

7_March_mongo_version

March 7, 2021

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

```
[56]: NUM_FEATURES=11
LB_LIMIT=-10
UB_LIMIT=10
MAX_ITR=10
MIN_COST=-999999 # ??/
POP_SIZE=20
MUT_RATE=0.3
RETENTION_RATE=0.25 # selection rate from prev generation
TODAY = "7th March, STINT_1 for outrageous penalty penalisation"
```

```
[57]: 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']
```

```
[58]: 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 4

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

global_storage=[]
```

```
[59]: 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'))
```

```
[60]: anmol_arr=[]
```

```
[61]: 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

    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

```

```

[62]: 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

```

```

[63]: 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

```

```
[64]: 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}})
```

```
[65]: global_json=[]
```

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

```
[]
```

```
[68]: 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]
        v=its_fitness_val[1]
        punish = 0
        punish += 1e11 if (t/v) < 3 else 0
```

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punish += 1e12 if t < 2e11 else 0
punish += 1e12 if v > 1e11 else 0
fitness_val= max(t,v) + punish
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

```

```
[69]: 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])  
  
  
# $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$  
  
# print("Sorted indices are \n", sort_indices)  
#sin(x) : 0, 45, 90  
#90, 45,0 (1, 1/root 2, 0)  
#45->1/root 2
```

```

#0->0
'''print("\nSorted members are \n")
print(*sorted_members_list, sep='\n')
print("-----")

print("\nSorted costs are \n")
print(*sorted_costs, sep='\n')
print("#####")
'''

return sorted_members_list, sorted_costs, unsorted_errors_traced_here,
↪sort_indices

```

```

[70]: def get_probabilities(n):
    numerator=np.arange(1,n+1)
    #print("init is ", numerator)
    numerator*=-1
    denom=(n*(n+1))/2
    numerator+=n+1
    #print("init is ", numerator)

    numerator=np.divide(numerator, denom)
    return numerator

```

```

[71]: def blend_crossover(parent1, parent2):

    '''
    [ x1- (x2-x1), x2+ (x2-x1)]
    '''

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

    num_genes=len(parent1)
    alpha=0.5

    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()

```

```

[72]: 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  $\eta = 1$ .'''

    '''The SBX operator generates offspring symmetrically about the parents,
    →which prevents
    bias towards any of the parents. For large values of  $\eta$  there is a higher
    →probability that
    offspring will be created near the parents. For small  $\eta$  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()

```

```

[74]: def get_mutated_version(arr, really=False):
    mut_prob_now=0.8
    arr=arr.tolist().copy()
    if really:
        #arr=arr.tolist()
        #print(arr)
        len_arr=len(arr)
        for i in range(0,len_arr):
            prob=random.uniform(0, 1)
            if prob<=mut_prob_now:
                curr_val=arr[i]
                if curr_val==0:
                    curr_val=1
                d_val=random.uniform(-abs(0.4*curr_val), abs(0.4*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

```

```

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

CURR_GEN_NUM=1
init_arr=np.array(
[
[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],

[0.04141639993961189, -1.0117081002184981e-12, -1.2994472471499564e-14, 7.
↪893352705113582e-11, -1.604137146808921e-10, -1.485052578582483e-15, 1.
↪0198774026946e-15, 2.0174164573336113e-05, -1.8350397232297526e-06, -7.
↪936364861853528e-09, 7.44044375654244e-10],

[0.05658892175271817, -1.0887038992714193e-12, -8.217466945173303e-14, 7.
↪42364385310126e-11, -1.549785938631631e-10, -1.3658858675157026e-15, 9.
↪474638055926674e-16, 2.049206132808684e-05, -1.8322094202807788e-06, -8.
↪992400344193647e-09, 7.612678224363422e-10],

[0.06660857981986575, -1.0485050121958876e-12, -5.1848667969262964e-14, 7.
↪383933420226818e-11, -1.7053996301357693e-10, -1.3517735508065022e-15, 9.
↪940306295422784e-16, 2.0328653526252607e-05, -1.8372934741650584e-06, -8.
↪424049358979012e-09, 7.532416052416367e-10],

[0.04108911210817906, -1.015583657495513e-12, -1.803672317884344e-14, 7.
↪889503608797325e-11, -1.5928343695820595e-10, -1.4800140859826129e-15, 1.
↪0141756787398243e-15, 2.0253219398914574e-05, -1.8438561327335002e-06, -8.
↪040079184305093e-09, 7.454157721498462e-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<5:
        starting_population_mat[i]=get_mutated_version(np.array(init_arr[i%5]),
↳False)
    else:
        starting_population_mat[i]=get_mutated_version(np.
↳array(init_arr[i%5]),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)

```

(5, 11)

Starting pop is

```

[ 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]

[ 4.14163999e-02 -1.01170810e-12 -1.29944725e-14  7.89335271e-11
 -1.60413715e-10 -1.48505258e-15  1.01987740e-15  2.01741646e-05
 -1.83503972e-06 -7.93636486e-09  7.44044376e-10]

[ 5.65889218e-02 -1.08870390e-12 -8.21746695e-14  7.42364385e-11
 -1.54978594e-10 -1.36588587e-15  9.47463806e-16  2.04920613e-05
 -1.83220942e-06 -8.99240034e-09  7.61267822e-10]

[ 6.66085798e-02 -1.04850501e-12 -5.18486680e-14  7.38393342e-11
 -1.70539963e-10 -1.35177355e-15  9.94030630e-16  2.03286535e-05
 -1.83729347e-06 -8.42404936e-09  7.53241605e-10]

[ 4.10891121e-02 -1.01558366e-12 -1.80367232e-14  7.88950361e-11
 -1.59283437e-10 -1.48001409e-15  1.01417568e-15  2.02532194e-05
 -1.84385613e-06 -8.04007918e-09  7.45415772e-10]

```

[9.87422586e-02 -6.90219903e-13 -2.23425488e-14 7.51805465e-11
-2.01648700e-10 -1.73059779e-15 1.17657477e-15 2.39149828e-05
-1.83767994e-06 -1.04738953e-08 7.87101833e-10]

[5.13545336e-02 -9.92866206e-13 -1.46401684e-14 7.89335271e-11
-9.97577935e-11 -1.26351672e-15 1.13079136e-15 1.77013161e-05
-1.45961121e-06 -7.74248940e-09 9.07318055e-10]

[4.98780581e-02 -8.89728364e-13 -4.98894311e-14 9.26666159e-11
-1.54978594e-10 -1.36588587e-15 8.51979338e-16 2.44186899e-05
-1.83772194e-06 -1.12638456e-08 4.85091282e-10]

[7.35712181e-02 -6.47715060e-13 -7.13928278e-14 7.71459549e-11
-2.10651274e-10 -1.52752962e-15 7.77642389e-16 2.52745749e-05
-1.99080989e-06 -8.42404936e-09 6.64095319e-10]

[5.47174316e-02 -7.24998782e-13 -1.80367232e-14 6.31258824e-11
-1.59283437e-10 -1.47339731e-15 9.15638549e-16 2.29962140e-05
-1.84385613e-06 -1.11580445e-08 7.29963559e-10]

[5.12402520e-02 -1.07948315e-12 -2.13663944e-14 9.09234606e-11
-2.43198467e-10 -1.69118351e-15 1.03636300e-15 1.97293463e-05
-2.56503852e-06 -7.68203725e-09 7.43354864e-10]

[5.66465370e-02 -8.06934342e-13 -1.37799032e-14 7.34184952e-11
-2.14193851e-10 -1.48505258e-15 6.51693277e-16 2.01741646e-05
-1.99748422e-06 -7.93636486e-09 7.42434790e-10]

[5.65889218e-02 -1.22494155e-12 -1.00157516e-13 4.69383882e-11
-1.85069679e-10 -1.36937643e-15 1.30876759e-15 1.37441246e-05
-2.44643730e-06 -6.52706342e-09 7.61267822e-10]

[4.11390196e-02 -1.05254039e-12 -3.56105562e-14 9.35859525e-11
-2.12159563e-10 -1.17884216e-15 1.10662365e-15 1.87137855e-05
-1.75011830e-06 -6.19698642e-09 9.46139957e-10]

[5.60228499e-02 -1.08272828e-12 -1.50057161e-14 8.18549027e-11
-1.97576413e-10 -9.79890631e-16 1.26209278e-15 2.47630076e-05
-1.73488060e-06 -5.65534376e-09 4.57652628e-10]

[7.14447044e-02 -1.29677966e-12 -3.02701824e-14 9.05278761e-11
-2.43453058e-10 -1.90086316e-15 6.32090344e-16 1.97293463e-05
-2.12921456e-06 -7.22745221e-09 7.43354864e-10]

[5.47104686e-02 -1.11927919e-12 -1.32674479e-14 7.64655523e-11
-1.23144218e-10 -1.61680594e-15 1.18831321e-15 2.53447308e-05
-1.83641314e-06 -8.16071254e-09 7.44044376e-10]

```
[ 7.11314884e-02 -1.08870390e-12 -7.46412389e-14  7.42364385e-11
 -1.83365995e-10 -1.11347594e-15  9.47463806e-16  1.92356593e-05
 -1.83220942e-06 -8.99240034e-09  4.89130512e-10]
```

```
[ 4.30712666e-02 -1.16131039e-12 -5.18486680e-14  9.38541218e-11
 -1.70539963e-10 -1.75868227e-15  9.71705940e-16  2.03286535e-05
 -2.32837225e-06 -9.21927058e-09  9.38373899e-10]
```

```
[ 5.39428712e-02 -1.12646555e-12 -2.16983280e-14  7.43131181e-11
 -1.66502027e-10 -1.48001409e-15  7.55579583e-16  2.27202167e-05
 -1.50678241e-06 -8.65027321e-09  6.74221354e-10]
```

```
[77]: 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
      })
```

```
[78]: 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': [0.07144470438737868, -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],
'errors': [-1, -1], 'mother_vec': [0.07144470438737868, -1.024341258927964e-12,
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'father_vec': [0.05658892175271817, -1.2249415455638981e-12,
```

```
-1.0015751592454839e-13, 4.693838823441354e-11, -1.8506967928619094e-10,  
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penalty penalisation', 'survived': False}
```

```
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-1.1788421552794073e-15, 1.106623646715594e-15, 1.8713785529109325e-05,  
-1.7501182954578924e-06, -6.196986421643499e-09, 9.461399571777572e-10], 'beta':  
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```

```
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-9.79890631447529e-16, 1.262092784626404e-15, 2.4763007564231e-05,  
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-9.79890631447529e-16, 1.262092784626404e-15, 2.4763007564231e-05,  
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-9.79890631447529e-16, 1.262092784626404e-15, 2.4763007564231e-05,  
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```

```
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-1.900863155731281e-15, 6.320903435777576e-16, 1.972934634335282e-05,
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-3.0270182375365753e-14, 9.052787605679302e-11, -2.434530584155614e-10,
-1.900863155731281e-15, 6.320903435777576e-16, 1.972934634335282e-05,
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```
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```

```
-1.1134759396784308e-15, 9.474638055926674e-16, 1.923565931699251e-05,  
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```

```
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STINT_1 for outrageous penalty penalisation', 'survived': False}
```

```
[79]: 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")
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 namey
```

```
[80]: MUT_RATE
```

```
[80]: 0.3
```

```
[81]: 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("-----")

# random_rows=

'''
%-----
% The new offspring and mutated chromosomes are
% evaluated
'''

#print(type(new_parents))

parents_now=new_parents
generation_info.append({"members":new_parents, "mut_magnitude":
↪mut_magnitude})

mut_magnitude=float(input("Enter mutation magnitude:"))
MUT_RATE=float(input("Enter fraction of cells you want to mutate:"))
num_cells_mutate=math.ceil((POP_SIZE-1)*NUM_FEATURES*MUT_RATE) ## ??????

```

/home/anmolagarwal/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:11: DeprecationWarning: count is deprecated. Use Collection.count_documents instead.

This is added back by InteractiveShellApp.init_path()

```

exist? 1
exist? 1
exist? 1
exist? 1
exist? 1
exist? 0
exist? 0
exist? 0
exist? 0
exist? 0
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 25590340184721.805
MIN fitness is 288805030030.3589
fitness vals are: ->

