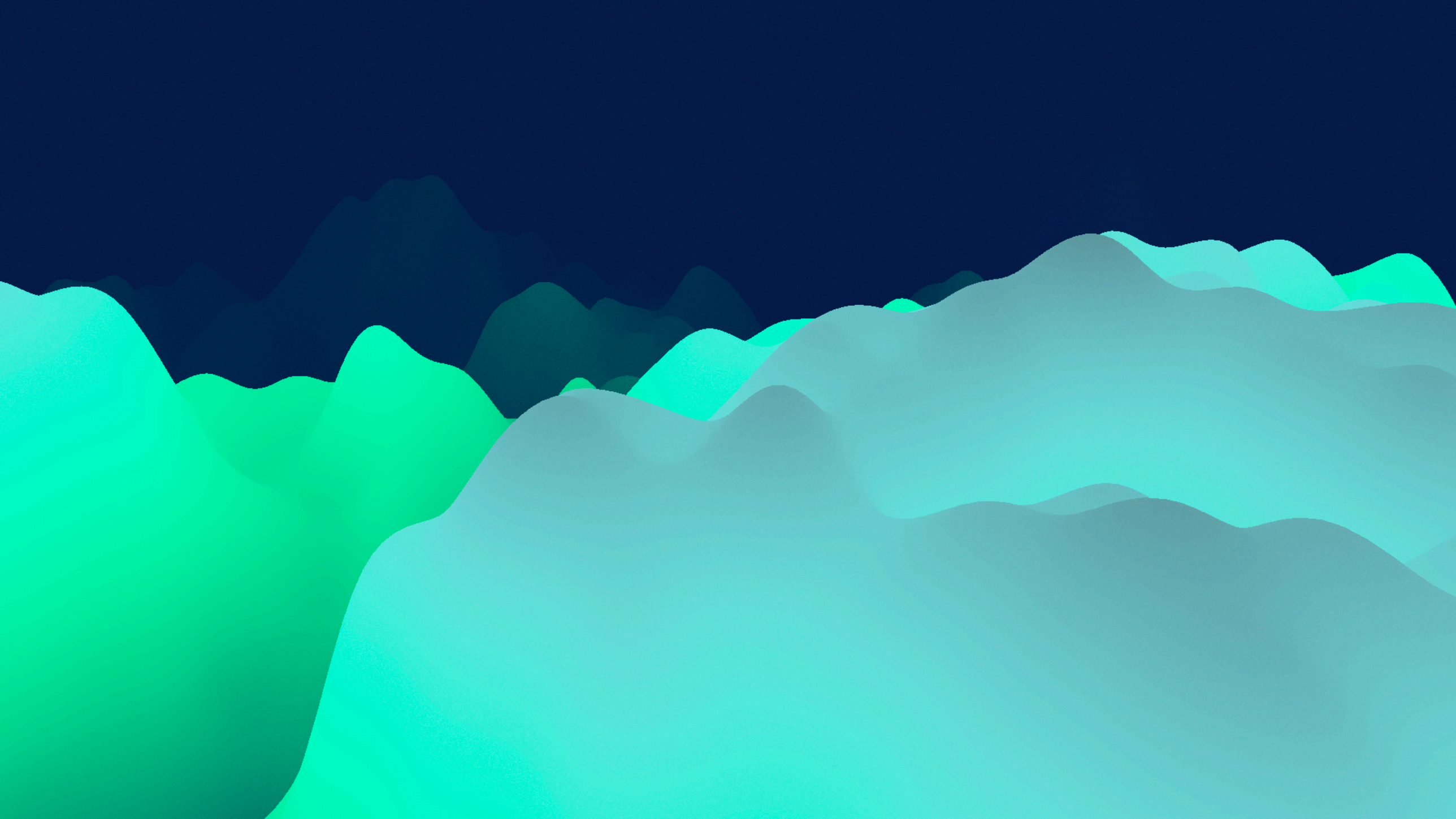
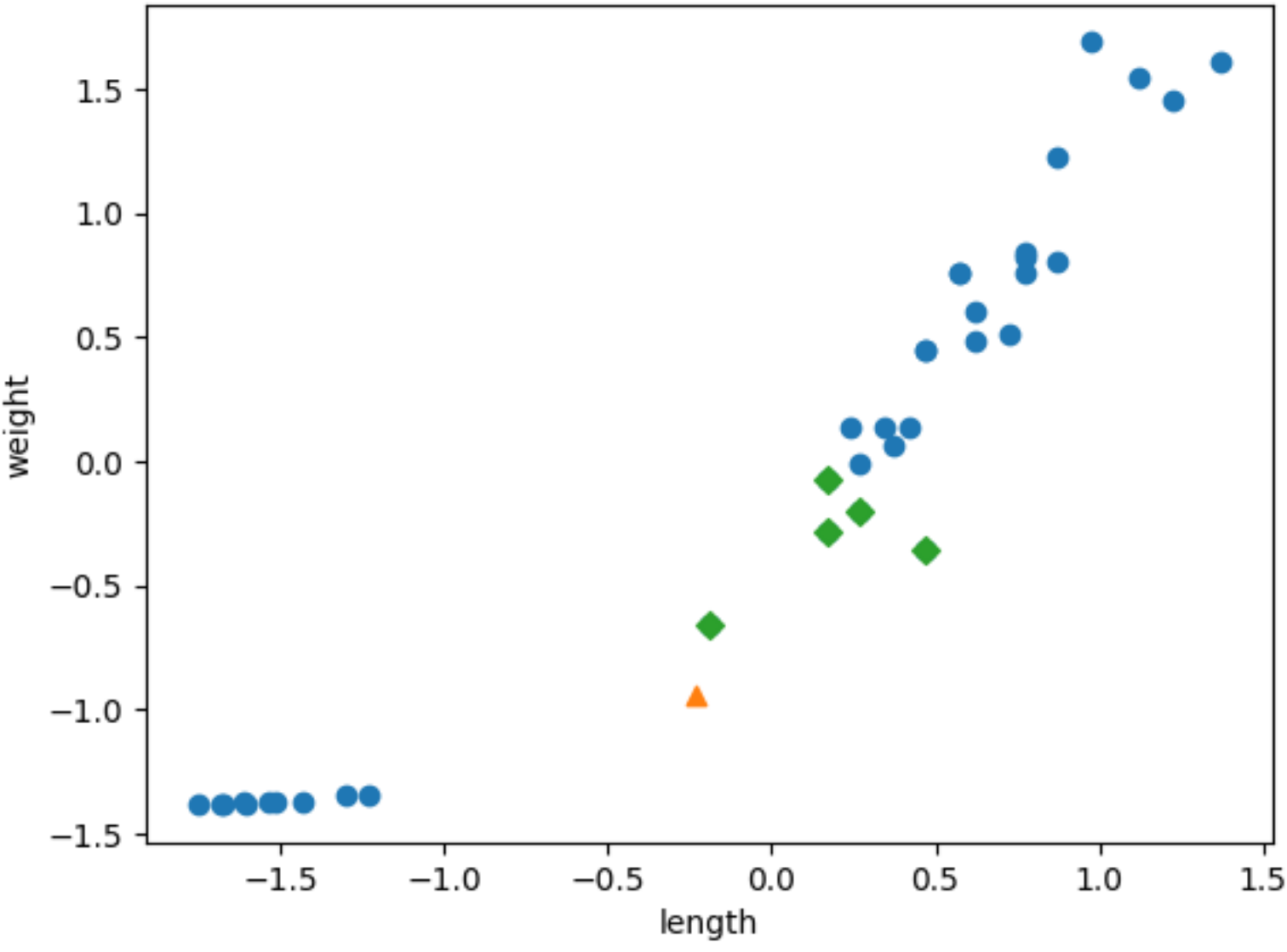
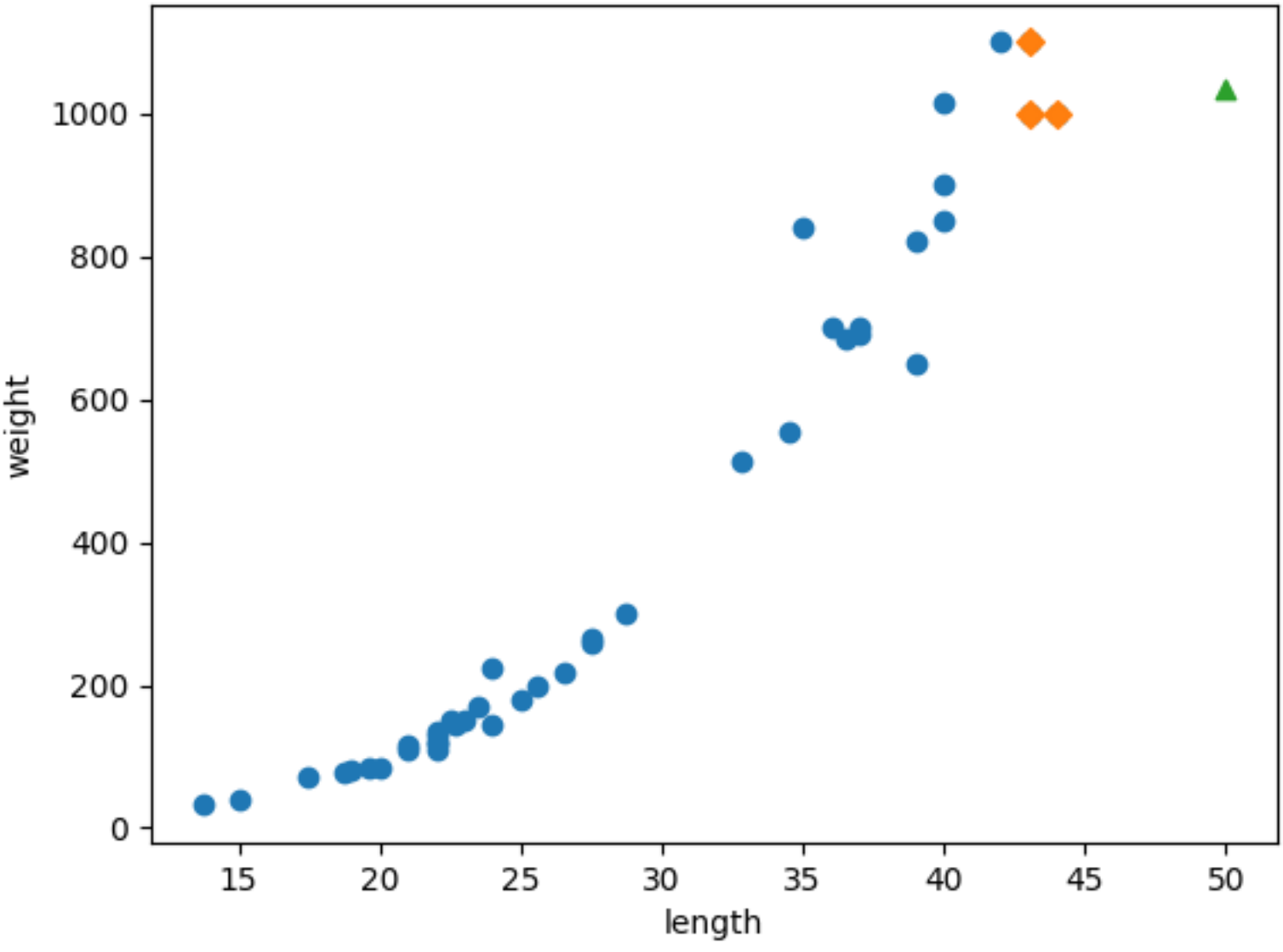
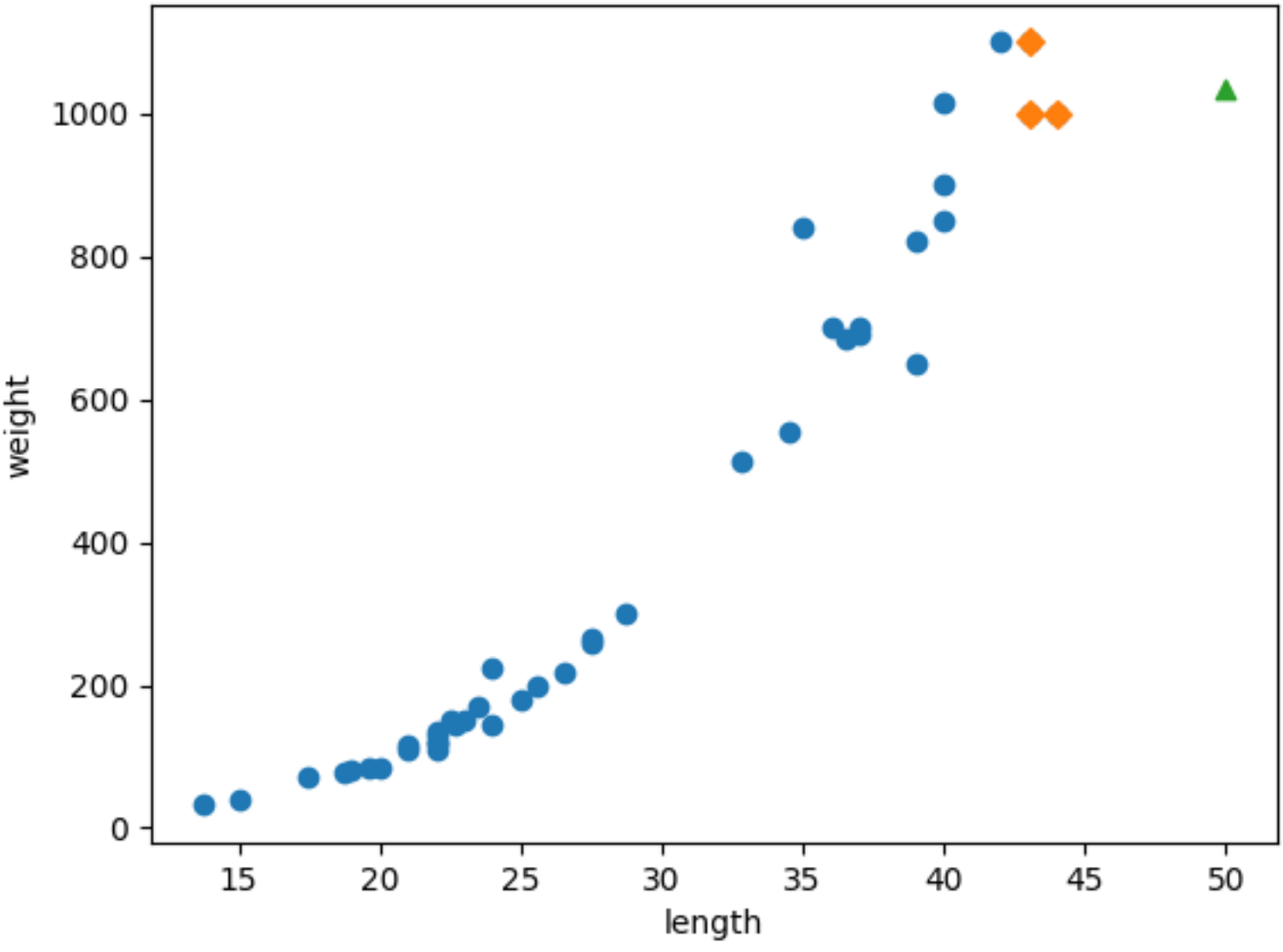


```python
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
import matplotlib.pyplot as plt

fish_length = [25.4, 26.3, 26.5, 29.0, 29.0, 29.7, 29.7, 30.0, 30.0, 30.7, 31.0, 31.0,
               31.5, 32.0, 32.0, 32.0, 33.0, 33.0, 33.5, 33.5, 34.0, 34.0, 34.5, 35.0,
               35.0, 35.0, 35.0, 36.0, 36.0, 37.0, 38.5, 38.5, 39.5, 41.0, 41.0, 9.8,
               10.5, 10.6, 11.0, 11.2, 11.3, 11.8, 11.8, 12.0, 12.2, 12.4, 13.0, 14.3, 15.0]
fish_weight = [242.0, 290.0, 340.0, 363.0, 430.0, 450.0, 500.0, 390.0, 450.0, 500.0, 475.0, 500.0,
               500.0, 340.0, 600.0, 600.0, 700.0, 700.0, 610.0, 650.0, 575.0, 685.0, 620.0, 680.0,
               700.0, 725.0, 720.0, 714.0, 850.0, 1000.0, 920.0, 955.0, 925.0, 975.0, 950.0, 6.7,
               7.5, 7.0, 9.7, 9.8, 8.7, 10.0, 9.9, 9.8, 12.2, 13.4, 12.2, 19.7, 19.9]

fish_data = np.column_stack((fish_length, fish_weight))
