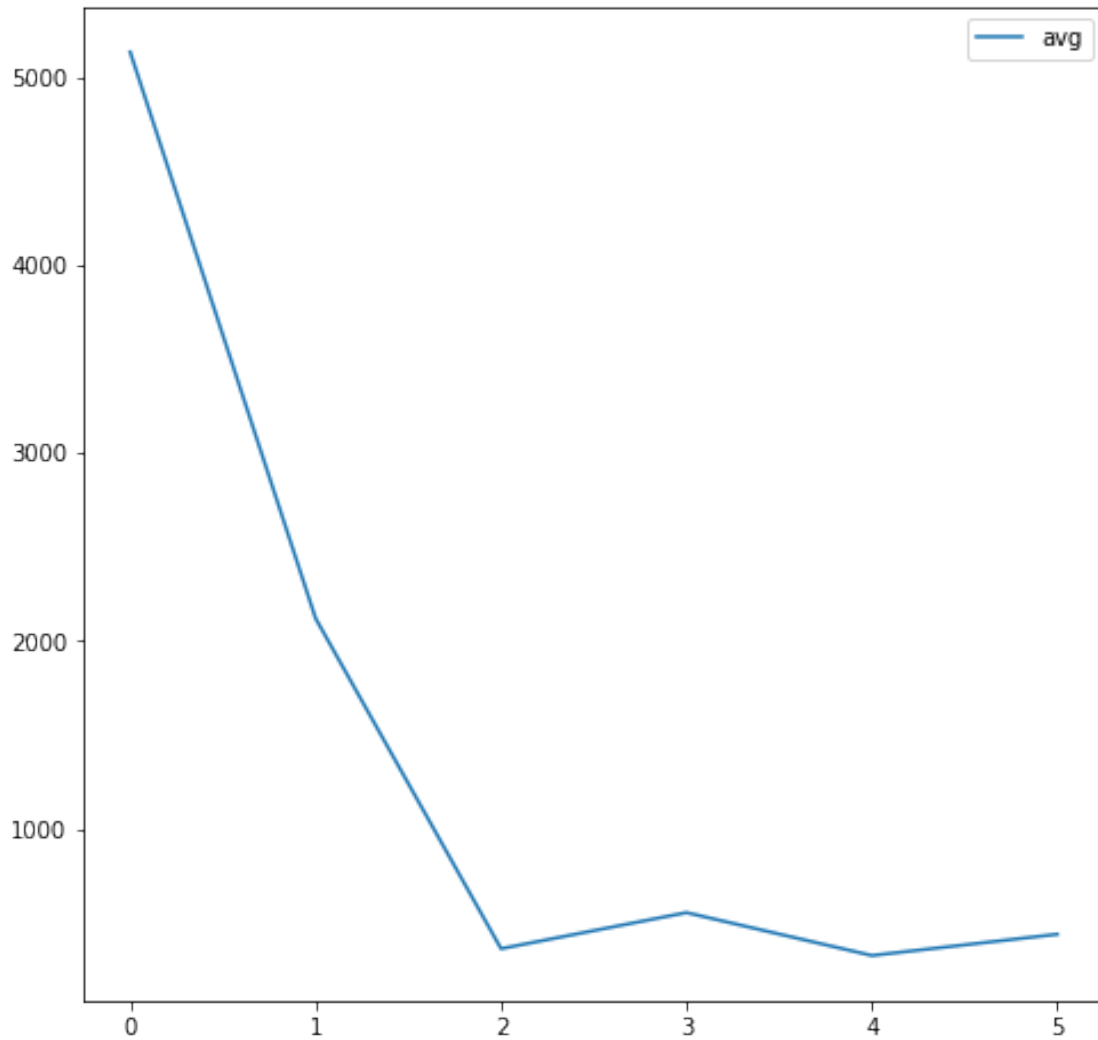
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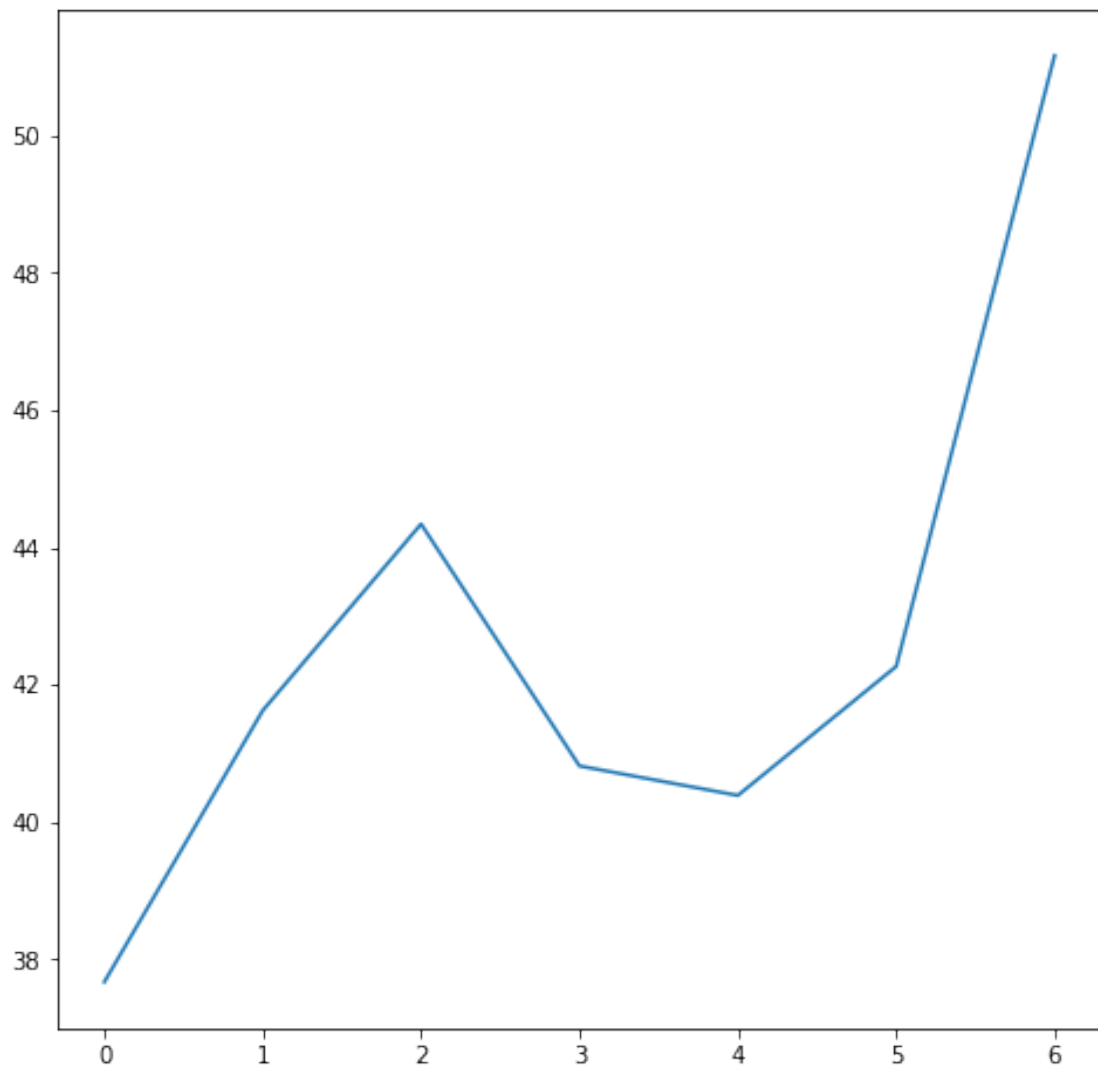
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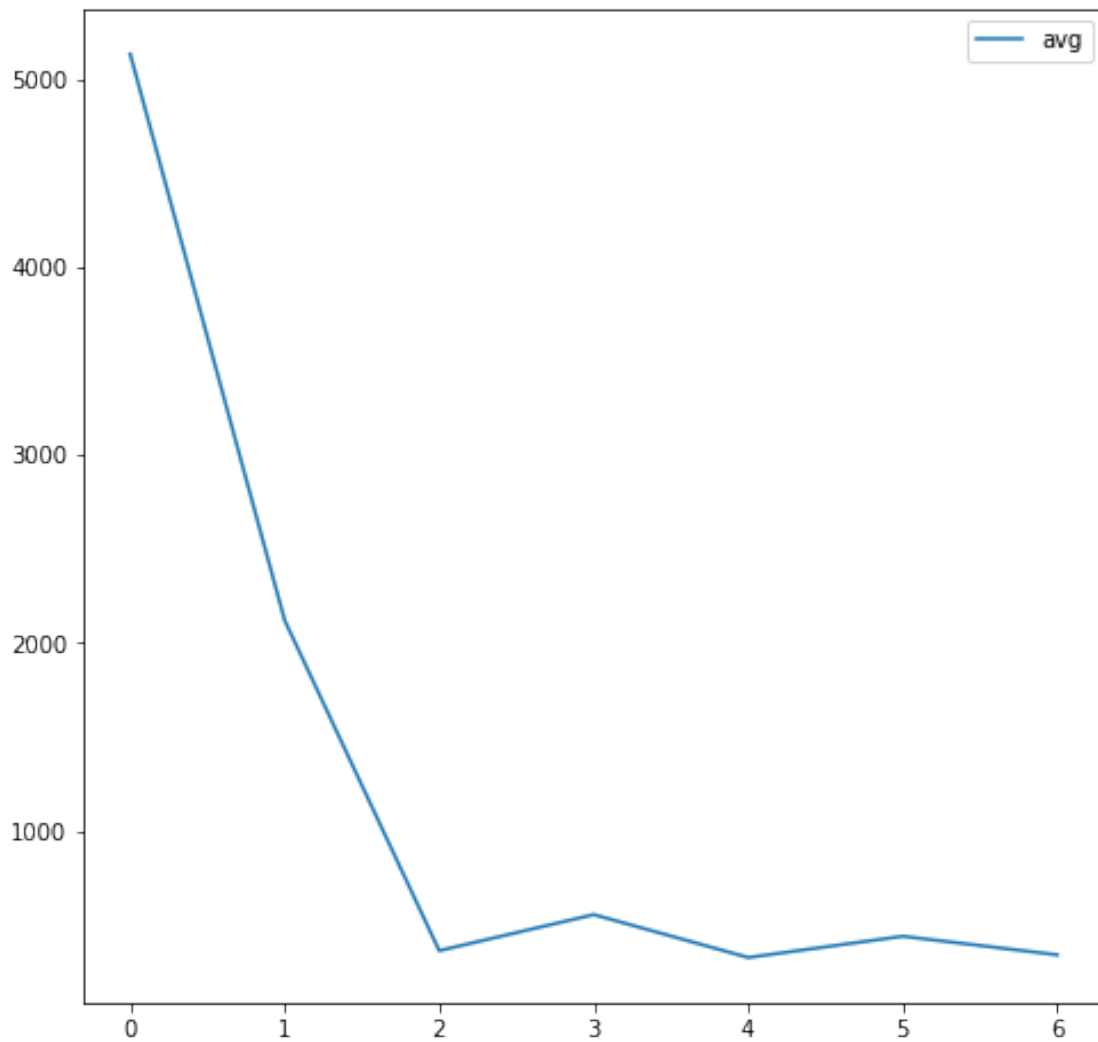
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↳ -----

```
KeyboardInterrupt                                Traceback (most recent call↳
↳last)

~/anaconda3/lib/python3.7/site-packages/ipykernel/kernelbase.py in
↳_input_request(self, prompt, ident, parent, password)
    883         try:
--> 884             ident, reply = self.session.recv(self.stdin_socket,↳
↳0)
    885         except Exception:
```

```

~/anaconda3/lib/python3.7/site-packages/jupyter_client/session.py in
recv(self, socket, mode, content, copy)
    802         try:
--> 803             msg_list = socket.recv_multipart(mode, copy=copy)
    804         except zmq.ZMQError as e:

