

KAIST-Samsung DS AI Expert

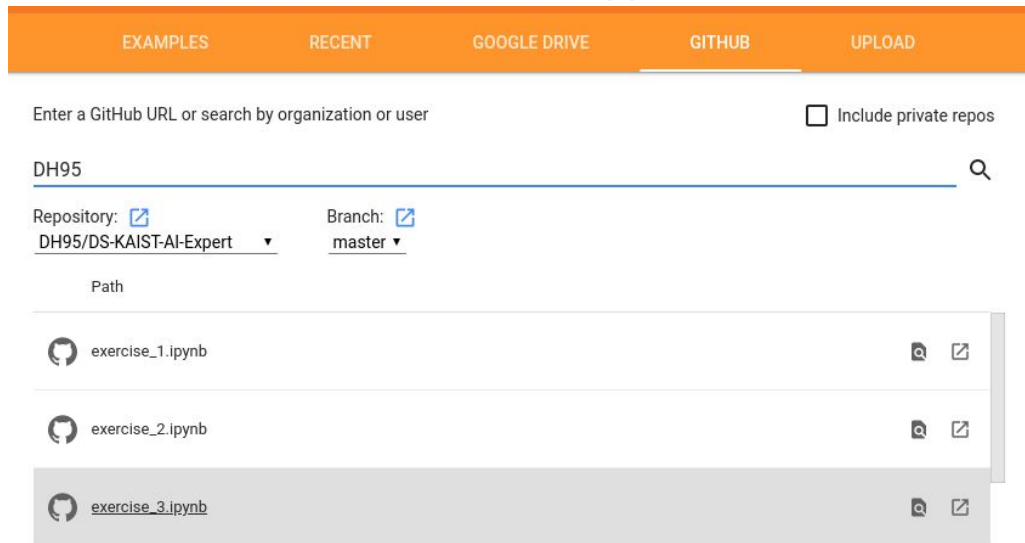
딥러닝 기초

TA: 강민구, 함동훈

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실습 세팅

- Go to <https://colab.research.google.com/>
- File -> Open notebook -> GITHUB -> type DH95



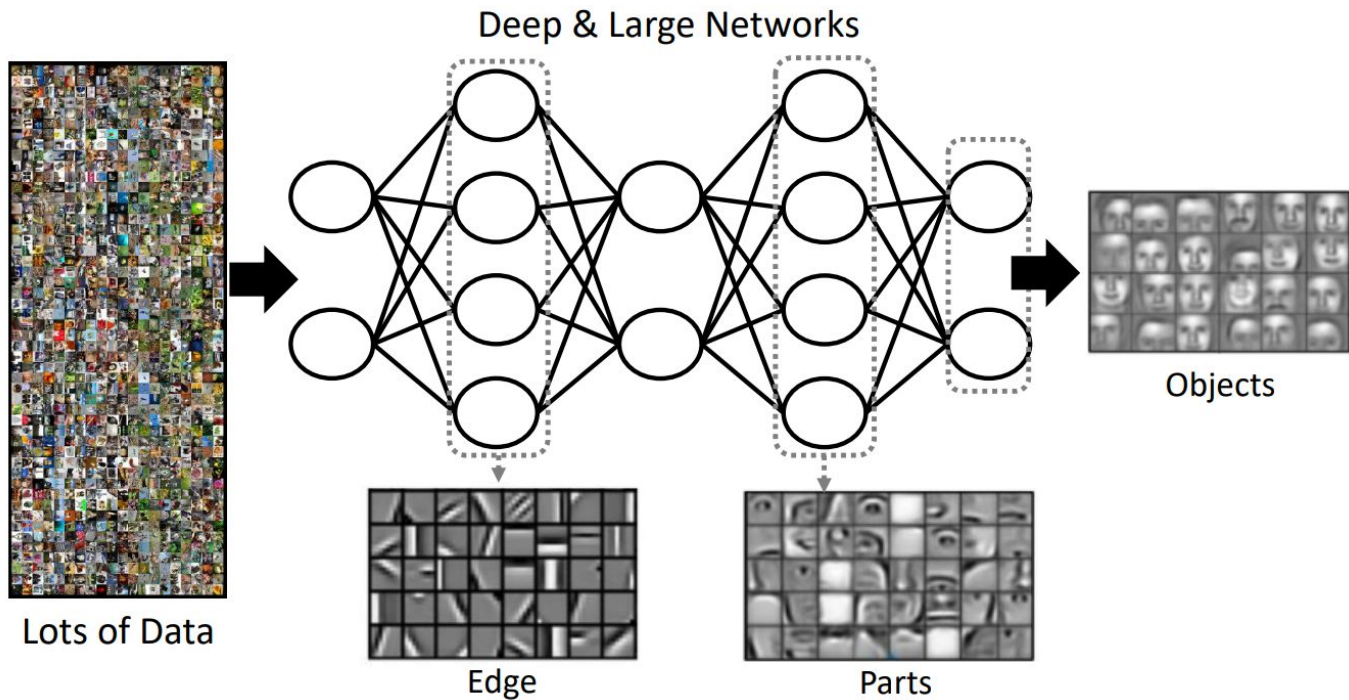
- Exercise 1~3, Extra.ipynb : make a copy in your drive!