288805030030.3589
315364737641.5538
320863201746.7522
349442835047.57336
371558283058.58466
1486527498210.6138
2485388902928.4927
3470122580646.6895
4171724111331.508
5612513677082.135
6723649998026.753
11971131322917.52
14549386941625.06
19265077102301.227
62632135062012.08
65473497438555.44
67021435174797.56
72734364236865.97
84304402841027.69
88259412718582.6
Enter y to continue.y
parent 1 is [0.04108911210817906, -1.015583657495513e-12,
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-1.4800140859826129e-15, 1.0141756787398243e-15, 2.0253219398914574e-05,
-1.8438561327335002e-06, -8.040079184305093e-09, 7.454157721498462e-10]
parent 2 is [0.051240251986295976, -1.079483152267884e-12,
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-1.6911835073394926e-15, 1.0363630046234666e-15, 1.972934634335282e-05,
-2.5650385157429267e-06, -7.682037245173995e-09, 7.433548643729261e-10]
CHILD 1 is [ 3.92439408e-02 -1.00396866e-12 -1.74314893e-14 7.67086310e-11
-1.44030213e-10 -1.44162985e-15 1.01014269e-15 2.03484437e-05
-1.71276691e-06 -8.10516042e-09 7.45790383e-10]
CHILD 2 is [ 5.30854233e-02 -1.09109815e-12 -2.19716282e-14 9.31098656e-11
-2.58451691e-10 -1.72956774e-15 1.04039599e-15 1.96341220e-05
-2.69612774e-06 -7.61695601e-09 7.42980253e-10]
#-----

```

parent 1 is [0.07144470438737868, -1.024341258927964e-12,
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-1.3903926150219416e-15, 1.0363630046234666e-15, 1.972934634335282e-05,
-1.8376799350638052e-06, -7.682037245173995e-09, 7.433548643729261e-10]
parent 2 is [0.04141639993961189, -1.0117081002184981e-12,
-1.2994472471499564e-14, 7.893352705113582e-11, -1.604137146808921e-10,
-1.485052578582483e-15, 1.0198774026946e-15, 2.0174164573336113e-05,
-1.8350397232297526e-06, -7.936364861853528e-09, 7.44044375654244e-10]
CHILD 1 is [6.72052451e-02 -1.02255768e-12 -2.10227677e-14 7.57104002e-11
-1.77374009e-10 -1.40375691e-15 1.03403553e-15 1.97921467e-05
-1.83730718e-06 -7.71794375e-09 7.43452211e-10]