fish_target = np.concatenate((np.ones(35), np.zeros(14)))

train_input, test_input, train_target, test_target = train_test_split(fish_data, fish_target, stratify=fish_target, random_state=42)

kn = KNeighborsClassifier()

mean = np.mean(train_input, axis=0)
std = np.std(train_input, axis=0)

train_scaled = (train_input - mean) / std
new = ([25, 150] - mean) / std

kn.fit(train_scaled, train_target)

plt.scatter(train_scaled[:,0], train_scaled[:,1])
plt.scatter(new[0], new[1], marker='^')
plt.xlabel('length')
plt.ylabel('weight')

distances, indexes = kn.kneighbors([new])
plt.scatter(train_scaled[indexes,0], train_scaled[indexes,1], marker='D')
plt.show()
```


weight
length
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5


weight
length
0
200
400
600
800
1000
15
20
25
30
35
40
45
50

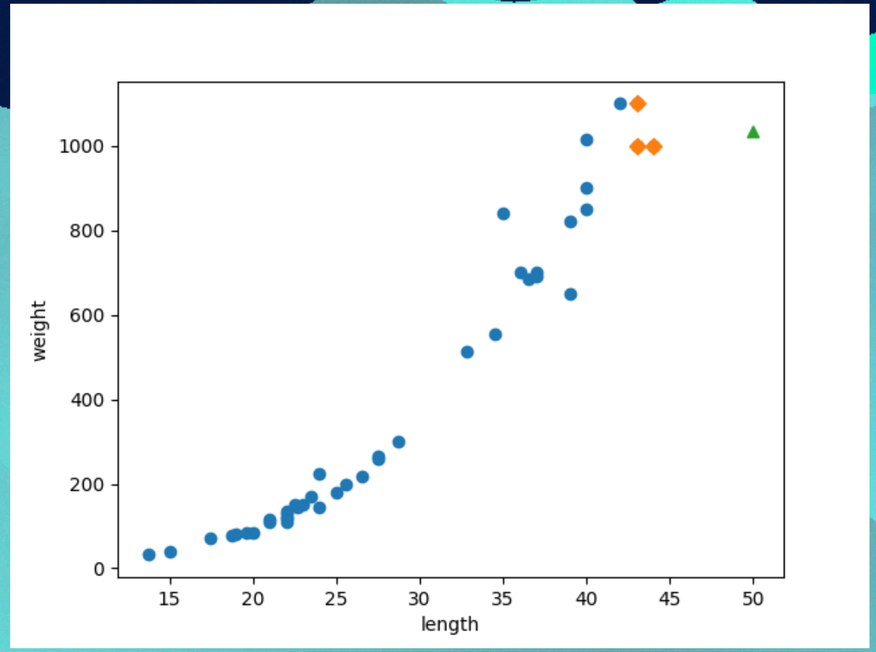
```python
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsRegressor
from matplotlib import pyplot as plt

perch_length = np.array([8.4, 13.7, 15.0, 16.2, 17.4, 18.0, 18.7, 19.0, 19.6, 20.0, 21.0,
       21.0, 21.0, 21.3, 22.0, 22.0, 22.0, 22.0, 22.0, 22.5, 22.5, 22.7,
