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!pip install pygad
import pygad
import numpy
import numpy as np
import matplotlib.pyplot as plt

def func_3D(x,y):
    wynik= 3*(1-x**2) * np.exp(-(x**2)-(y+1)**2) \
    -10*(x/5 -x**3 -y**5)* \
    np.exp(-x**2-y**2)- \
    (1/3) * np.exp(-(x+1)**2 -x**2)
    return wynik

x = np.linspace(-4, 4, 100)
y = np.linspace(-4, 4, 100)
X, Y = np.meshgrid(x, y)
Z = func_3D(X,Y)
plt.rcParams["figure.figsize"] = (6,6)
fig = plt.figure()
ax = fig.add_subplot(projection='3d')
surface = ax.plot_surface(X, Y, Z, cmap='coolwarm')
plt.show()

def fitness_function(ga_instance, solution, solution_idx):
    return func_3D(solution[0],solution[1])

last_fitness = 0
def on_generation(ga_instance):
    global last_fitness
    print(f"Generation = {ga_instance.generations_completed}")
    print(f"Fitness = {ga_instance.best_solution(pop_fitness=ga_instance.last_generation_fitness)[1]}")
    print(f"Change = {ga_instance.best_solution(pop_fitness=ga_instance.last_generation_fitness)[1] - last_fitness}")
    print()
    last_fitness = ga_instance.best_solution(pop_fitness=ga_instance.last_generation_fitness)[1]

ga_instance = pygad.GA(
    num_generations=50,
    num_parents_mating=15,
    sol_per_pop=100,
    num_genes=2,
    init_range_low=-4,
    init_range_high=4,
    fitness_func=fitness_function,
    crossover_type="single_point",
    parent_selection_type = "rws",
    mutation_type = "random",
    mutation_percent_genes=15,
    on_generation=on_generation
)

print(ga_instance.population)

ga_instance.run()

solution, solution_fitness, solution_idx = ga_instance.best_solution()
print(f"Argumenty najlepszego rozw : {solution}")
print(f"Wartosc dla najlepszego rozw: {solution_fitness}")

def wykres_populacji(ga_instance):
    x = np.linspace(-4, 4, 100)
    y = np.linspace(-4, 4, 100)
    X, Y = np.meshgrid(x, y)
    Z = func_3D(X,Y)
    plt.contour(X, Y, Z, cmap='coolwarm')
    plt.plot(ga_instance.population[:,0], ga_instance.population[:,1], 'bo')
    plt.show()

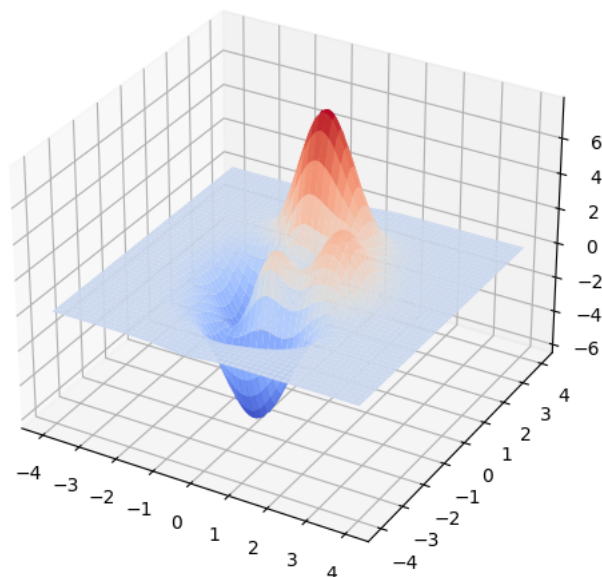
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wykres_populacji(ga_instance)
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Requirement already satisfied: cloudpickle in /usr/local/lib/python3.10/dist-packages (from pygad) (2.2.1)
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