CHILD 2 is [4.56558592e-02 -1.01349168e-12 -1.43142536e-14 7.84036733e-11
-1.63201838e-10 -1.47168829e-15 1.02220487e-15 2.01113642e-05
-1.83541247e-06 -7.90045835e-09 7.43947029e-10]
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parent 1 is [0.04108911210817906, -1.015583657495513e-12,
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-1.4800140859826129e-15, 1.0141756787398243e-15, 2.0253219398914574e-05,
-1.8438561327335002e-06, -8.040079184305093e-09, 7.454157721498462e-10]
parent 2 is [0.09874225859356164, -6.902199032663343e-13,
-2.234254875776415e-14, 7.518054647321033e-11, -2.0164869955755928e-10,
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-1.8376799350638052e-06, -1.047389529650048e-08, 7.871018331104102e-10]
CHILD 1 is [3.55404873e-02 -1.04689715e-12 -1.76223241e-14 7.92525241e-11
-1.55206141e-10 -1.45589754e-15 9.98546148e-16 1.99008058e-05
-1.84445054e-06 -7.80584509e-09 7.41403843e-10]
CHILD 2 is [1.04290883e-01 -6.58906410e-13 -2.27569478e-14 7.48230585e-11
-2.05725996e-10 -1.75471434e-15 1.19220430e-15 2.42673963e-05
-1.83708553e-06 -1.07081294e-08 7.91113762e-10]
#-----
parent 1 is [0.04113901959671902, -1.05254038604447e-12, -3.561055622942309e-14,
9.358595246650619e-11, -2.1215956300852873e-10, -1.1788421552794073e-15,
1.106623646715594e-15, 1.8713785529109325e-05, -1.7501182954578924e-06,
-6.196986421643499e-09, 9.461399571777572e-10]
parent 2 is [0.07357121809864575, -6.477150600151365e-13,
-7.139282776609207e-14, 7.714595489574242e-11, -2.1065127421867123e-10,
-1.5275296243684317e-15, 7.776423887959767e-16, 2.5274574939924868e-05,
-1.9908098862401653e-06, -8.424049358979012e-09, 6.640953185289153e-10]
CHILD 1 is [3.83966679e-02 -1.08677098e-12 -3.25849343e-14 9.49760603e-11
-2.12287099e-10 -1.14935838e-15 1.13444113e-15 1.81590284e-05
-1.72976627e-06 -6.00867388e-09 9.69988651e-10]
CHILD 2 is [7.63135698e-02 -6.13484466e-13 -7.44184497e-14 7.57558470e-11
-2.10523739e-10 -1.55701340e-15 7.49824901e-16 2.58293320e-05
-2.01116191e-06 -8.61236190e-09 6.40246624e-10]
#-----
