



INTRODUCTION TO DEEP LEARNING

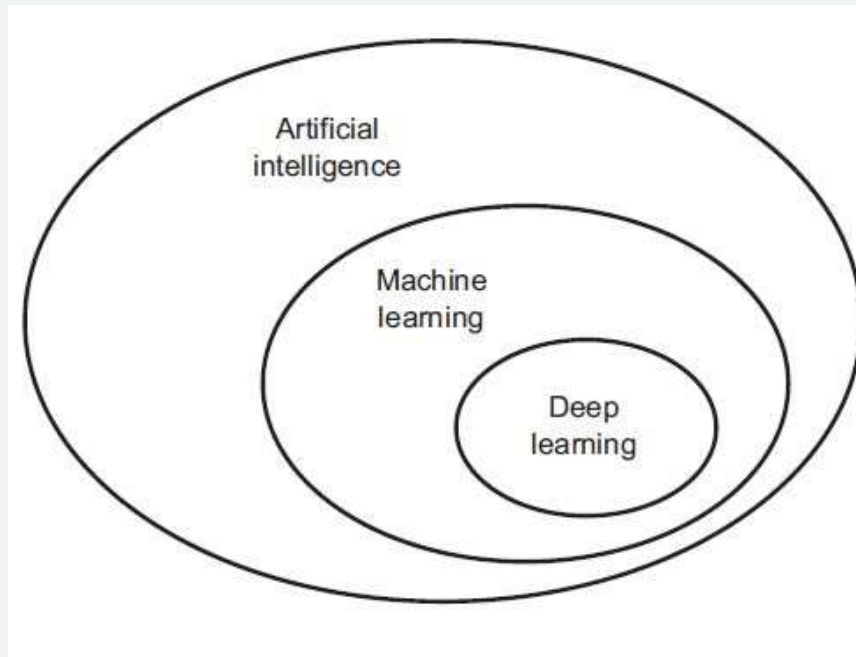
Dr.Varodom Toochinda

Dept. of Mechanical Engineering, Kasetsart University

Outline

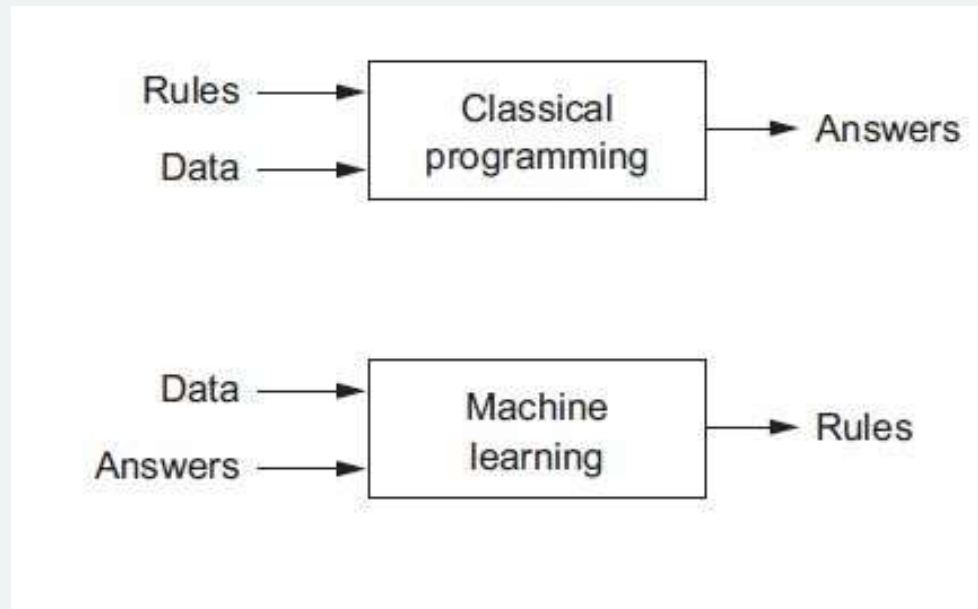
- **Fundamentals of deep learning**
- **AI, machine learning, and deep learning**
- **New programming paradigm**
- **Deep learning structure**
- **Gradient descent**
- **Neural network architectures**
- **using Google colab**
- **Jupyter notebook and TensorFlow installation on local machine**
- **Exercises**
- **References**

What is Deep Learning?