수업시간에 배웠던 내용들

- Multilayer Perceptrons
- Gradient Descent Algorithm, Back propagation
- Regression, Classification ..

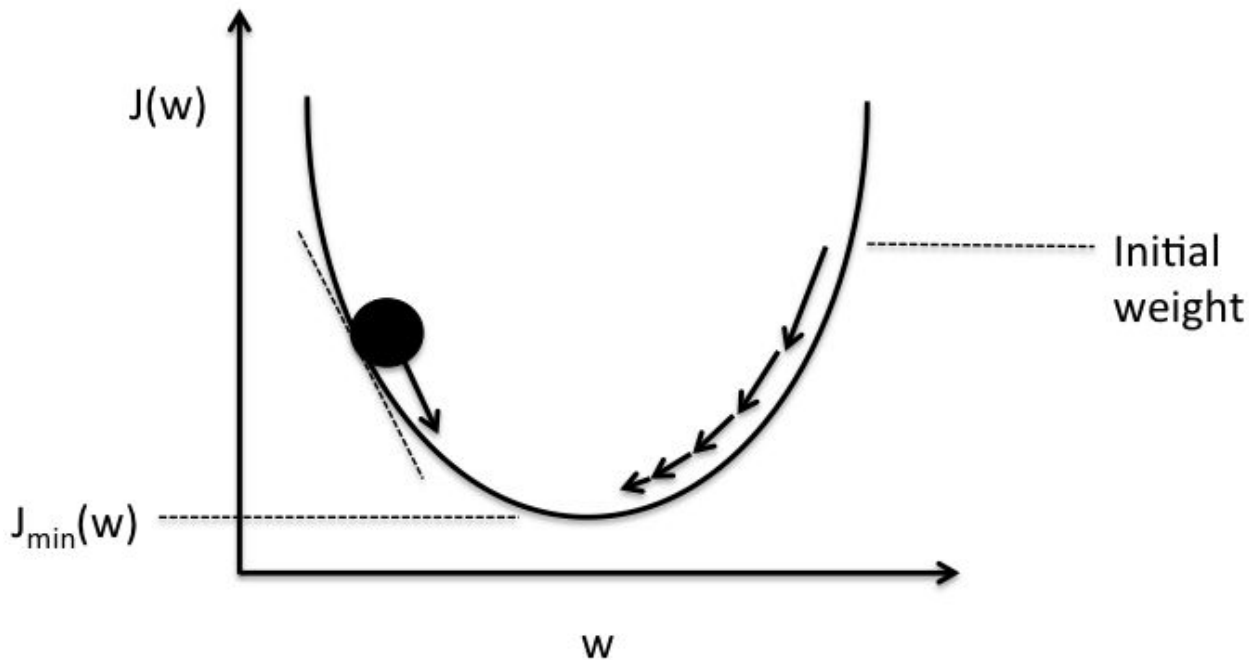
딥러닝이란?

Deep & Large Network를 이용하여
Data로 부터 다양한 **abstraction**을 **learning** 하는 algorithm!



How to train DNN ?