       23.0, 23.5, 24.0, 24.0, 24.6, 25.0, 25.6, 26.5, 27.3, 27.5, 27.5,
       27.5, 28.0, 28.7, 30.0, 32.8, 34.5, 35.0, 36.5, 36.0, 37.0, 37.0,
       39.0, 39.0, 39.0, 40.0, 40.0, 40.0, 40.0, 42.0, 43.0, 43.0, 43.5,
       44.0])
perch_weight = np.array([5.9, 32.0, 40.0, 51.5, 70.0, 100.0, 78.0, 80.0, 85.0, 85.0, 110.0,
       115.0, 125.0, 130.0, 120.0, 120.0, 130.0, 135.0, 110.0, 130.0,
       150.0, 145.0, 150.0, 170.0, 225.0, 145.0, 188.0, 180.0, 197.0,
       218.0, 300.0, 260.0, 265.0, 250.0, 250.0, 300.0, 320.0, 514.0,
       556.0, 840.0, 685.0, 700.0, 700.0, 690.0, 900.0, 650.0, 820.0,
       850.0, 900.0, 1015.0, 820.0, 1100.0, 1000.0, 1100.0, 1000.0,
       1000.0])

train_input, test_input, train_target, test_target = train_test_split(perch_length, perch_weight, random_state=42)

train_input = train_input.reshape(-1, 1)
test_input = test_input.reshape(-1, 1)

knr = KNeighborsRegressor(n_neighbors=3)
knr.fit(train_input, train_target)

distances, indexes = knr.kneighbors([[50]])
plt.scatter(train_input, train_target)