```

```

~/anaconda3/lib/python3.7/site-packages/zmq/sugar/socket.py in
recv_multipart(self, flags, copy, track)
    474         """
--> 475         parts = [self.recv(flags, copy=copy, track=track)]
    476         # have first part already, only loop while more to receive

```

```

zmq/backend/cython/socket.pyx in zmq.backend.cython.socket.Socket.recv()

```

```

zmq/backend/cython/socket.pyx in zmq.backend.cython.socket.Socket.recv()

```

```

zmq/backend/cython/socket.pyx in zmq.backend.cython.socket._recv_copy()

```

```

~/anaconda3/lib/python3.7/site-packages/zmq/backend/cython/checkrc.pxd
in zmq.backend.cython.checkrc._check_rc()

```

KeyboardInterrupt:

During handling of the above exception, another exception occurred:

```

KeyboardInterrupt                                Traceback (most recent call
last)

<ipython-input-176-c10d9d433eec> in <module>
    280         generation_info.append({"members":new_parents, "mut_magnitude":
mut_magnitude})
    281
--> 282         mut_magnitude=float(input("Enter mutation magnitude:"))
    283         MUT_RATE=float(input("Enter fraction of cells you want to mutate:
"))
    284         num_cells_mutate=math.ceil((POP_SIZE-1)*NUM_FEATURES*MUT_RATE)
## ???????

```



```
~/anaconda3/lib/python3.7/site-packages/ipykernel/kernelbase.py in
↳ raw_input(self, prompt)
    857         self._parent_ident,
    858         self._parent_header,
--> 859         password=False,
    860     )
    861
```

```
~/anaconda3/lib/python3.7/site-packages/ipykernel/kernelbase.py in
↳ _input_request(self, prompt, ident, parent, password)
    887         except KeyboardInterrupt:
    888             # re-raise KeyboardInterrupt, to truncate traceback
--> 889             raise KeyboardInterrupt
    890         else:
    891             break
```

KeyboardInterrupt:

```
[177]: print(tot_crosses)
       print(same_crosses)
```

```
98
0
```

```
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8
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[29]: #print(get_fitness_value(generation_info[0]["members"][0]))
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[180]: print(anmol_arr)
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```

```

[181]: with open('json_dump_test_8th_STINT_2_check.json','w') as fd:
        obj={}

```

```

print(type(anmol_arr[0]["errors_returned"]))
obj["anmol_arr"]=anmol_arr
obj["generation_info"]=generation_info
obj["trace_arr"]=trace_arr
#print(type(anmol_arr))
#obj["b"]=[1,2,3,4]
json.dump(obj, fd)

```

```
<class 'list'>
```

```

#print(len(generation_info)) with open('json_dump.txt','w') as fd: for obj in generation_info:
#print(obj) obj = {'members': obj['members'].tolist()} json.dump(obj, fd)

```

1 json.dumps(generation_info)

2 print(generation_info)

```
[182]: print("trace_arr is ", trace_arr)
```

```

trace_arr is [[{'generation': 1, 'try_vector': [0.07144470438737868,
-1.024341258927964e-12, -2.234254875776415e-14, 7.518054647321033e-11,
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data = {} for i in range(0, 11): data[i] = [] data['errors_training'] = [] data['errors_validation'] =
[]

for doc in coll.find({}, {'_id': False}):
    # print(doc)
    for i in range(0, 11):
        data[i].append(doc['try_vector'][i])

    data['errors_training'].append(doc['errors'][0])
    data['errors_validation'].append(doc['errors'][1])

# print(data)

df = pd.DataFrame(data).sort_values(
    by=['errors_training', 'errors_validation'])
print(df)
with open('history.txt', 'w') as f:
    print(df, file=f)

```

[]:

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