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-1.1134759396784308e-15, 9.474638055926674e-16, 1.923565931699251e-05,

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-1.8322094202807788e-06, -8.992400344193647e-09, 4.89130511788216e-10]
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CHILD 1 is [ 7.06664342e-02 -1.08956981e-12 -7.29030925e-14 7.42995685e-11
-1.81660475e-10 -1.12773058e-15 9.54284820e-16 1.94086723e-05
-1.83232847e-06 -8.96884639e-09 4.96349841e-10]
CHILD 2 is [ 5.51755227e-02 -1.11841328e-12 -1.50055944e-14 7.64024223e-11
-1.24849739e-10 -1.60255130e-15 1.18149220e-15 2.51717178e-05
-1.83629409e-06 -8.18426649e-09 7.36825046e-10]
#-----
parent 1 is [0.05658892175271817, -1.0887038992714193e-12,
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parent 2 is [0.06660857981986575, -1.0485050121958876e-12,
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CHILD 1 is [ 5.76831729e-02 -1.08431376e-12 -7.88627539e-14 7.41930706e-11
-1.56678058e-10 -1.36434466e-15 9.52549388e-16 2.04742155e-05
-1.83276465e-06 -8.93033049e-09 7.60391276e-10]
CHILD 2 is [ 6.55143287e-02 -1.05289515e-12 -5.51605835e-14 7.38827021e-11
-1.68840499e-10 -1.35331476e-15 9.88945047e-16 2.03464994e-05
-1.83673824e-06 -8.48611921e-09 7.54118152e-10]
#-----
parent 1 is [0.05658892175271817, -1.0887038992714193e-12,
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CHILD 1 is [ 5.48059994e-02 -1.09585699e-12 -8.75709519e-14 7.43071002e-11
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-1.83130475e-06 -9.09353410e-09 7.62696027e-10]
CHILD 2 is [ 6.83915021e-02 -1.04135192e-12 -4.64523855e-14 7.37686725e-11
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-1.83819814e-06 -8.32291560e-09 7.51813401e-10]
#-----
parent 1 is [0.04108911210817906, -1.015583657495513e-12,
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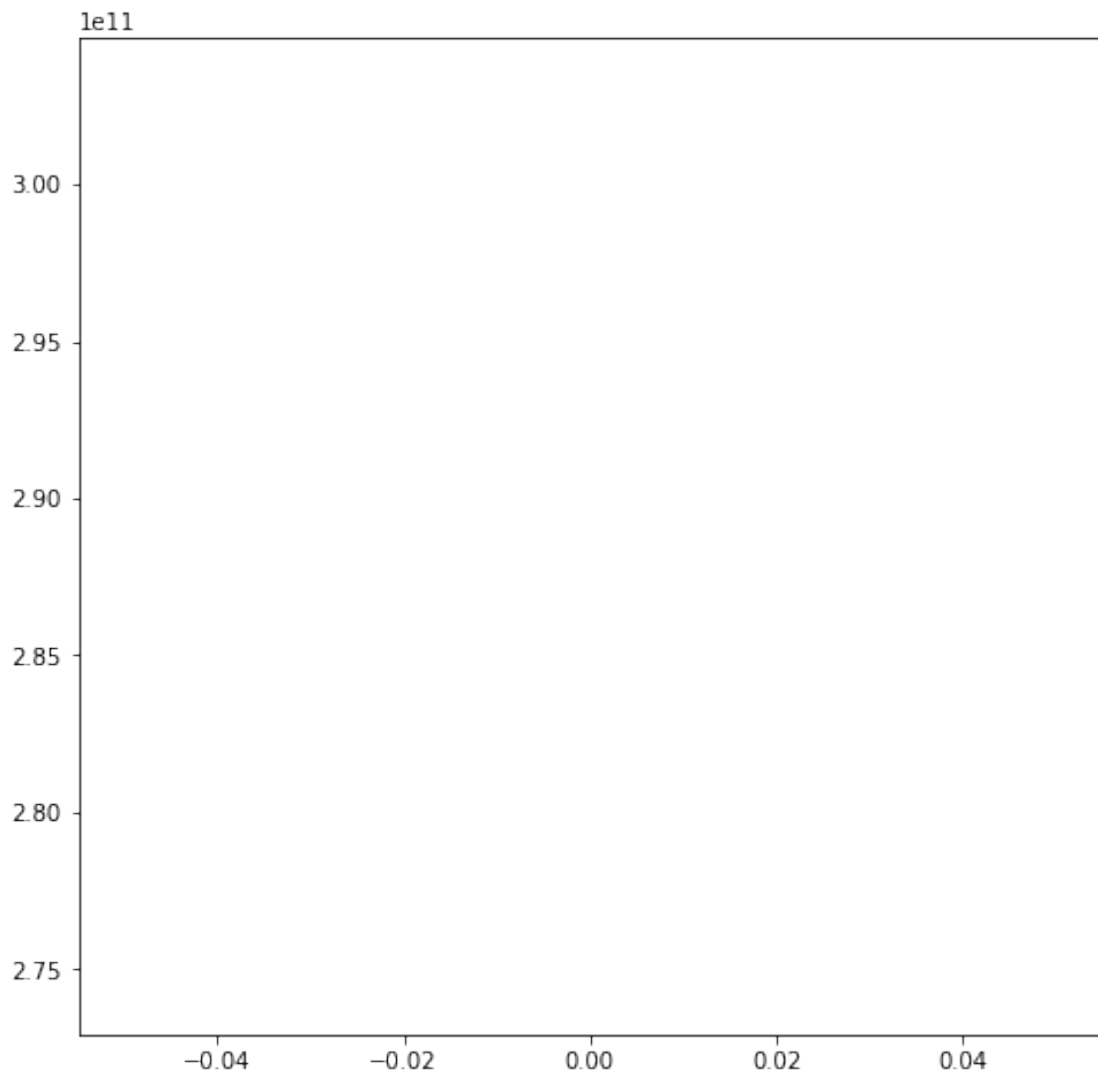
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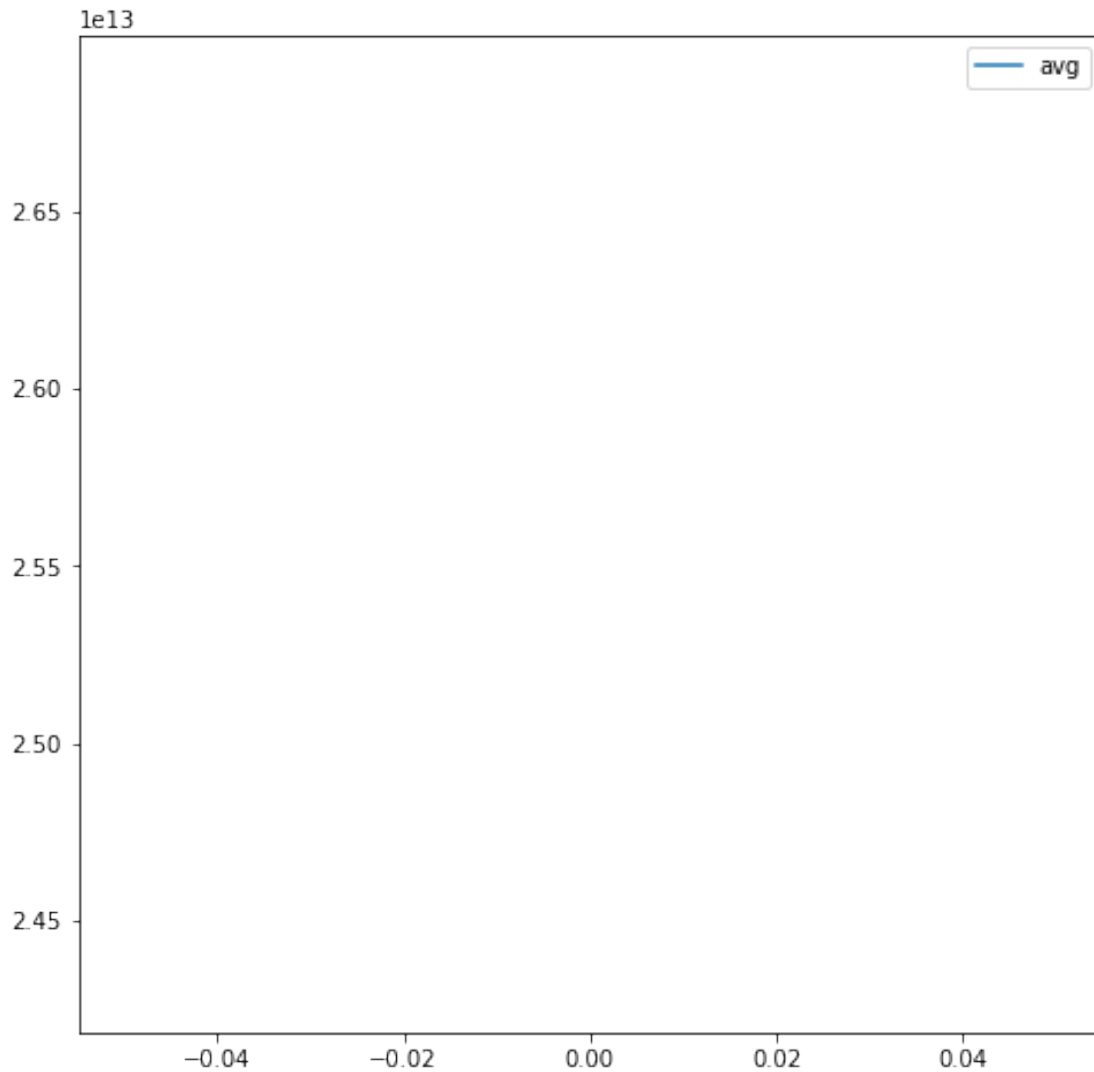