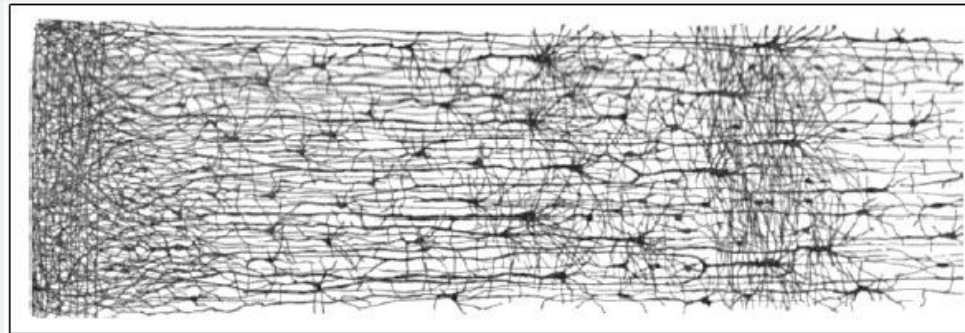
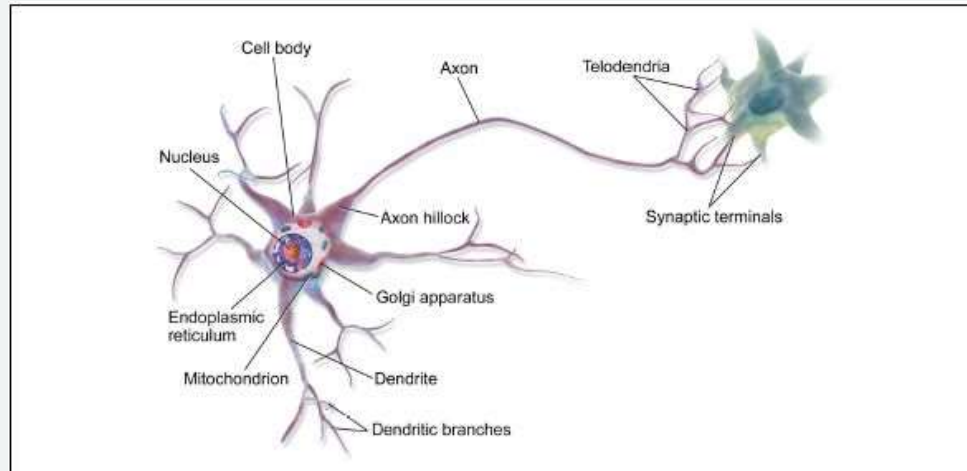
*From Deep Learning with Python, Francois Chollet, 2018