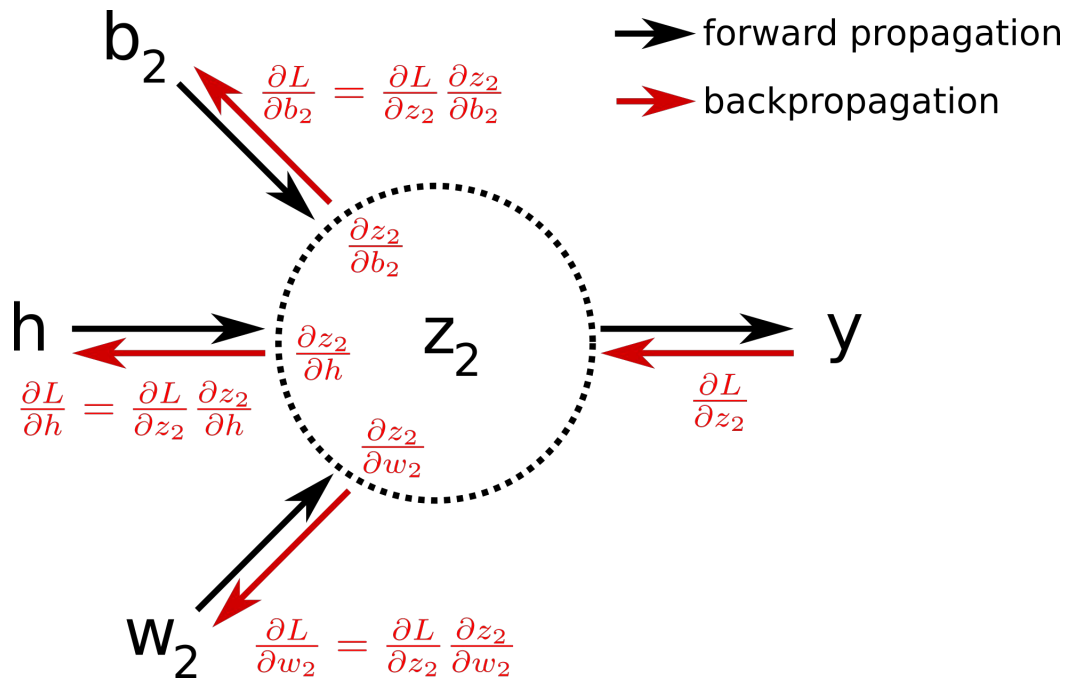
- 그래디언트 하강(Gradient Descent)



$$w = w - \alpha \frac{\partial J(w)}{\partial w}$$

Forward & Backpropagation

- Chain rule을 이용하여 gradient 를 계산함!

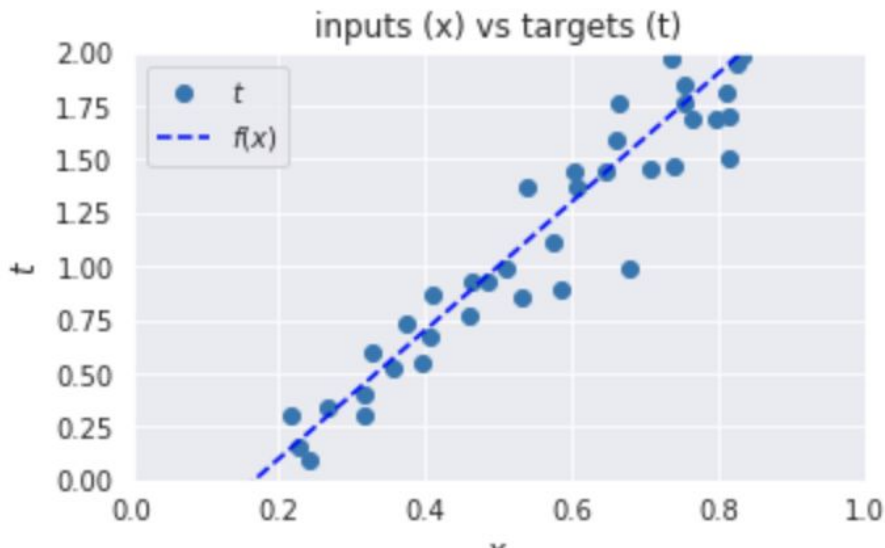


실습 주제 1.