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-1.84161977e-06 -8.92134746e-09 7.60510012e-10]
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Enter mutation magnitude:0.05

Enter fraction of cells you want to mutate:0.3

/home/anmolagarwal/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:11: DeprecationWarning: count is deprecated. Use Collection.count_documents instead.

This is added back by InteractiveShellApp.init_path()

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Avg fitness is 17879743841780.64
MIN fitness is 273687024991.89908
fitness vals are: ->

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Enter y to continue.y

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 CHILD 2 is [7.00396446e-02 -1.00558155e-12 -2.16034244e-14 7.80136813e-11
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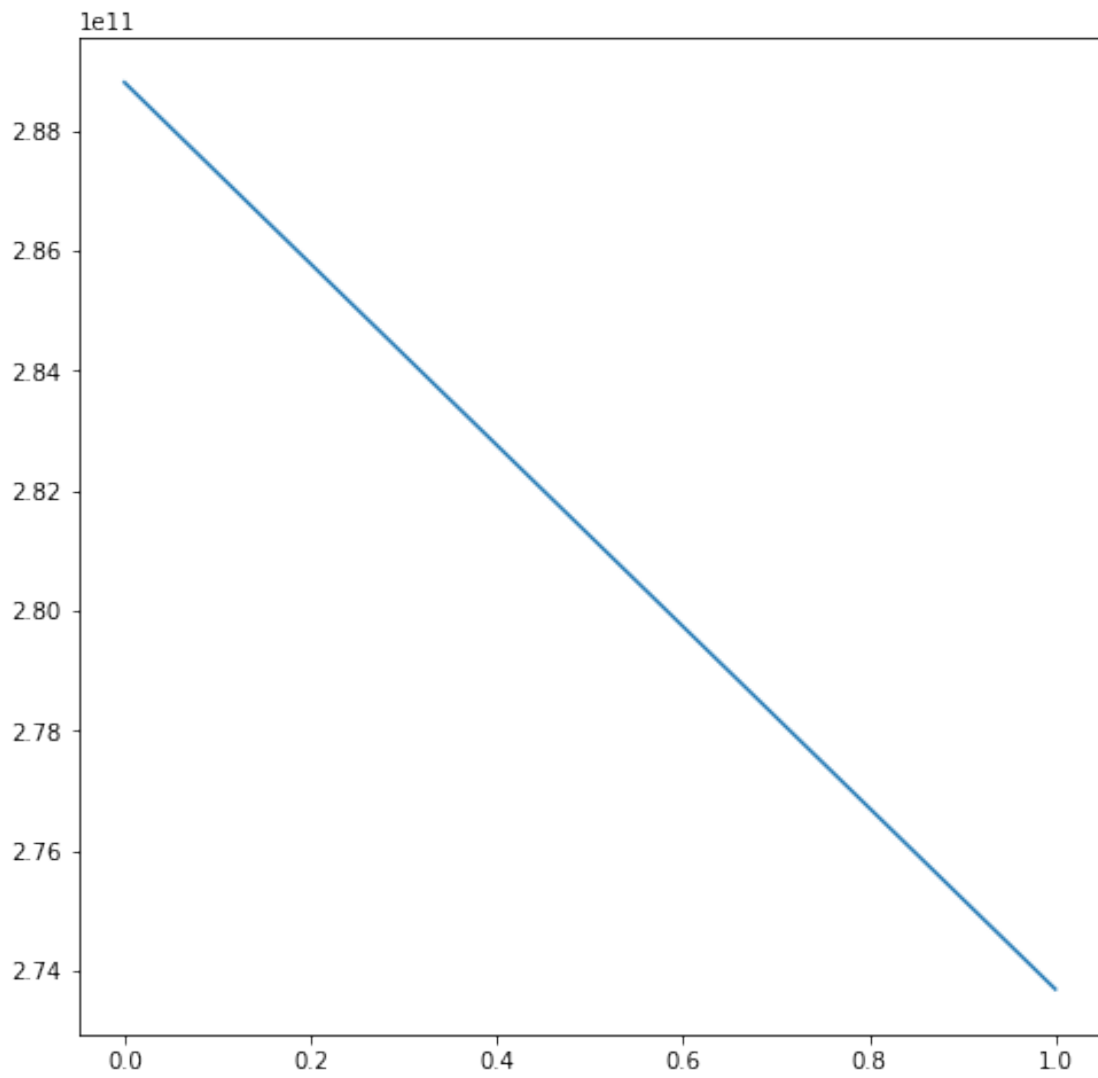
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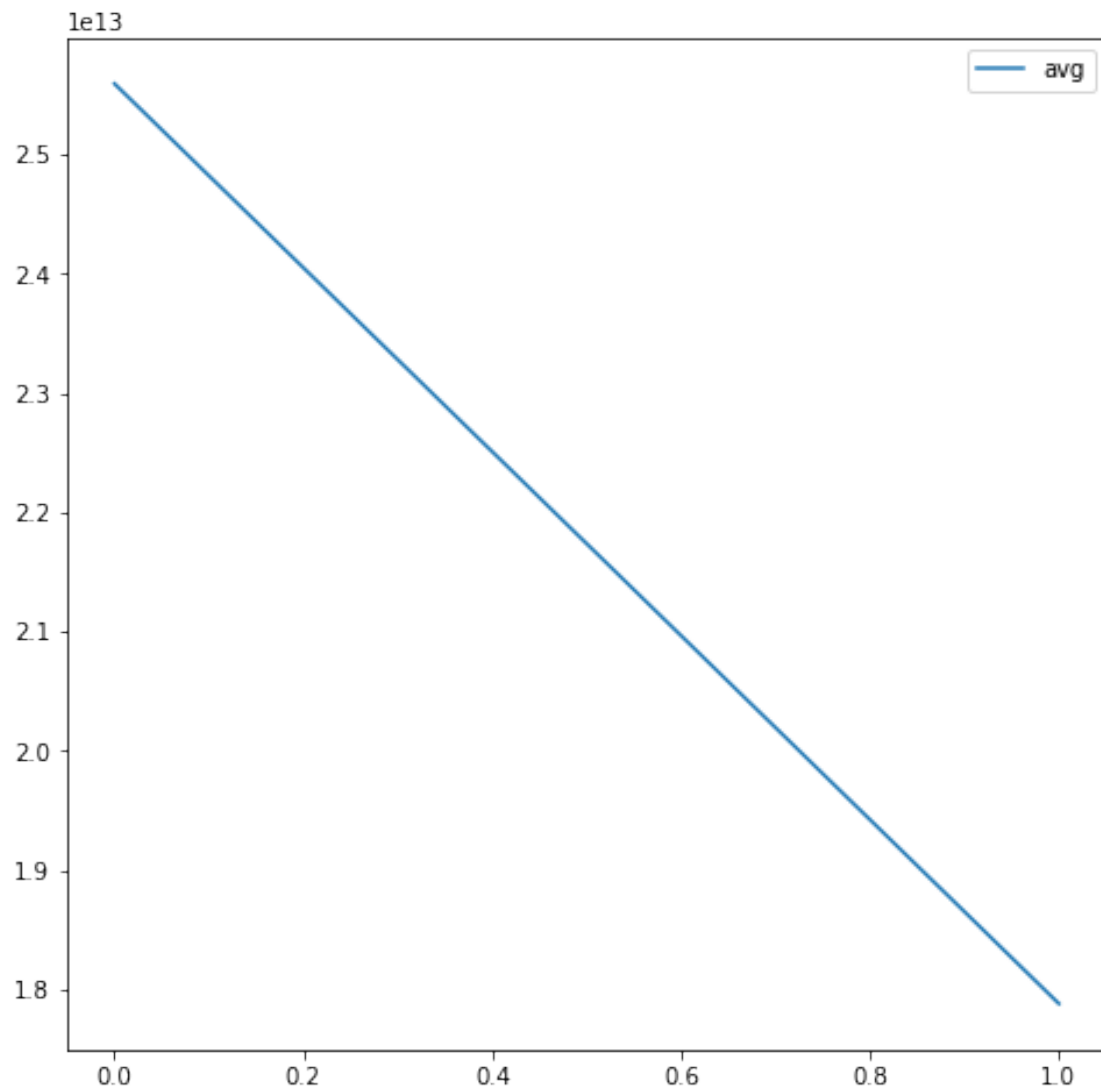
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Enter mutation magnitude:0.05
Enter fraction of cells you want to mutate:0.4

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

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exist? 0
exist? 0
exist? 1
exist? 0
exist? 0

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exist? 0
exist? 0
exist? 0
exist? 0
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MIN fitness is 269788013314.2377
fitness vals are: ->

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Enter y to continue.y

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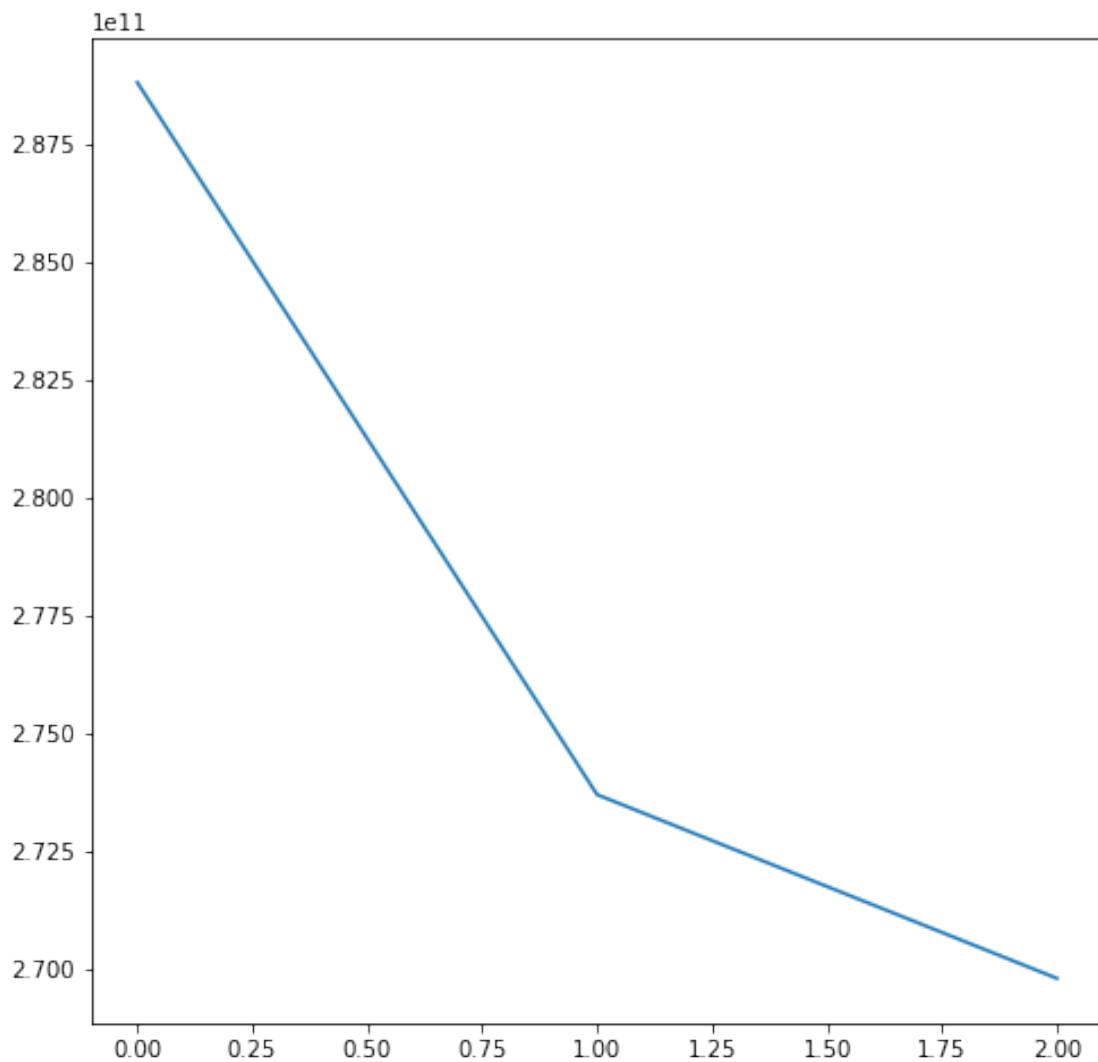
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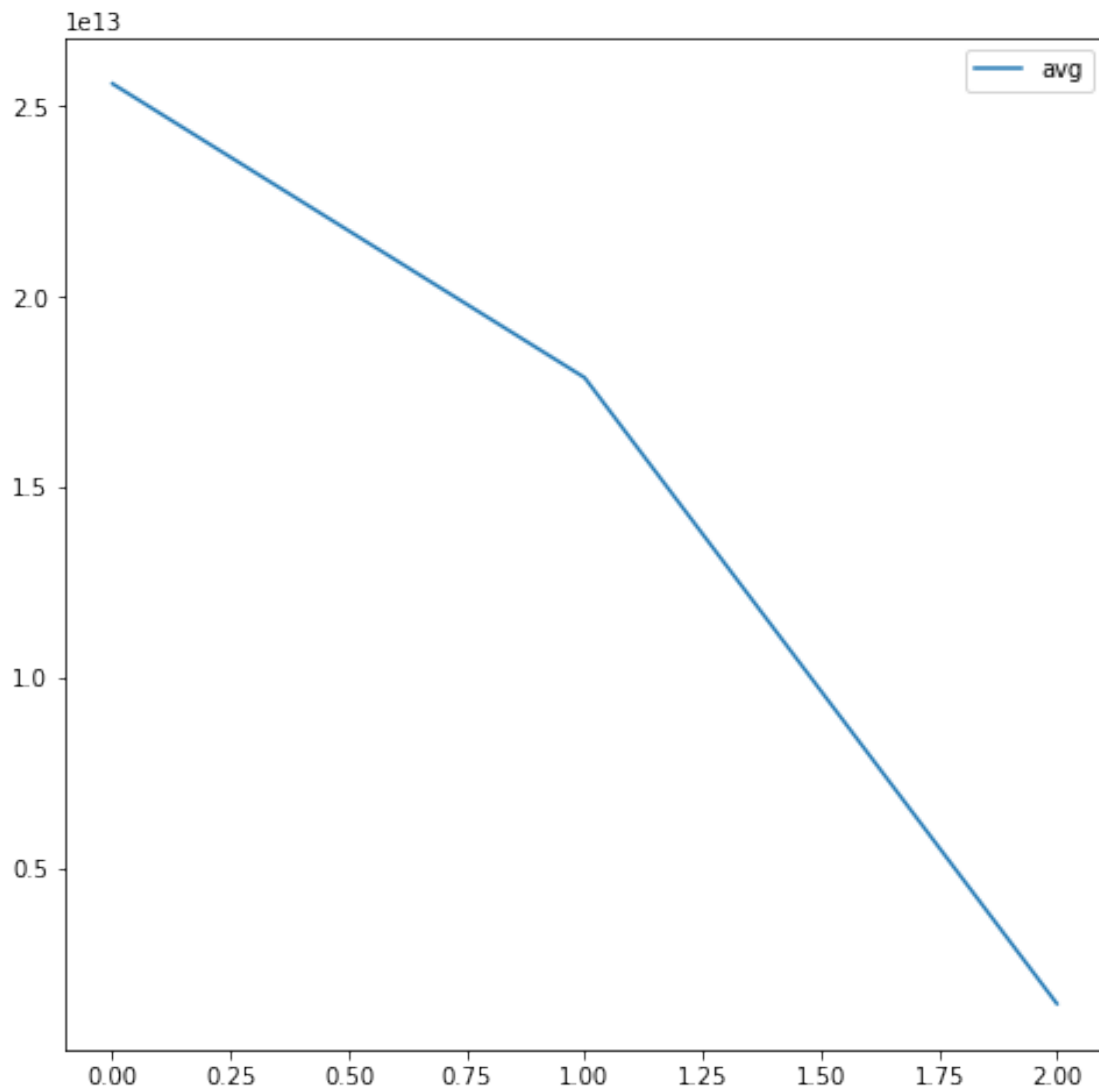
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Enter fraction of cells you want to mutate:0.4
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Collection.count_documents instead.
  # This is added back by InteractiveShellApp.init_path()
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exist?  0