New programming paradigm in ML



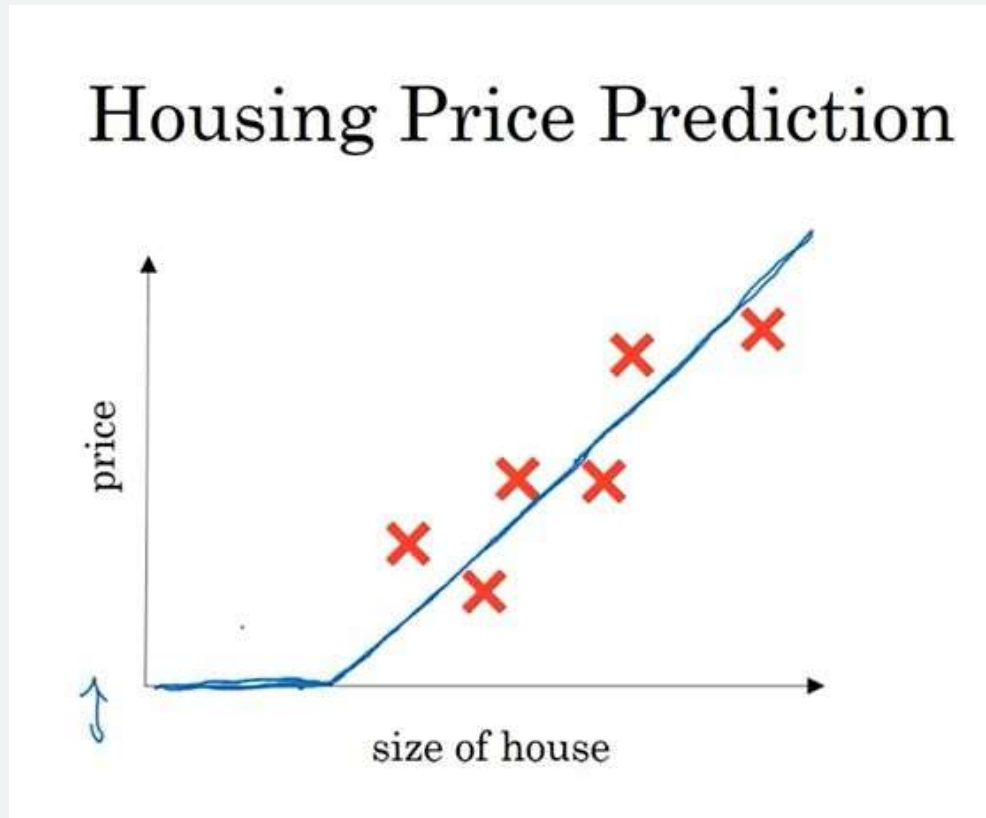
*From Deep Learning with Python, Francois Chollet, 2018

Motivation from biological neurons



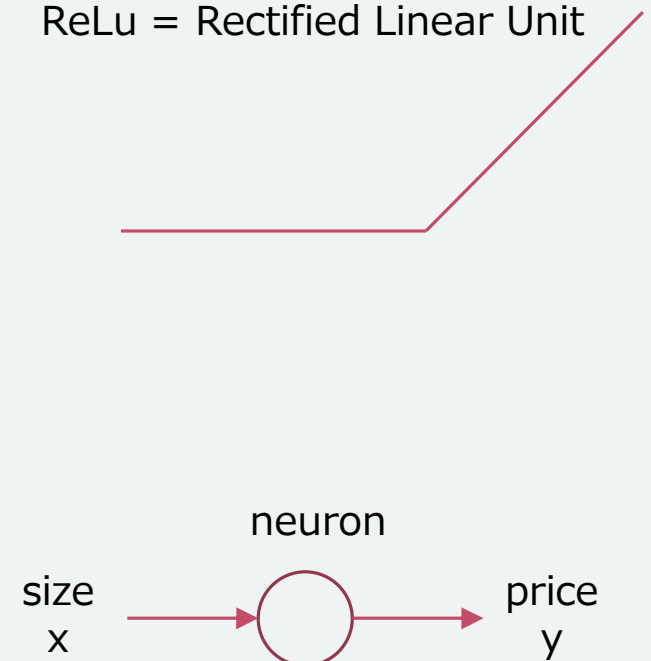
*From Hand on Machine Learning with Scikit Learn, Keras, and TensorFlow, Aurelien Geron. 2019