Gradient Descent by Back propagation

목표 : Linear Regression by gradient descent

- Tensorflow 같은 High-level API를 쓰지 않고, forward and backward pass 를 구현하기
- Toy dataset 으로 부터 Gradient Descent 알고리즘을 사용해서 원래 그래프 복원하기



Linear Regression

- 선형 관계 $y = Wx + b$ 를 가정
- MSE Loss function $J(W, b) = \frac{1}{n} \sum_{i=1}^n (Wx_i + b - y_i)^2$
- $$\frac{\partial J}{\partial W} = \frac{2}{n} \sum_{i=1}^n x_i ((Wx_i + b) - y_i)$$

$$\frac{\partial J}{\partial b} = \frac{2}{n} \sum_{i=1}^n ((Wx_i + b) - y_i)$$

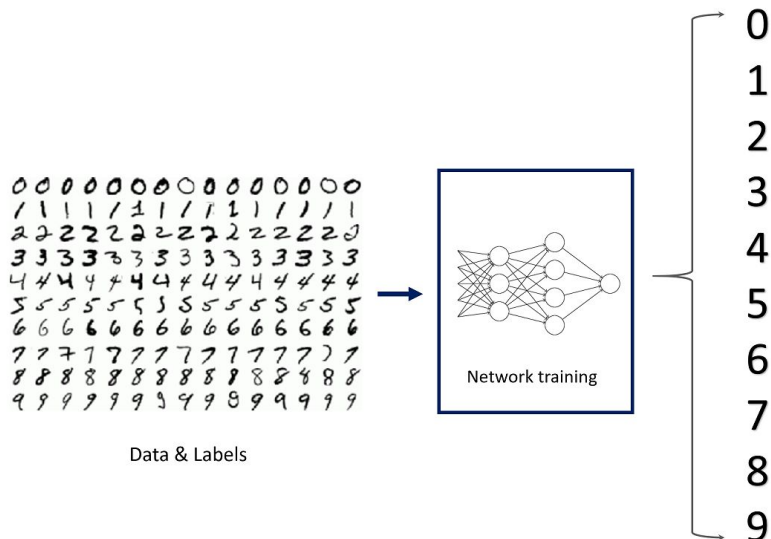
- Gradient update : $W \leftarrow W - \text{learning rate} * dW$
 $b \leftarrow b - \text{learning rate} * db$

실습 주제 2.

