

Week 3 Homework 1

Project Falling Detection: Python + kNN + Colab

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Dataset

Accelerometer Data			Gyroscope Data			Fall (+), Not (-)
x	y	z	x	y	z	+/-
1	2	3	2	1	3	-
2	1	3	3	1	2	-
1	1	2	3	2	2	-
2	2	3	3	2	1	-
6	5	7	5	6	7	+
5	6	6	6	5	7	+
5	6	7	5	7	6	+
7	6	7	6	5	6	+
7	6	5	5	6	7	??

Understand the problem

In this exercise, we have to calculate the prediction of the last row of the dataset using KNN

First of all, we have the heuristic of choosing K

“The choice of K equal to the odd number closest to the square root of the number of instances is an empirical rule-of-thumb”

$$K = \text{sqrt}(8) = 2.828 = 3$$

Thus, choose $K = 3$

Calculation

We will use KNN manually to calculate the result of the prediction

Calculate the distance of each data set to the prediction data set

Formula:

$$\left(A_{x-pred} - A_x \right)^2 + \left(A_{y-pred} - A_y \right)^2 + \left(A_{z-pred} - A_z \right)^2 + \left(G_{x-pred} - G_x \right)^2 + \left(G_{y-pred} - G_y \right)^2 + \left(G_{z-pred} - G_z \right)^2$$

We will have the data table as below:

Calculation

Accelerometer Data			Gyroscope Data			Distance	Fall (+), Not (-)
x	y	z	x	y	z		+/-
1	2	3	2	1	3	10.2956301	-
2	1	3	3	1	2	10.3923048	-
1	1	2	3	2	2	10.7238053	-
2	2	3	3	2	1	10.0498756	-
6	5	7	5	6	7	2.44948974	+
5	6	6	6	5	7	2.64575131	+
5	6	7	5	7	6	3.16227766	+
7	6	7	6	5	6	2.64575131	+
7	6	5	5	6	7		??

Hand calculation conclusion

The closest data suggests that the results are all 3 positives (+). Therefore, the result of the prediction will be positive (+).

Then, we will use KNN implementation in Python program to predict fall.

Dataset: [Fall_detection.csv](#)

Source code:

<https://colab.research.google.com/drive/1NT13wt7pGmEJwbU3w3FqEQv2zYW9xihC?usp=sharing>

Program result

```
print(model.predict([(7, 6, 5, 5, 6, 7)]))
```

```
['+']
```