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fitness vals are: ->

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Enter y to continue.y

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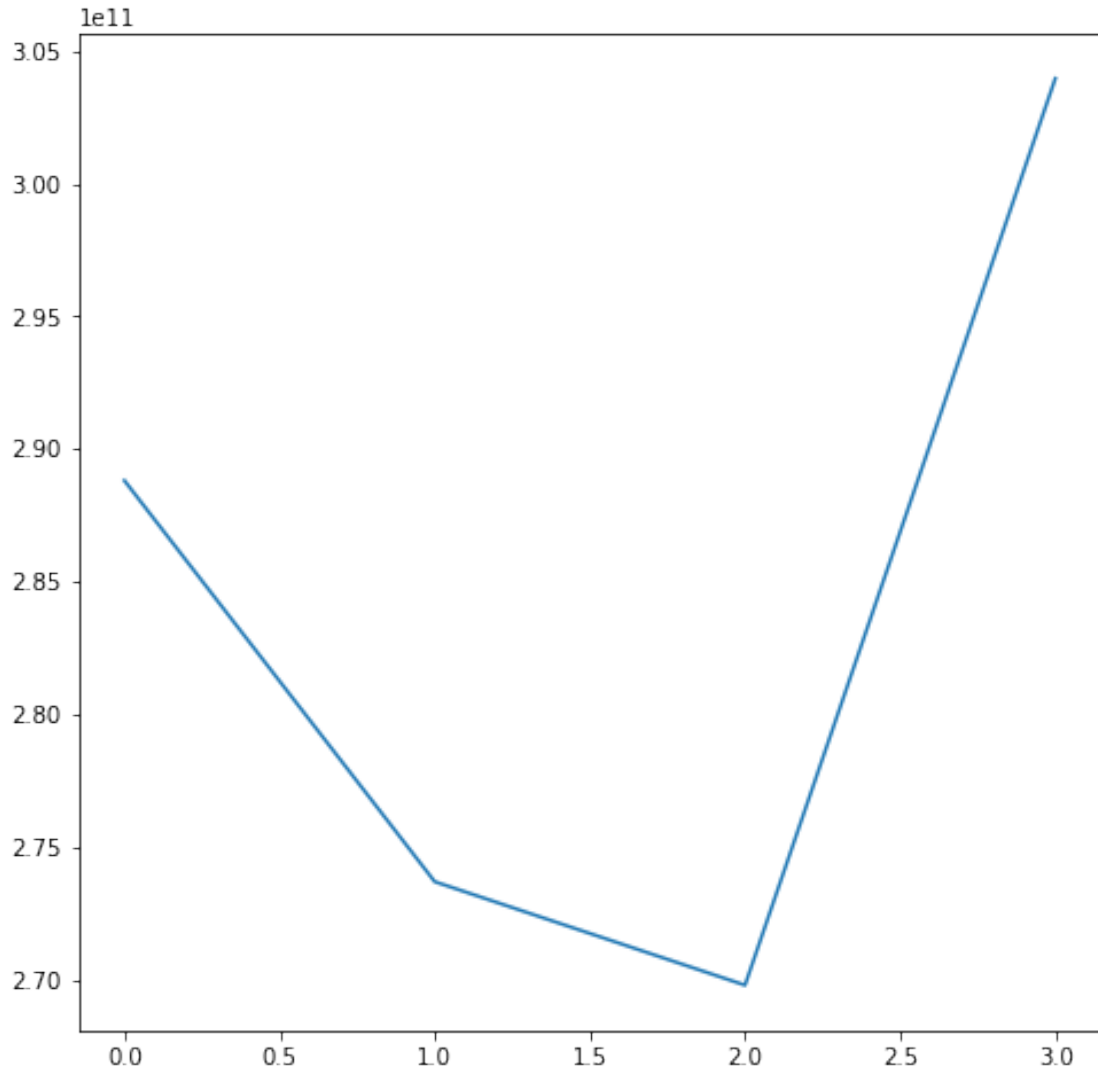
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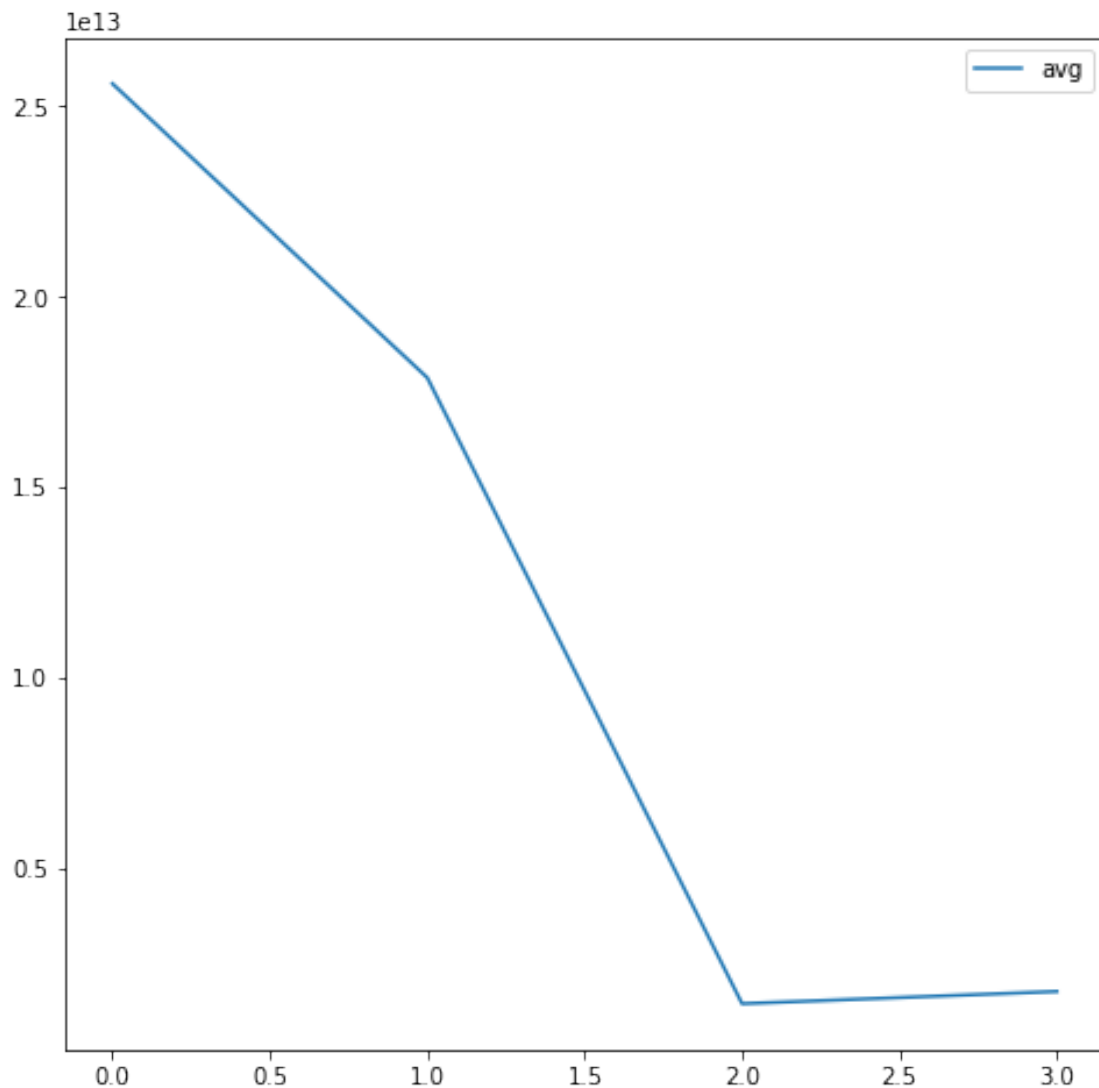
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Enter fraction of cells you want to mutate:0.3

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

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Enter y to continue.y

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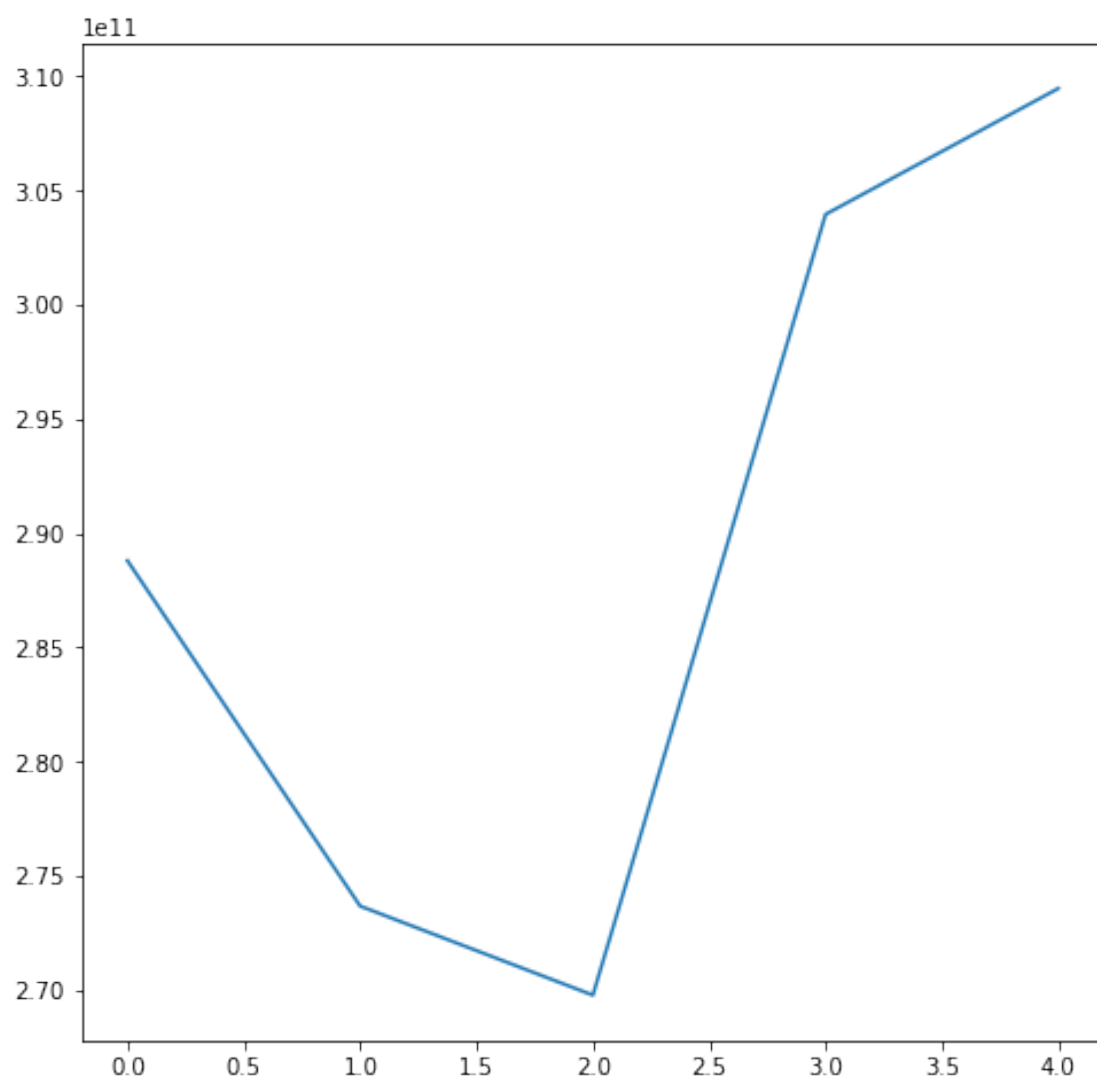
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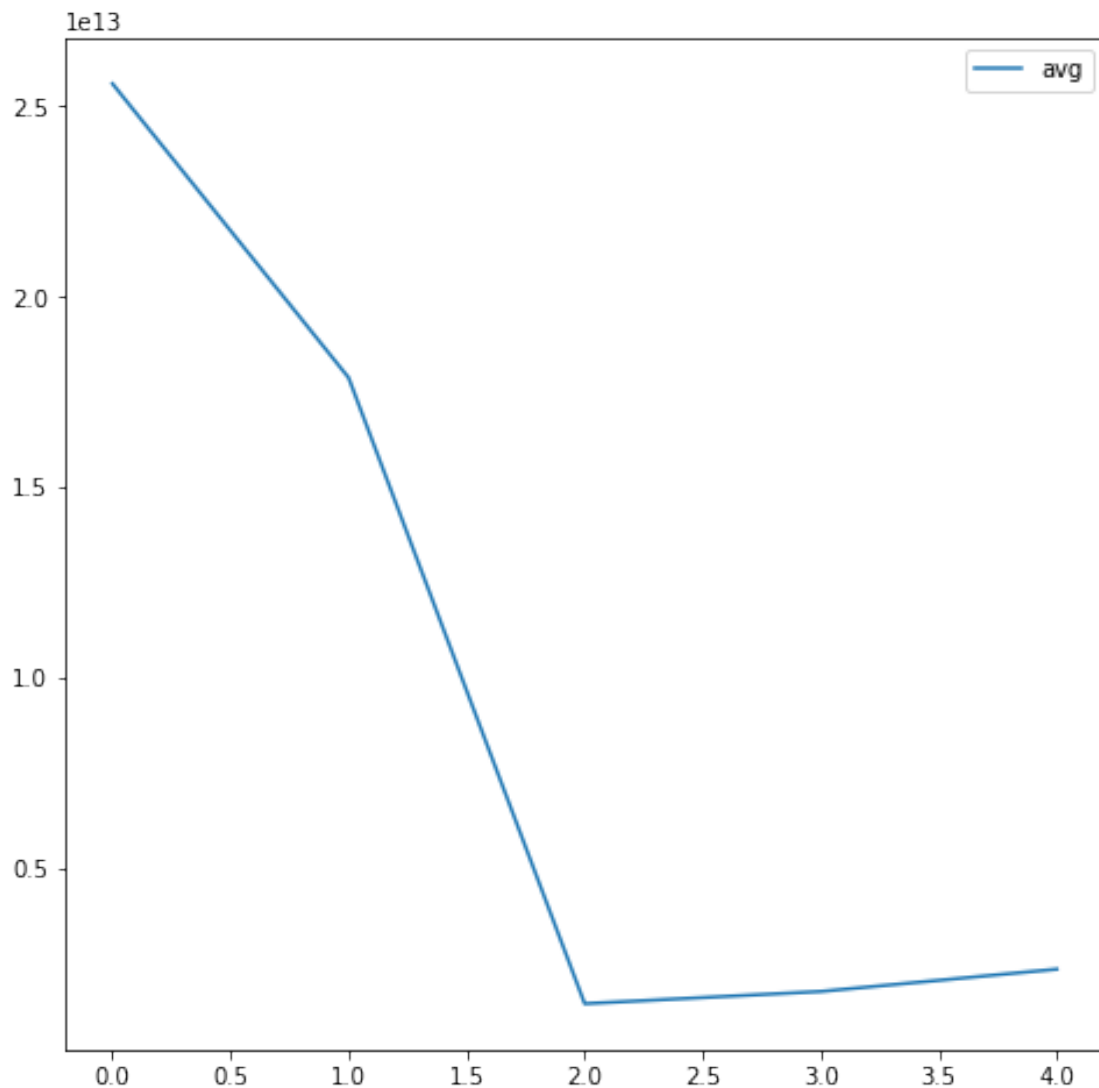
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Enter mutation magnitude:0.2

Enter fraction of cells you want to mutate:0.5

/home/anmolagarwal/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:11: DeprecationWarning: count is deprecated. Use Collection.count_documents instead.

This is added back by InteractiveShellApp.init_path()

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exist? 0
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MIN fitness is 303507050111.9392
fitness vals are: ->

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Enter y to continue.y

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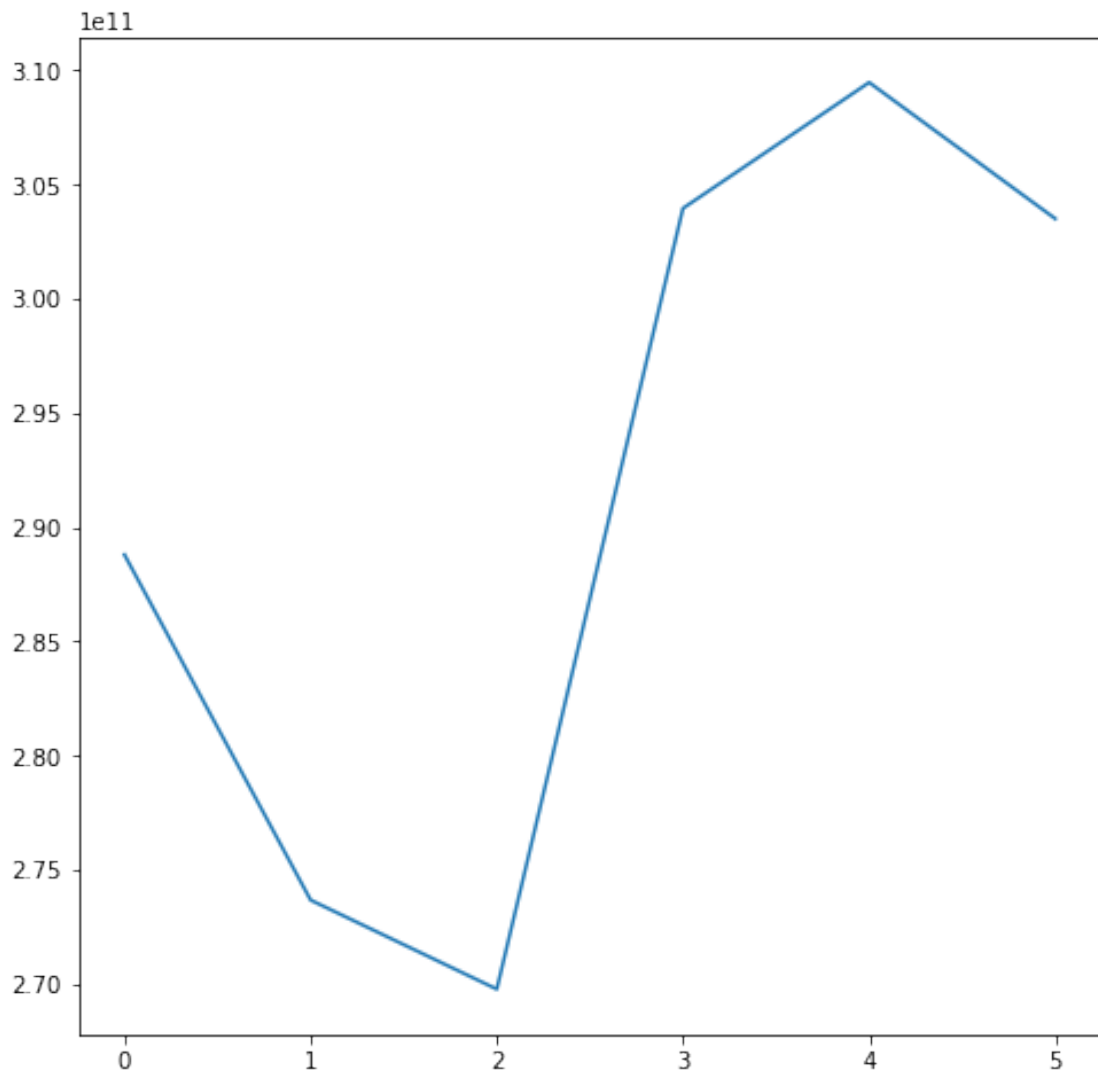
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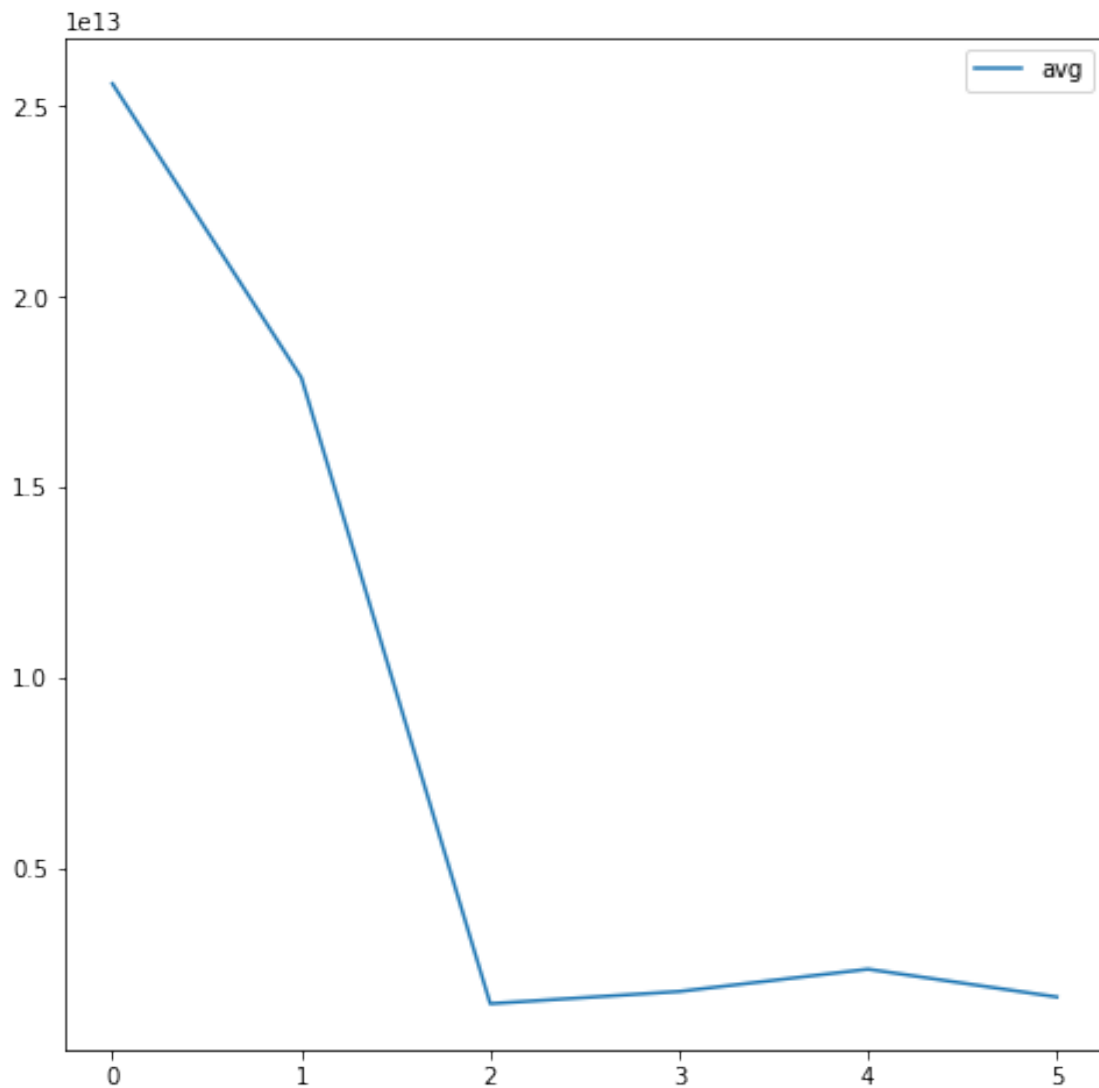
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Enter mutation magnitude:0.3

Enter fraction of cells you want to mutate:0.5

/home/anmolagarwal/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:11: DeprecationWarning: count is deprecated. Use Collection.count_documents instead.

This is added back by InteractiveShellApp.init_path()

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exist? 0
exist? 0
exist? 0
exist? 0
exist? 0

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exist?  0
