Classification

MFM Program

Data Science Indonesia

Classification vs Regression

Klasifikasi: Secara sederhana diartikan sebagai pengkelasan

- Membedakan gambar kambing, sapi, dan kucing **(classification)**
- Mengenali transaksi fraud **(classification)**
- Mengenali gender orang **(classification)**
- *Estimasi umur orang* ***(regression)***
- *Prediksi kandungan gula pada buah* ***(regression)***
- Pendugaan varietas buah **(classification)**

Algorithms

- Logistic Regression
- Support Vector Machines
- K-NN
- Decision Tree
- Random Forest
- Neural Networks

Neural Network (Why …?)

- Logistic Regression
- Support Vector Machines
- K-NN
- Decision Tree
- Random Forest

Only for structural data classification,

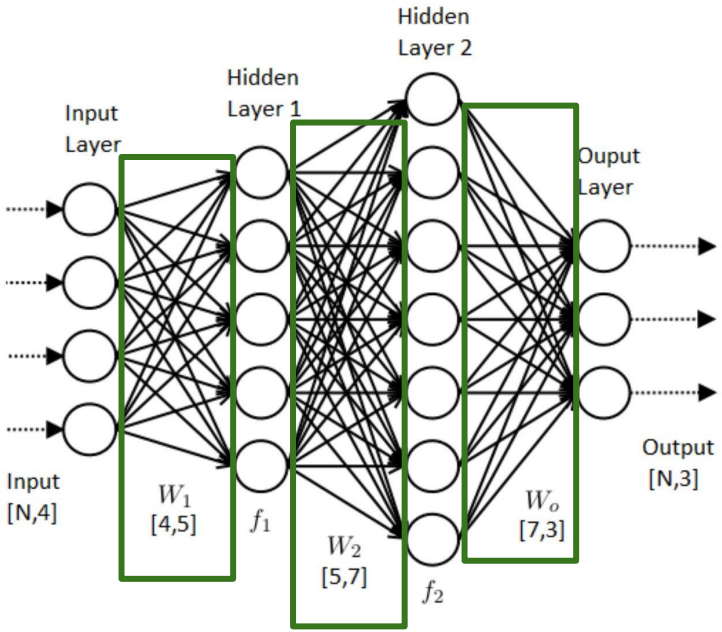
Ex: credit scoring

- Neural Network

Works for both structural and perceptual data (image/video) classification

Ex: credit scoring, but also face gender classification

Neural Network Introduction



Fully Connected Neural Network:

*H1 = W1 * Input + bias (jika ada)*
H1 = Activation(H1) (jika ada activation fuction)

*H2 = W2 * H1 + bias (jika ada)*
H2 = Activation(H2) (jika ada activation fuction)

*O = W3 * H2 + bias (jika ada)*

For Regression:

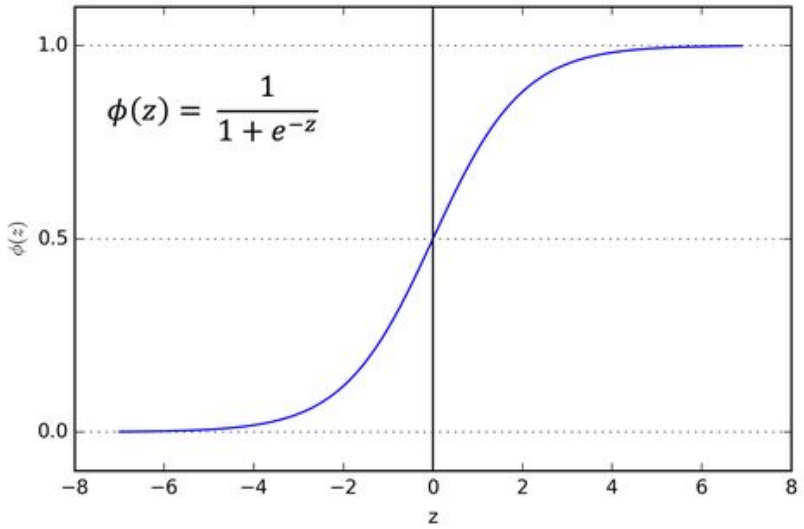
- *Tak perlu activation function*
- *dalam kasus truncated regression, ditambahkan aktivasi sigmoid (contoh: Yolo object detector)*

For Classification

- tambahkan aktivasi sigmoid untuk klasifikasi biner
  - Softmax untuk mul tikelas

Neural Network
Activation Function for Classification

Sigmoid



sofmax

$$\text{Softmax}(x_i) = \frac{\exp(x_i)}{\sum_j \exp(x_j)}$$

Neural Network Classification Losses

Binary cross entropy

$$H_p(q) = -\frac{1}{N}\sum_{i=1}^{N} y_i \cdot log(p(y_i)) + (1 - y_i) \cdot log(1 - p(y_i))$$

Binary Cross-Entropy / Log Loss

softmax cross entropy

$$Cross\ Entropy = -\frac{1}{N}\sum_{j} y_j * \log(\hat{y}_j)$$

③ ② ①

① true label * log(predicted)

② sum over all sequences in each batch

③ divide by the number of samples

Next: Convolutional Neural Networks

Bagi yang penasaran, bisa belajar di channel ini (bahasa indonesia):

https://www.youtube.com/playlist?list=PLYTTx9MHqpB_jr4UmeGUO1daHkVIh8Xy6

Practice

Task:

- Image classification

Tools:

- Google colab

Dependencies:

- Tensorflow
- Opencv-python
- Numpy
- *Simple-tensor*

Repo:

https://github.com/fatchur/Tensorflow-and-Image-Processing-Tutorial/tree/master/intro-classification