MNIST Classification with Tensorflow

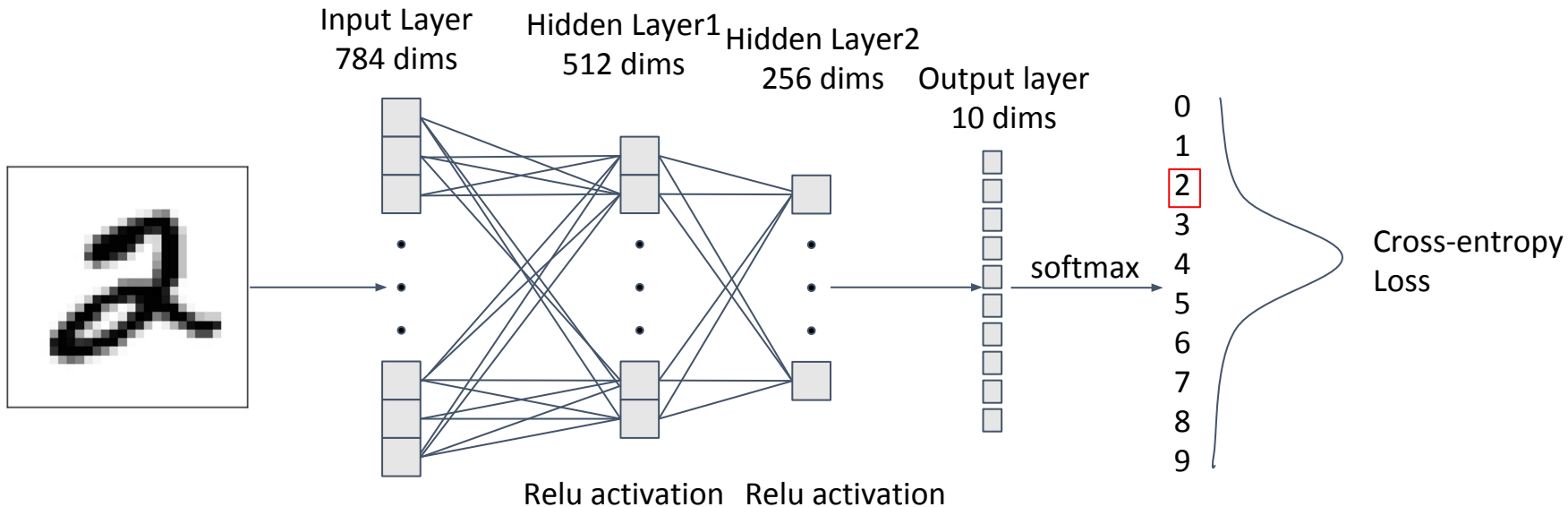
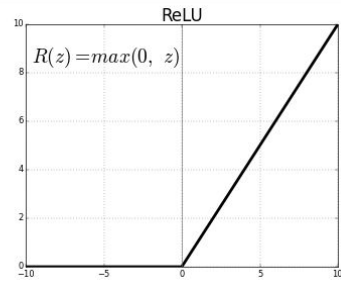
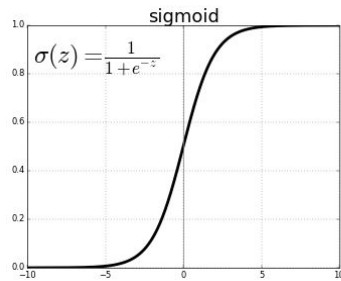
목표 : MNIST Classifier 구현

- 데이터셋 : MNIST dataset - 0 ~ 9 까지의 숫자들로 이루어진 손글씨 그림 (28 x 28 pixel)
- High-level API (ex.Keras) 를 사용하지 않고, Tensorflow basic operation 들만 이용해서 구현해볼것



Classifier Architecture

- Input : 28 x 28 pixel (784 dimension vector)
- Output : 10 x 1 (0~9 까지 label에 대한 확률)

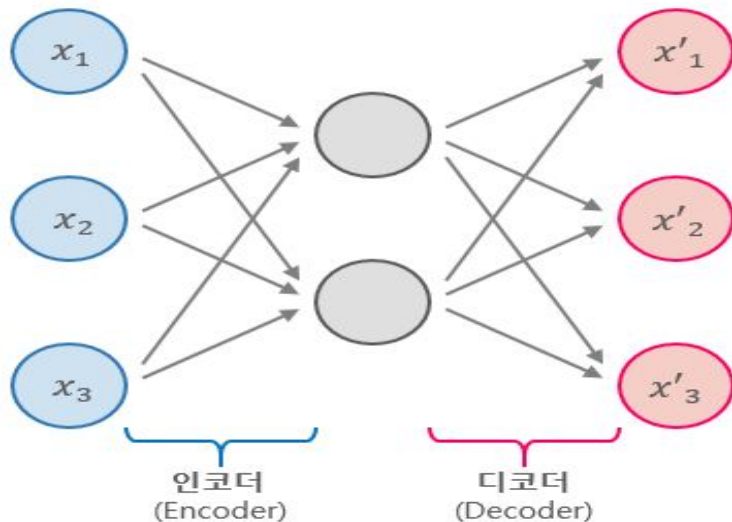


실습 주제 3.

