

Exercise 15

We need to find the prediction of kNN for X. For each feature, we need to represent the classes with numbers, so that we could calculate the Euclidean distance.

Body Temperature

- warm-blooded = 1
- cold-blooded = 2

Skin Cover

- hair = 1
- scales = 2
- none = 3
- feathers = 4
- fur = 5
- quills = 6

Gives Birth

- yes = 1
- no = 2

Aquatic Creature

- yes = 1
- no = 2
- Semi = 3

Aerial Creature

- yes = 1
- no = 2

Has Legs

- yes = 1
- no = 2

Hibernates

- yes = 1
- no = 2

Name	Body Temperature	Skin Cover	Gives Birth	Aquatic Creature	Aerial Creature	Has Legs	Hibernates	Class
Human	1	1	1	2	2	1	2	mammal
Python	2	2	2	2	2	2	1	reptile
Salmon	2	2	2	1	2	2	2	fish
Whale	1	1	1	1	2	2	2	mammal
Frog	2	3	2	3	2	1	1	amphibian
Komodo Dragon	2	2	2	2	2	1	2	reptile
Bat	1	1	1	2	1	1	1	mammal
Pigeon	1	4	2	2	1	1	2	bird
Cat	1	5	1	2	2	1	2	mammal
Leopard Shark	2	2	1	1	2	2	2	fish
Turtle	2	2	2	3	2	1	2	reptile
Penguin	1	4	2	3	2	1	2	bird
Porcupine	1	6	1	2	2	1	1	X
Eel	2	2	2	1	2	2	2	Y
Salamander	2	3	2	3	2	1	1	Z

Euclidean Distance

$$\sqrt{(p_1 - q_1)^2 + (p_2 - q_2)^2 + \dots + (p_n - q_n)^2} = \sqrt{\sum_{i=1}^n (p_i - q_i)^2}$$

Distance

	Class	Porcupine	Eel	Salamander
Human	mammal	5.099019514	2.236067977	2.828427125
Python	reptile	4.358898944	1.414213562	1.732050808
Salmon	fish	4.582575695	0	2.645751311
Whale	mammal	5.291502622	1.732050808	3.464101615
Frog	amphibian	3.464101615	2.645751311	0
Komodo Dragon	reptile	4.358898944	1.414213562	1.732050808
Bat	mammal	5.099019514	2.645751311	2.828427125
Pigeon	bird	2.645751311	2.828427125	2.236067977
Cat	mammal	1.414213562	3.605551275	2.828427125
Leopard Shark	fish	4.472135955	1	2.828427125
Turtle	reptile	4.472135955	2.236067977	1.414213562
Penguin	bird	2.645751311	1.732050808	1.732050808

K = 1

- Porcupine: *Mammal*
- Eel: *Fish*
- Salamander: *Amphibian*

K = 3

- Porcupine: Mammal (1), Bird (2) → *Bird*
- Eel: Fish (2), Reptile (1) → *Fish*
- Salamander: Amphibian (1), Reptile (2) → *Reptile*