Simple Idea

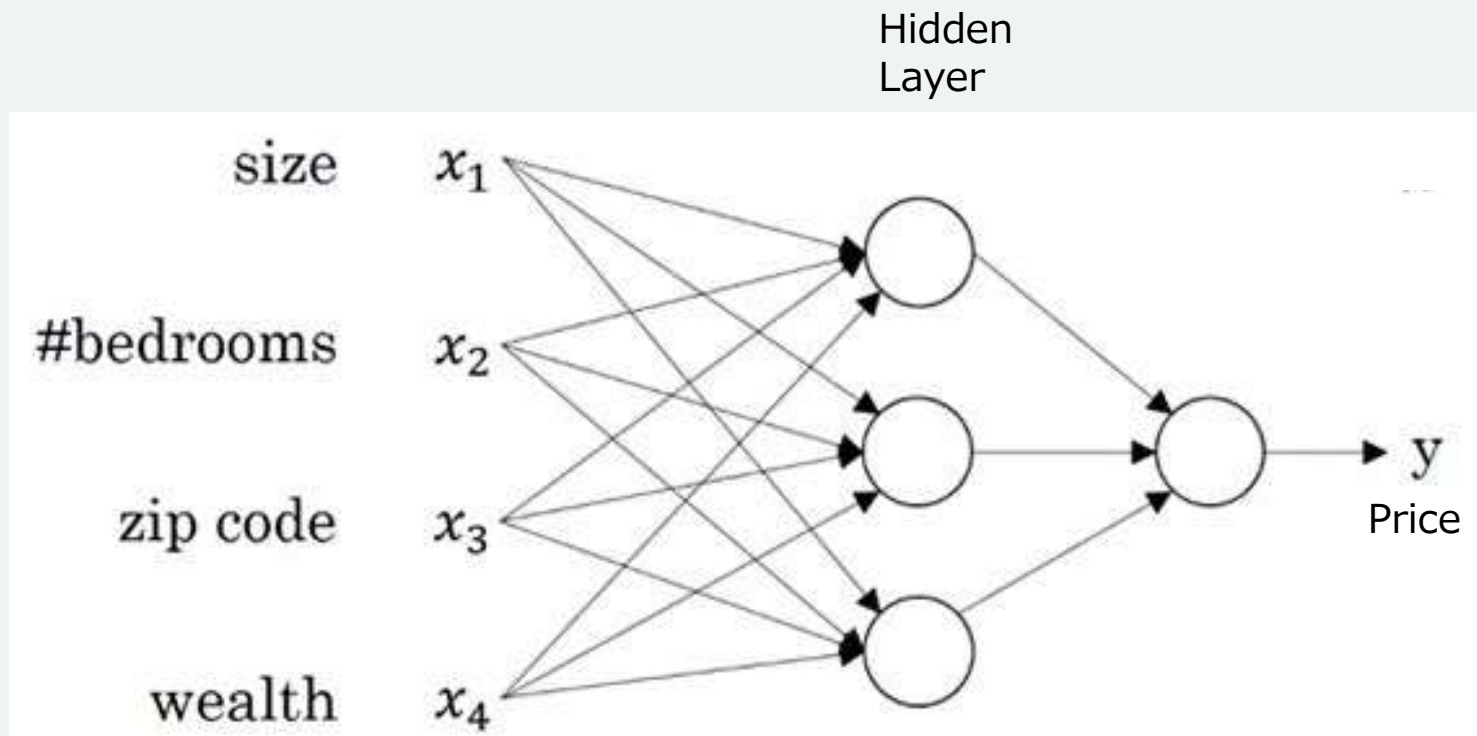


*Neural Network and Deeplearning course, deeplearning.ai, Coursera

