LAPORAN OBSERVASI

$$f(x_1, x_2) = \left(4 - 2.1x_1^2 + \frac{x_1^4}{3}\right)x_1^2 + x_1 x_2 + (-4 + 4x_2^2)x_2^2$$

dengan batasan $-3 \le x_1 \le 3$ dan $-2 \le x_2 \le 2$.

Strategi penyelesaian

- Teknik menentukan nilai parameter dengan batasan -3<x1<3 dan -2<x2<2

Nilai parameter GA paling optimum

- Desain kromosom dengan bentuk [0,1]
- Probabilitas mutasi

```
#mutation
def mutation(offspring_crossover):
    for idx in range(offspring_crossover.shape[0]):
        random_value = np.random.uniform(-1.0, 1.0, 1)
        offspring_crossover[idx, 1] = offspring_crossover[idx, 1] + random_value
    return offspring_crossover
```

- Crossover

```
#crossover
def crossover(parents, offspring_size):
    offspring = np.empty(offspring_size)
    crossover_point = np.uint8(offspring_size[1]/2)

    for k in range(offspring_size[0]):
        parent1_idx = k%parents.shape[0]
        parent2_idx = (k+1)%parents.shape[0]
        offspring[k, 0:crossover_point] = parents[parent1_idx, 0:crossover_point]
        offspring[k, crossover_point:] = parents[parent2_idx, crossover_point:]
    return offspring
```

- Populasi sebanyak 10
- Generasi sebanyak 10

Screenshot hasil running

```
===================== RESTART: E:/GeneticAlgorithm1.py =========

generasi 1
nilai random: -0.1609462642181057
nilai random: -0.1937151214563868
nilai random: -0.17575788839102097
nilai random: -0.16478525646252867
keturunan [[-0.21835611 -0.90500488]
 [-0.1169573   0.0813155 ]
 [-0.21835611 -0.18262486]
 [-0.21835611  0.14309377]
 [-0.21835611  0.46692117]
 [-0.1169573  -0.1133094 ]]
Hasil terbaik :  -0.5979140643910319 8

generasi 2
nilai random: -0.24652452807318703
nilai random: -0.07096291044196036
nilai random: -0.4205608349826347
nilai random: -0.48213110325946756
keturunan [[-0.1169573   -0.89557332]
 [-0.21835611  0.42415046]
 [-0.1169573   -0.60891905]
 [-0.1169573   -0.85634699]
 [-0.1169573    0.79969921]
 [-0.21835611  0.5134933 ]]
Hasil terbaik :  -0.9613446944526653 8

generasi 3
nilai random: -0.28976782937932727
nilai random: -0.21922179835715674
nilai random: -0.08969174245558664
nilai random: -0.11788850311869392
keturunan [[-0.1169573   -0.2417266 ]
 [-0.1169573   -0.19367211]
 [-0.1169573    0.35373262]
```