plt.scatter(train_input[indexes], train_target[indexes], marker='D')

plt.scatter(50, 1033, marker='^')
plt.xlabel('length')
plt.ylabel('weight')
plt.show()
```


weight
length
0
200
400
600
800
1000
15
20
25
30
35
40
45
50

알고리즘 구현

k-최근접 이웃 알고리즘

```python
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsRegressor
from matplotlib import pyplot as plt

perch_length = np.array([8.4, 13.7, 15.0, 16.2, 17.4, 18.0, 18.7, 19.0, 19.6, 20.0, 21.0,
       21.0, 21.0, 21.3, 22.0, 22.0, 22.0, 22.0, 22.0, 22.5, 22.5, 22.7,
       23.0, 23.5, 24.0, 24.0, 24.6, 25.0, 25.6, 26.5, 27.3, 27.5, 27.5,
       27.5, 28.0, 28.7, 30.0, 32.8, 34.5, 35.0, 36.5, 36.0, 37.0, 37.0,
       39.0, 39.0, 39.0, 40.0, 40.0, 40.0, 40.0, 42.0, 43.0, 43.0, 43.5,
       44.0])
perch_weight = np.array([5.9, 32.0, 40.0, 51.5, 70.0, 100.0, 78.0, 80.0, 85.0, 85.0, 110.0,
       115.0, 125.0, 130.0, 120.0, 120.0, 130.0, 135.0, 110.0, 130.0,
       150.0, 145.0, 150.0, 170.0, 225.0, 145.0, 188.0, 180.0, 197.0,
       218.0, 300.0, 260.0, 265.0, 250.0, 250.0, 300.0, 320.0, 514.0,