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MIN fitness is 349604551526.0907
fitness vals are: ->

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Enter y to continue.y

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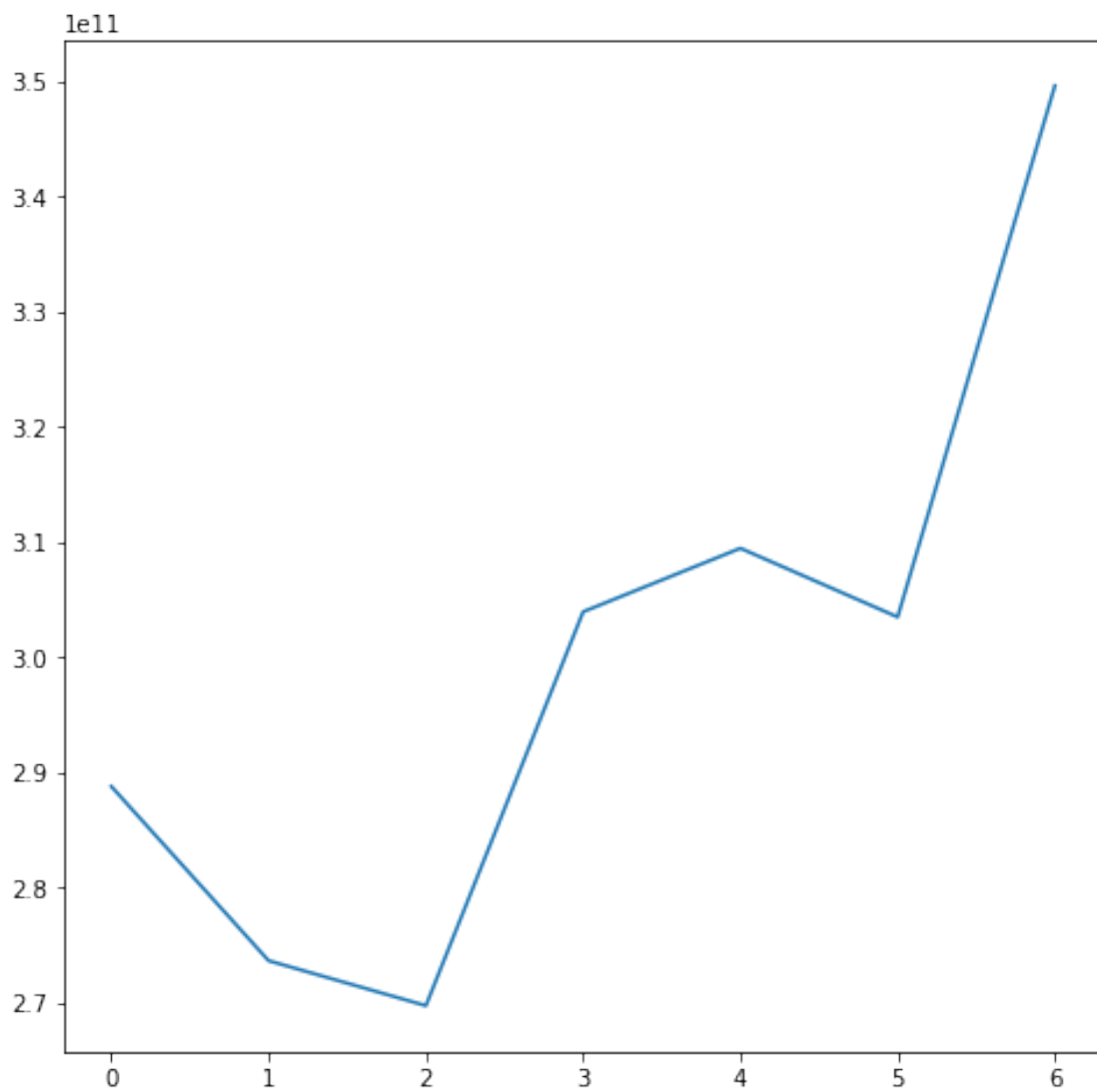
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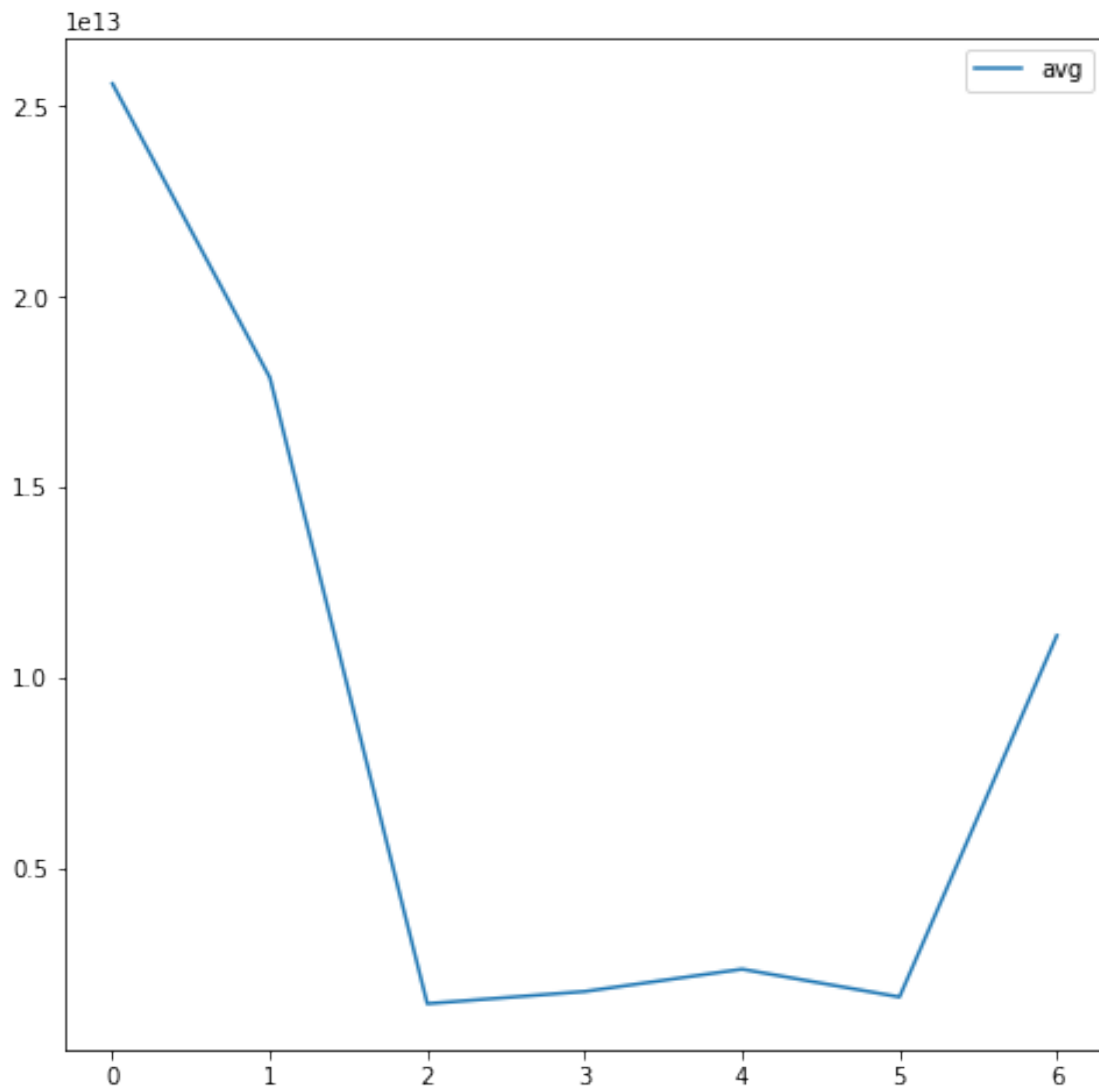
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Enter mutation magnitude:0.07
Enter fraction of cells you want to mutate:0.2

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

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exist? 0
exist? 0
exist? 0
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exist? 0

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Enter y to continue.y

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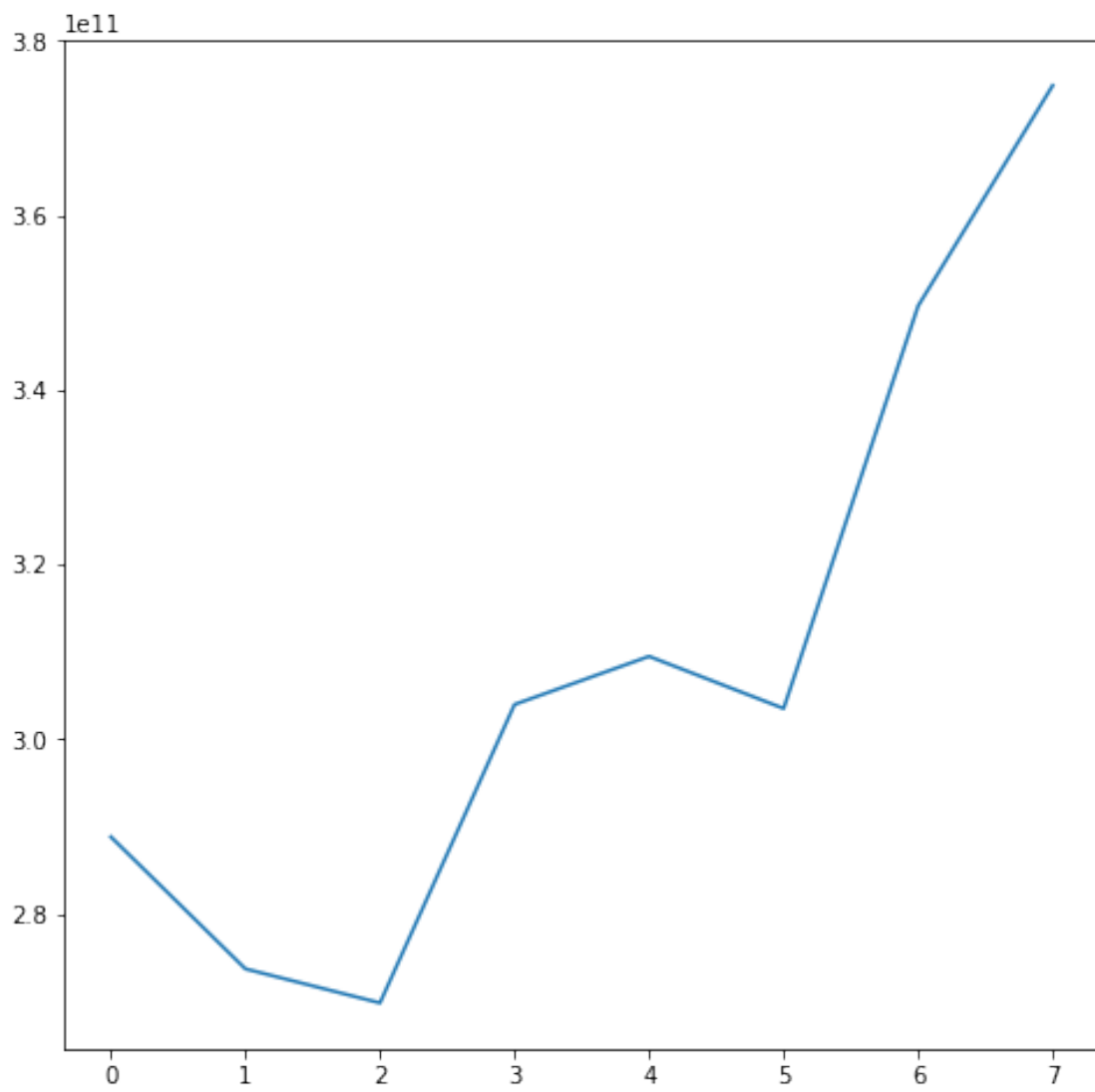
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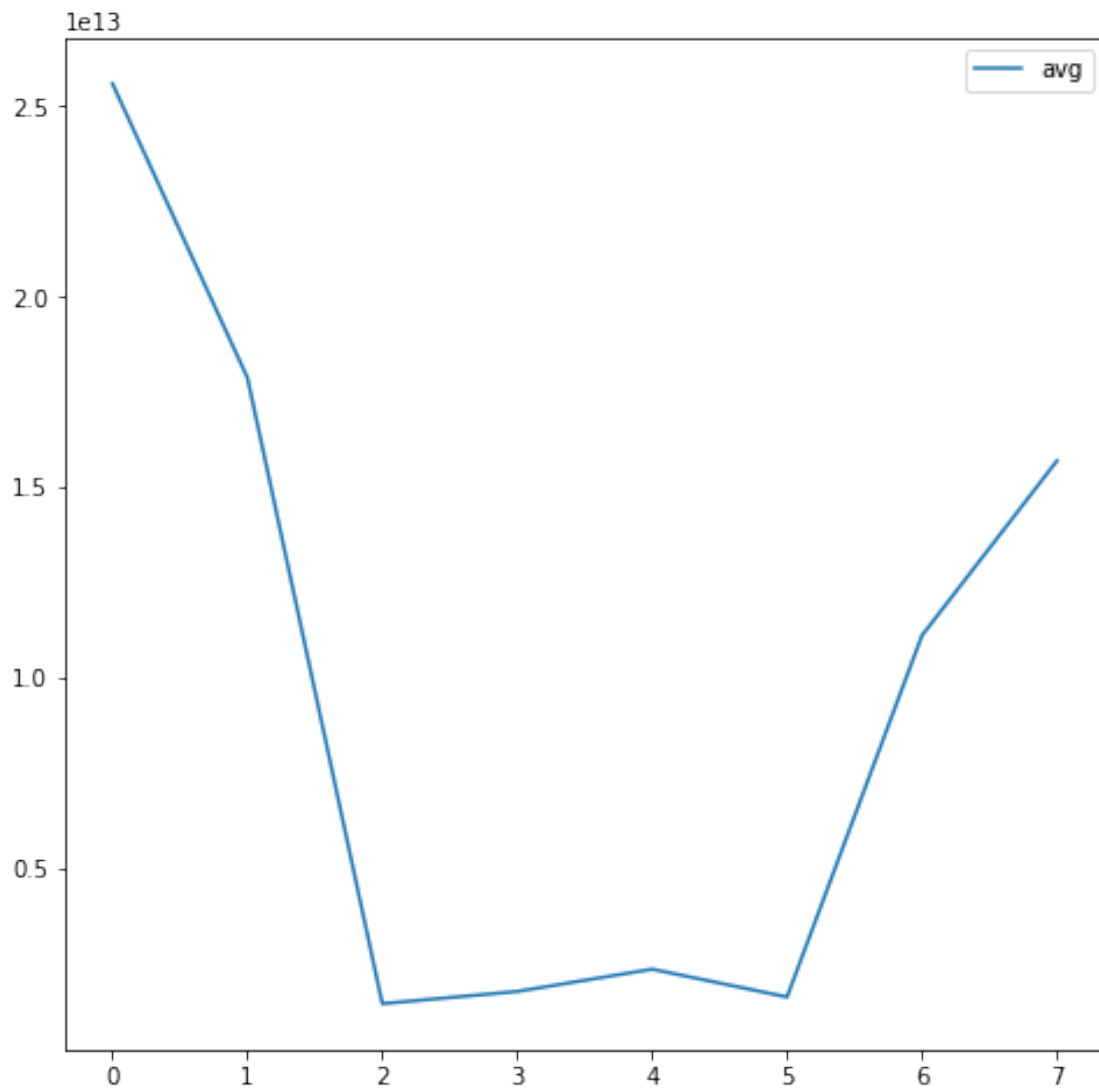
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Enter mutation magnitude:0.3

Enter fraction of cells you want to mutate:0.4

/home/anmolagarwal/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:11: DeprecationWarning: count is deprecated. Use Collection.count_documents instead.

This is added back by InteractiveShellApp.init_path()

exist? 0
exist? 0
exist? 0
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exist? 0
exist? 0

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exist? 0
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MIN fitness is 333029448727.55676
fitness vals are: ->

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Enter y to continue.y

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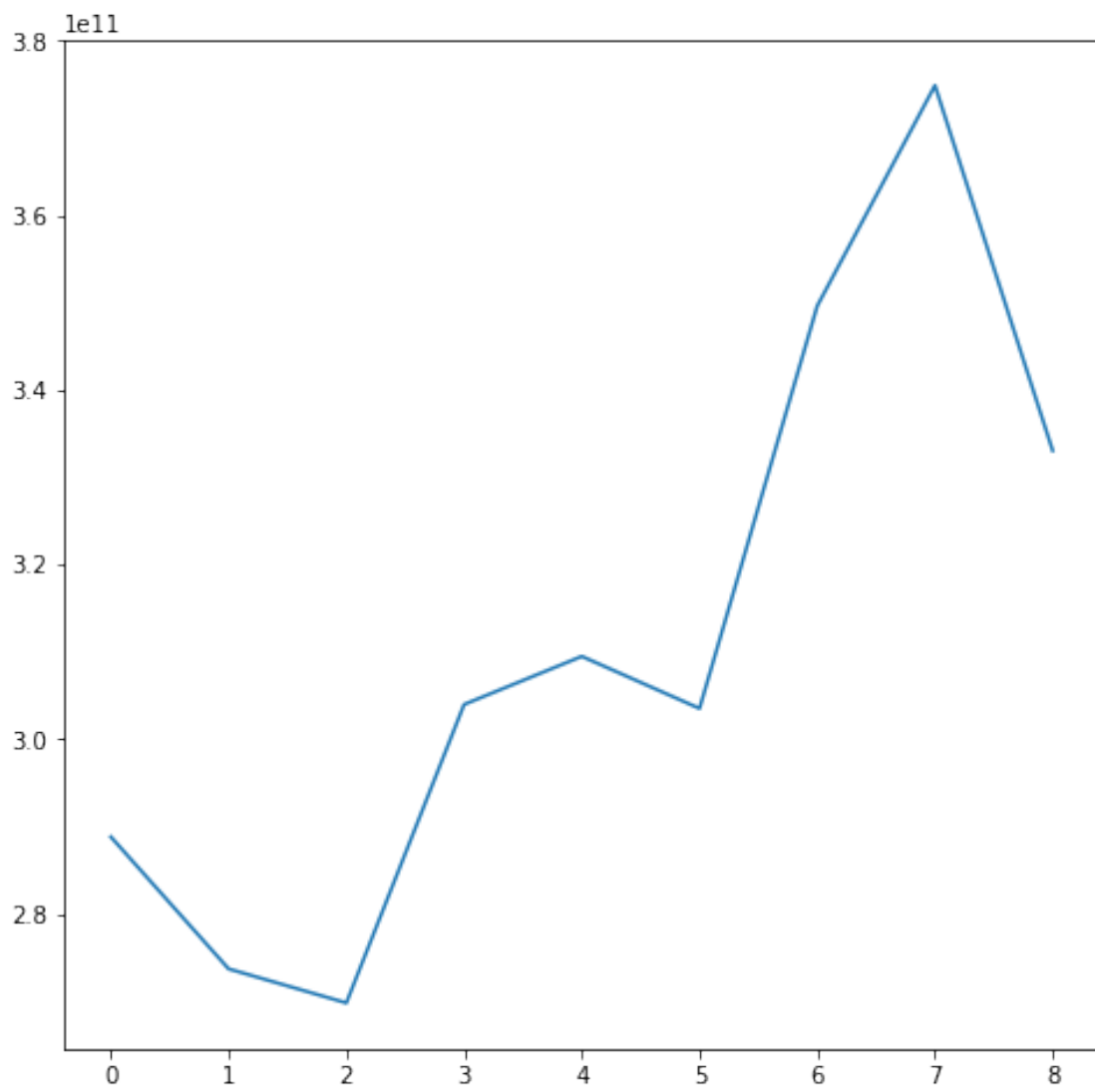
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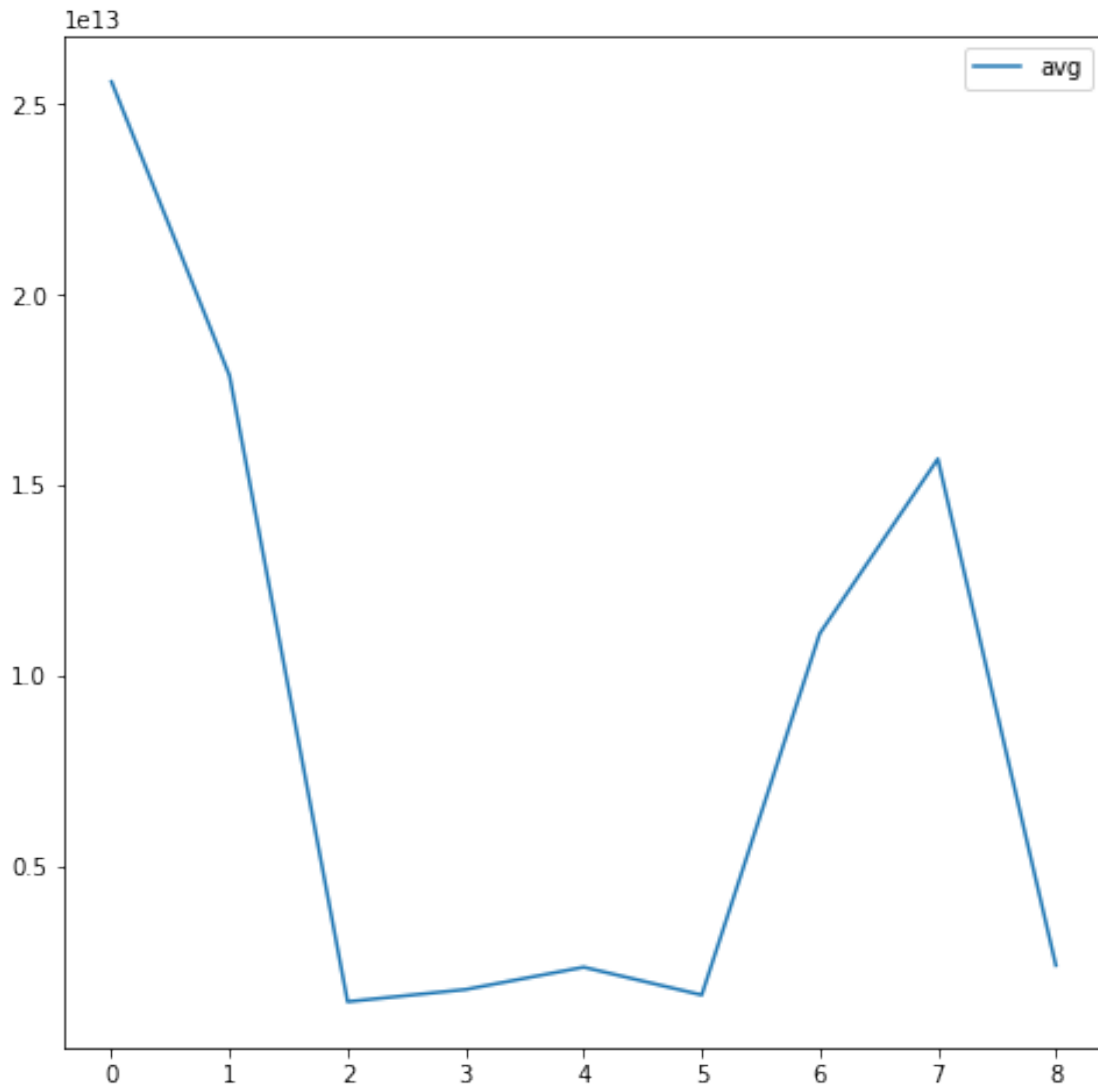
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1854165597491.4094, 2128847153463.201, 2955322330400.7744, 4756843036259.82,
4803802332700.5205, 16685886819022.057]]]