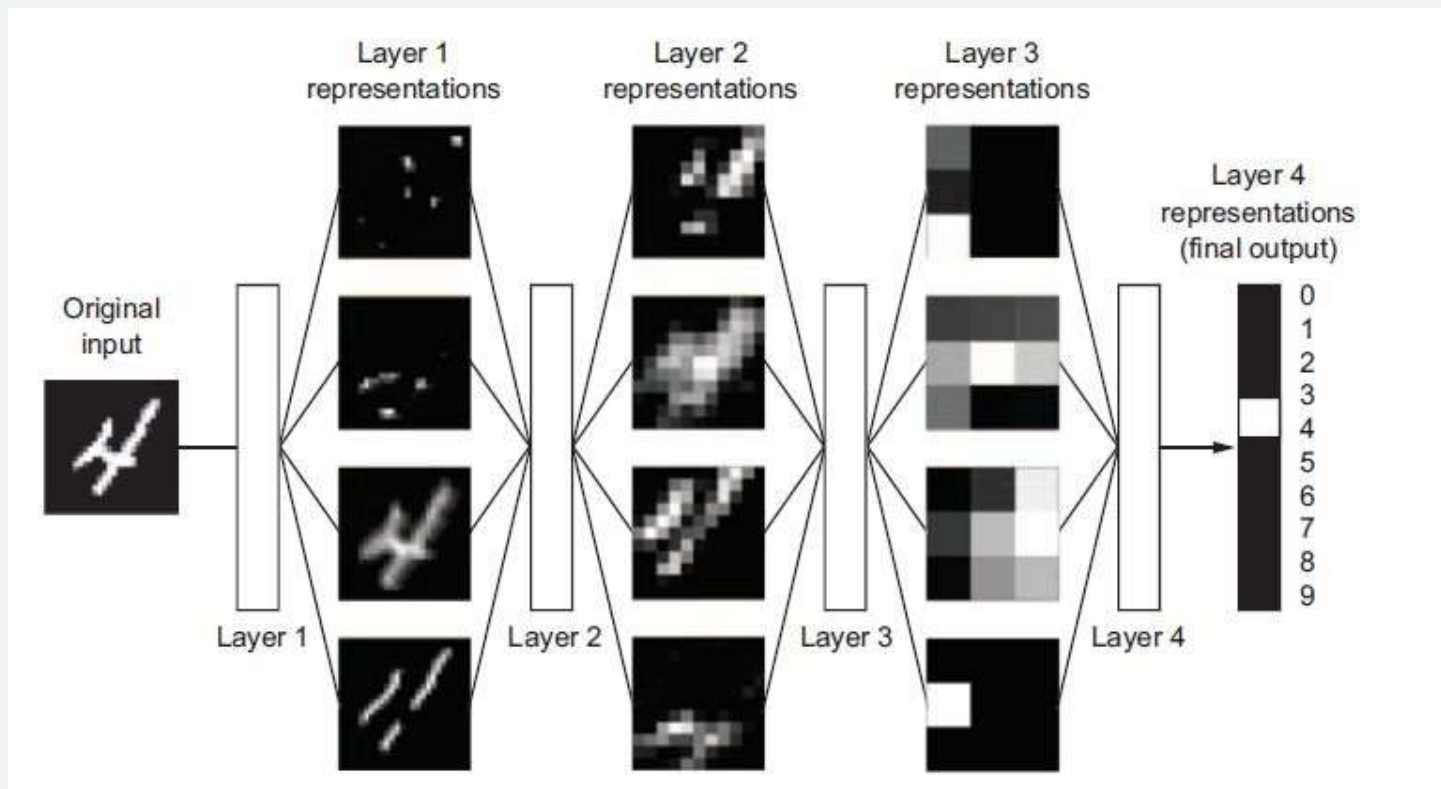
ReLu = Rectified Linear Unit



Input Features

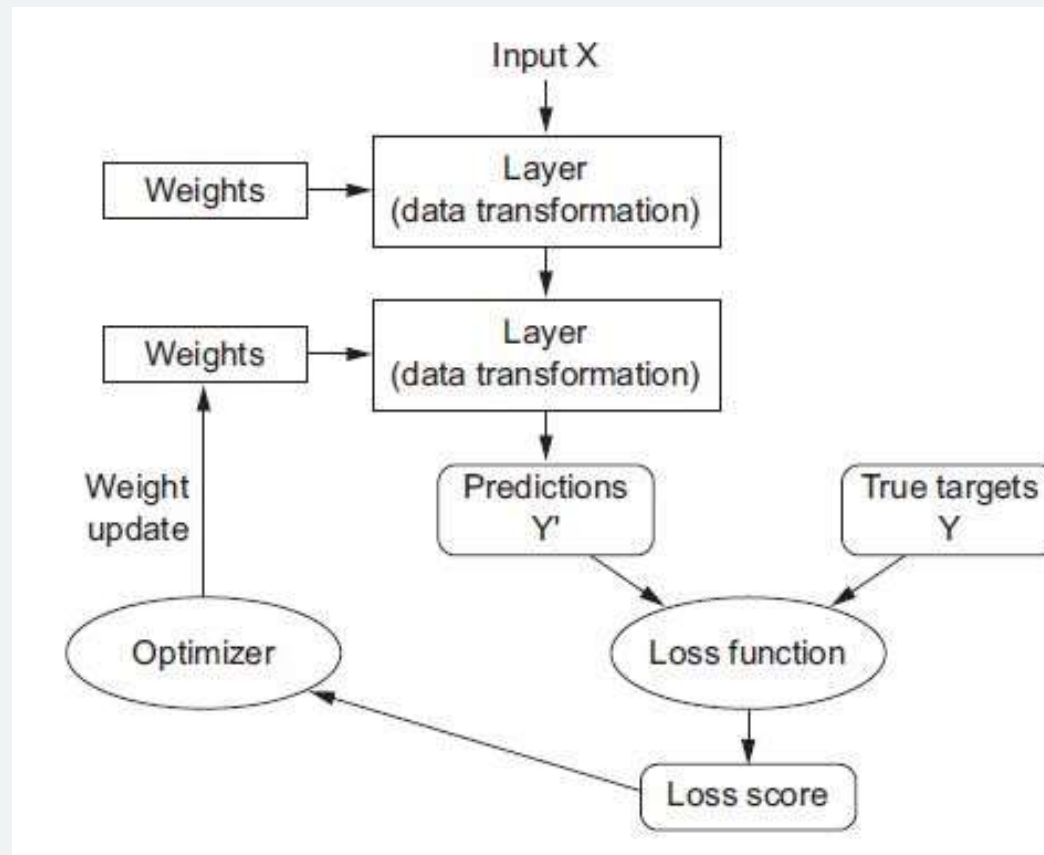


Deep neural network for digit classification