       556.0, 840.0, 685.0, 700.0, 700.0, 690.0, 900.0, 650.0, 820.0,
       850.0, 900.0, 1015.0, 820.0, 1100.0, 1000.0, 1100.0, 1000.0,
       1000.0])

train_input, test_input, train_target, test_target = train_test_split(perch_length, perch_weight, random_state=42)

train_input = train_input.reshape(-1, 1)
test_input = test_input.reshape(-1, 1)

knr = KNeighborsRegressor(n_neighbors=3)
knr.fit(train_input, train_target)

distances, indexes = knr.kneighbors([[50]])
plt.scatter(train_input, train_target)
plt.scatter(train_input[indexes], train_target[indexes], marker='D')

plt.scatter(50, 1033, marker='^')
plt.xlabel('length')
plt.ylabel('weight')
plt.show()
```



알고리즘 구현

선형 회귀 알고리즘

```python
from sklearn.linear_model import LinearRegression
import numpy as np
from sklearn.model_selection import train_test_split
from matplotlib import pyplot as plt

perch_length = np.array([8.4, 13.7, 15.0, 16.2, 17.4, 18.0, 18.7, 19.0, 19.6, 20.0, 21.0,
       21.0, 21.0, 21.3, 22.0, 22.0, 22.0, 22.0, 22.0, 22.5, 22.5, 22.7,
       23.0, 23.5, 24.0, 24.0, 24.6, 25.0, 25.6, 26.5, 27.3, 27.5, 27.5,