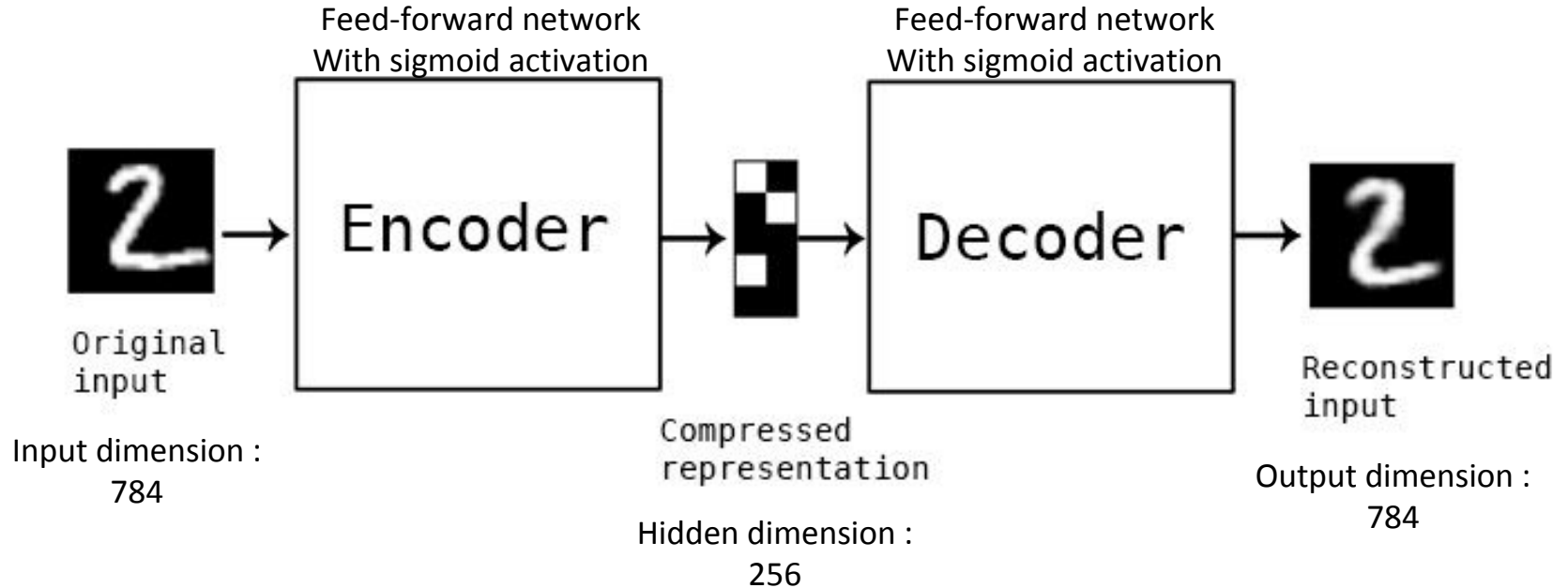
Autoencoder

Autoencoder 란?

- Input을 output에서 재생성하는 신경망
- Encoder, decoder 파트로 이루어짐
- Encoder -> input data를 압축
- Decoder -> 압축된 hidden state로 부터 reconstruction.
- 다양한 활용 : Variational Autoencoder, Denoising Autoencoder ..



Our Architecture



Extra.

Iris data classification

Dataset

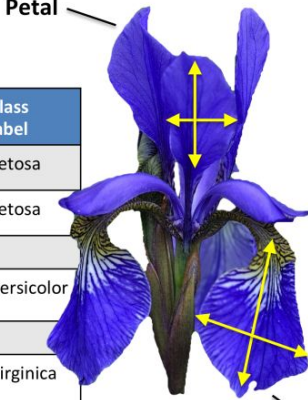
- 4 inputs (Sepal length, Sepal width, Petal length, Petal width)
- 3 classes (Setosa, Versicolor, Virginica)

Samples
(instances, observations)

	Sepal length	Sepal width	Petal length	Petal width	Class label
1	5.1	3.5	1.4	0.2	Setosa
2	4.9	3.0	1.4	0.2	Setosa
...					
50	6.4	3.5	4.5	1.2	Versicolor
...					
150	5.9	3.0	5.0	1.8	Virginica

Features
(attributes, measurements, dimensions)

Class labels
(targets)



Example data:

```
[[5.1 3.5 1.4 0.2]
 [4.9 3.  1.4 0.2]
 [4.7 3.2 1.3 0.2]
 [4.6 3.1 1.5 0.2]
 [5.  3.6 1.4 0.2]]
```

Example labels:

```
[0 0 0 0 0]
```

All codes:

<https://github.com/DH95/DS-KAIS>
[T-AI-Expert](#)