```





Enter mutation magnitude:0.2

Enter fraction of cells you want to mutate:0.4

/home/anmolagarwal/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:11: DeprecationWarning: count is deprecated. Use Collection.count_documents instead.

This is added back by InteractiveShellApp.init_path()

exist? 0
exist? 0
exist? 0
exist? 0
exist? 0
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exist? 0
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exist? 0
exist? 0
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exist? 0
exist? 0
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exist? 0
exist? 0
exist? 0
exist? 0

Avg fitness is 18108181541592.95
MIN fitness is 372388180442.54236
fitness vals are: ->

372388180442.54236
398138034574.6492
409877463062.2617
1412048702067.707
1550883070620.909
1686767690462.9802
1780389255738.4287
1782302783190.1045
1885652910430.2002
1900591117485.8066
2294431514257.122
6496321795119.116
10983475495301.809
18883654316937.895
22892034270833.008
37825605425663.695
38913701778734.664
41915461236120.38
71228298511196.31
97551607279619.39

Enter y to continue.y

parent 1 is [0.06716173684970622, -7.520246371698351e-13,
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-1.8716553446246326e-06, -7.122849222121121e-09, 7.483812287449034e-10]
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-1.8470099142326474e-14, 6.394764871609952e-11, -1.752721880519778e-10,
-1.3718600511201959e-15, 1.2234017023040073e-15, 1.9615595068206856e-05,
-1.8574458315348267e-06, -7.153876867623328e-09, 7.385642511328086e-10]
CHILD 1 is [6.71760702e-02 -7.51773623e-13 -2.74745302e-14 5.91596021e-11

```

-1.76169351e-10 -1.36949115e-15 1.24702894e-15 1.65036500e-05
-1.87192895e-06 -7.12225178e-09 7.48570257e-10]
CHILD 2 is [ 6.64030165e-02 -7.65311805e-13 -1.82999920e-14 6.40381020e-11
-1.75255239e-10 -1.37190480e-15 1.22295535e-15 1.96743843e-05
-1.85717222e-06 -7.15447431e-09 7.38375223e-10]
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-1.8577431073783963e-06, -7.3285875640743365e-09, 7.389692367519607e-10]
CHILD 1 is [ 6.66028396e-02 -7.79206080e-13 -2.05922508e-14 6.69735005e-11
-1.73234845e-10 -1.03505798e-15 1.19904768e-15 1.96426179e-05
-1.84371082e-06 -7.03679927e-09 7.50513780e-10]
CHILD 2 is [ 6.25577677e-02 -7.62197182e-13 -2.06723565e-14 6.64084989e-11
-1.63989082e-10 -1.36170762e-15 1.22825864e-15 1.96256419e-05
-1.85721406e-06 -7.31758653e-09 7.39404491e-10]
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-1.98300586e-10 -1.25027353e-15 1.02607428e-15 1.96430113e-05
-2.33121885e-06 -5.94612626e-09 7.22850293e-10]
CHILD 2 is [ 6.74606026e-02 -7.60301561e-13 -2.37390661e-14 6.42405891e-11
-1.69594914e-10 -9.85320012e-16 1.22574094e-15 1.96433271e-05
-1.76411570e-06 -7.20071408e-09 7.55501264e-10]
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parent 1 is [0.07203916351632209, -1.0667444958383723e-12,
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-1.2890511796285456e-15, 7.622139275324143e-16, 1.932192611260813e-05,
-2.1112682286978357e-06, -6.692675424823702e-09, 7.348913950426076e-10]
parent 2 is [0.07716141697972792, -1.0443219402310077e-12,
1.2175364648380774e-14, 9.151240434034258e-11, -2.0499908144790522e-10,
-1.1390599653289333e-15, 1.1606671598554108e-15, 1.7724314740084854e-05,
-1.7950335757954858e-06, -5.92458407037279e-09, 9.100187616025812e-10]
CHILD 1 is [ 7.12239872e-02 -1.07031291e-12 -5.91406163e-15 8.11522128e-11
-2.07013144e-10 -1.31292139e-15 6.98802452e-16 1.95761765e-05
-2.16159510e-06 -6.81491262e-09 7.07020910e-10]
CHILD 2 is [ 7.79765933e-02 -1.04075352e-12 1.46589430e-14 9.29348015e-11

```

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-2.04722562e-10 -1.11518975e-15 1.22407864e-15 1.74700643e-05
-1.74470670e-06 -5.80234687e-09 9.37889246e-10]
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CHILD 1 is [ 6.63548700e-02 -7.67829762e-13 -1.78097986e-14 6.47968393e-11
-1.76748824e-10 -1.36796737e-15 1.21507115e-15 1.95657576e-05
-1.87739862e-06 -7.13213270e-09 7.34451117e-10]
CHILD 2 is [ 6.48340157e-02 -8.35230767e-13 -1.73706857e-15 8.54674413e-11
-2.12692401e-10 -1.27321356e-15 1.01229281e-15 1.83526383e-05
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CHILD 1 is [ 8.32267222e-02 -9.61924147e-13 -2.69912495e-14 7.90798082e-11
-1.70026087e-10 -1.76951744e-15 1.00280231e-15 1.98394029e-05
-1.63671064e-06 -9.24491470e-09 6.79982086e-10]
CHILD 2 is [ 6.54080343e-02 -9.08446182e-13 2.18612312e-17 1.07145302e-10
-2.71569721e-10 -1.27545248e-15 9.81158220e-16 1.92278057e-05
-1.83933625e-06 -6.61903464e-09 7.19721782e-10]
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-1.29323688e-10 -1.35400653e-15 1.19659192e-15 1.66837222e-05
-1.86600167e-06 -7.02896547e-09 7.43088504e-10]
CHILD 2 is [ 6.89131898e-02 -8.53756353e-13 -2.48861793e-14 6.68245596e-11
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-1.85827689e-06 -7.17919099e-09 7.39272761e-10]
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CHILD 1 is [6.87493637e-02 -7.47074304e-13 -2.84843327e-14 5.78950840e-11
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CHILD 2 is [5.64261236e-02 -7.85499040e-13 -1.93258141e-14 6.84124411e-11
-1.19181994e-10 -1.34763550e-15 1.18940418e-15 1.65719342e-05
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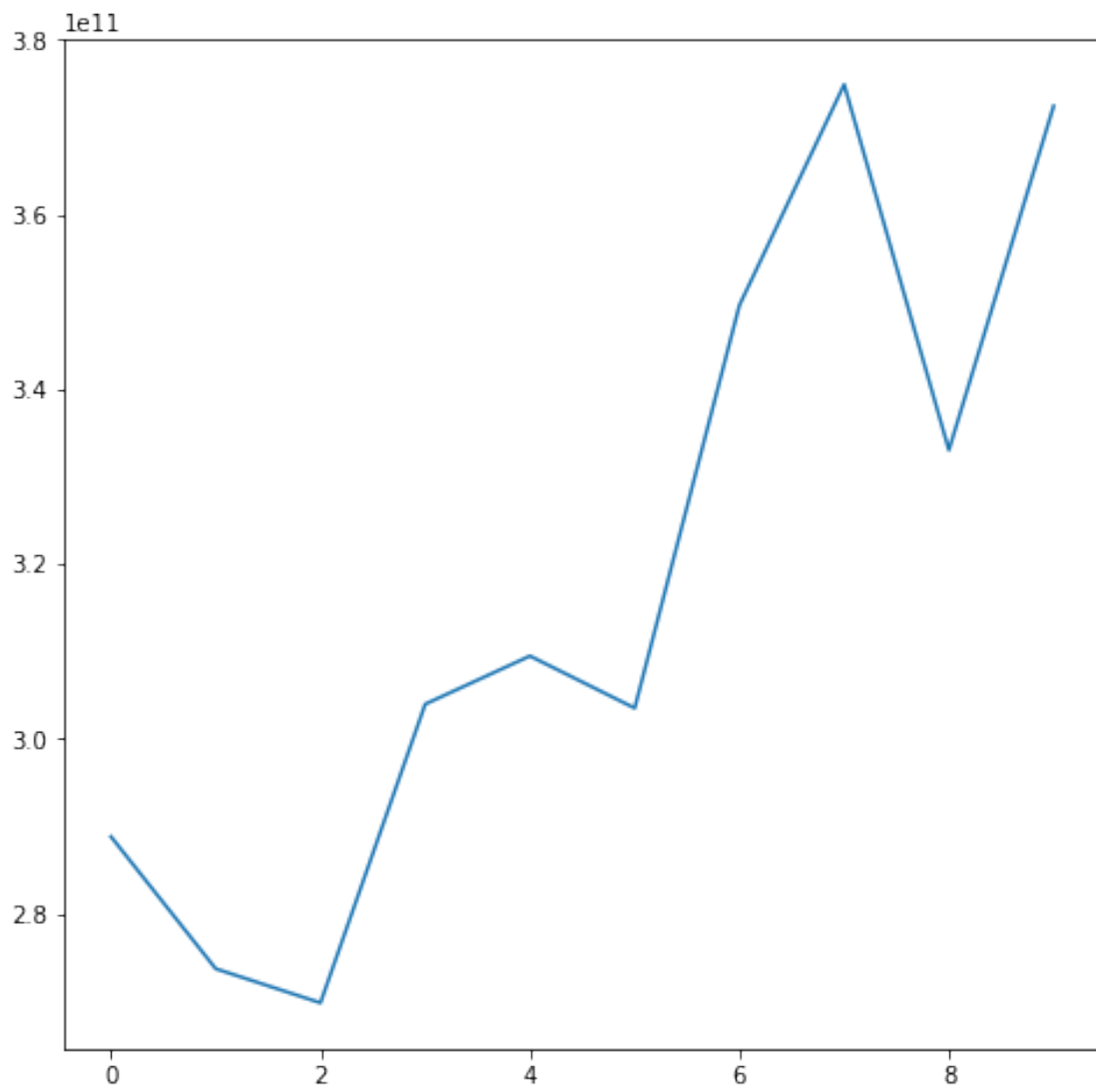
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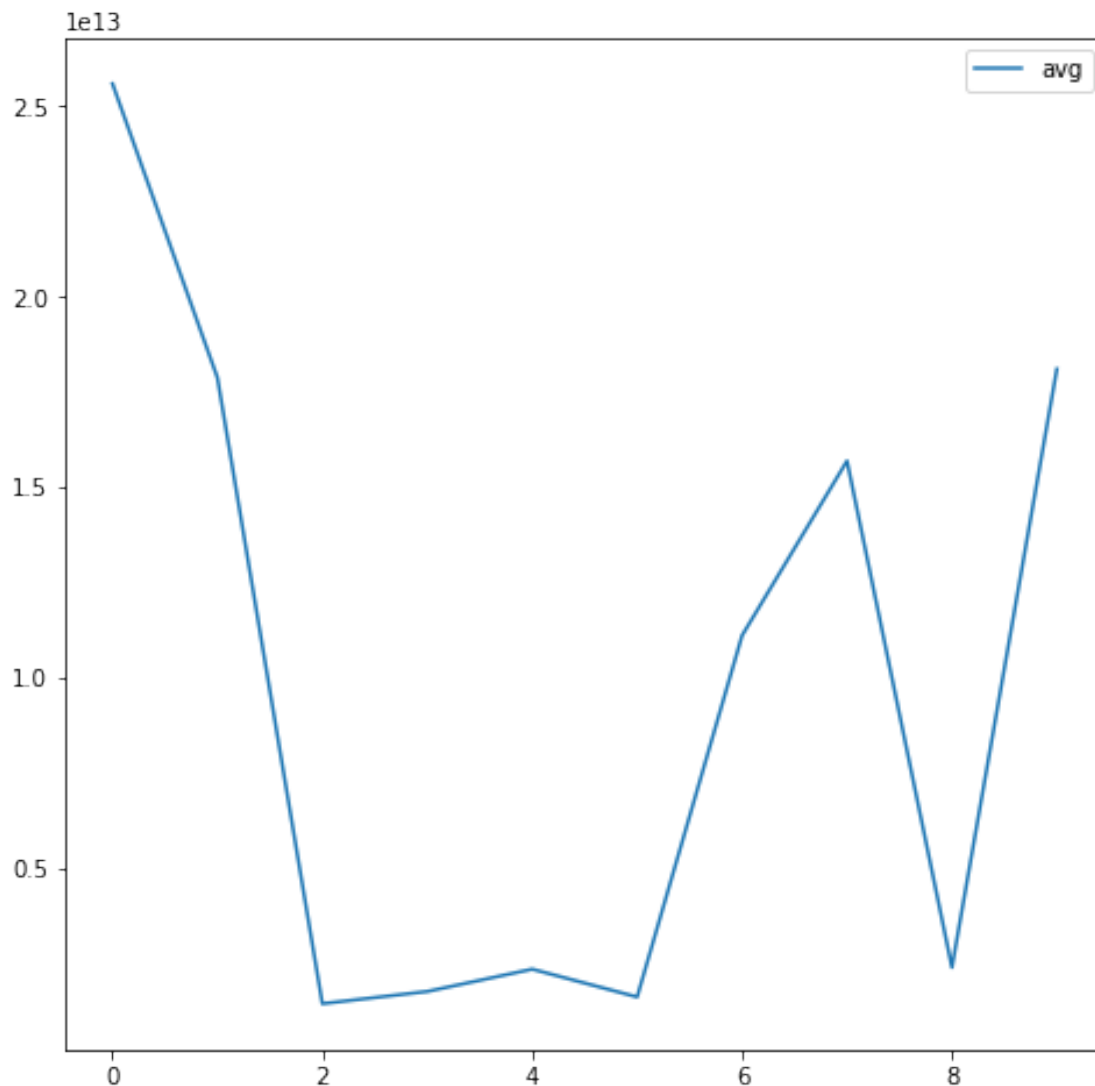
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Enter mutation magnitude:0.7

Enter fraction of cells you want to mutate:0.4

/home/anmolagarwal/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:11: DeprecationWarning: count is deprecated. Use Collection.count_documents instead.

This is added back by InteractiveShellApp.init_path()

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exist? 0
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Enter y to continue.y
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[28]: #print(get_fitness_value(generation_info[0]["members"][0]))
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[85]: print(anmol_arr)
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```

```

[86]: with open('json_dump_test_7th_MARCH_STINT_1.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)

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

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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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