       27.5, 28.0, 28.7, 30.0, 32.8, 34.5, 35.0, 36.5, 36.0, 37.0, 37.0,
       39.0, 39.0, 39.0, 40.0, 40.0, 40.0, 40.0, 42.0, 43.0, 43.0, 43.5,
       44.0])
perch_weight = np.array([5.9, 32.0, 40.0, 51.5, 70.0, 100.0, 78.0, 80.0, 85.0, 85.0, 110.0,
       115.0, 125.0, 130.0, 120.0, 120.0, 130.0, 135.0, 110.0, 130.0,
       150.0, 145.0, 150.0, 170.0, 225.0, 145.0, 188.0, 180.0, 197.0,
       218.0, 300.0, 260.0, 265.0, 250.0, 250.0, 300.0, 320.0, 514.0,
       556.0, 840.0, 685.0, 700.0, 700.0, 690.0, 900.0, 650.0, 820.0,
       850.0, 900.0, 1015.0, 820.0, 1100.0, 1000.0, 1100.0, 1000.0,
       1000.0])

train_input, test_input, train_target, test_target = train_test_split(perch_length, perch_weight, random_state=42)

train_input = train_input.reshape(-1, 1)
test_input = test_input.reshape(-1, 1)

lr = LinearRegression()

lr.fit(train_input, train_target)

plt.scatter(train_input, train_target)
# plt.plot([15,50], [15*lr.coef_+lr.intercept_, 50*lr.coef_+lr.intercept_])
plt.scatter(50, 1241.8, marker='^')
plt.xlabel('length')
plt.ylabel('weight')
plt.show()
```