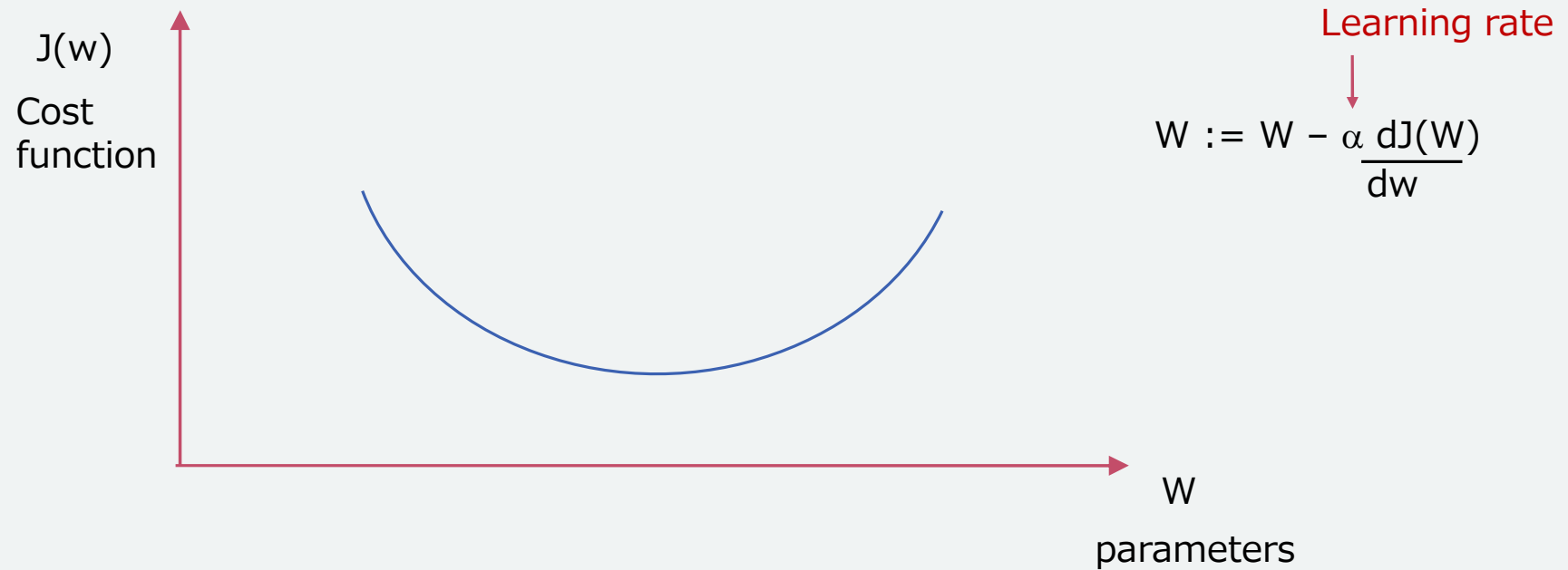
*From Deep Learning with Python, Francois Chollet, 2018

Deep learning structure



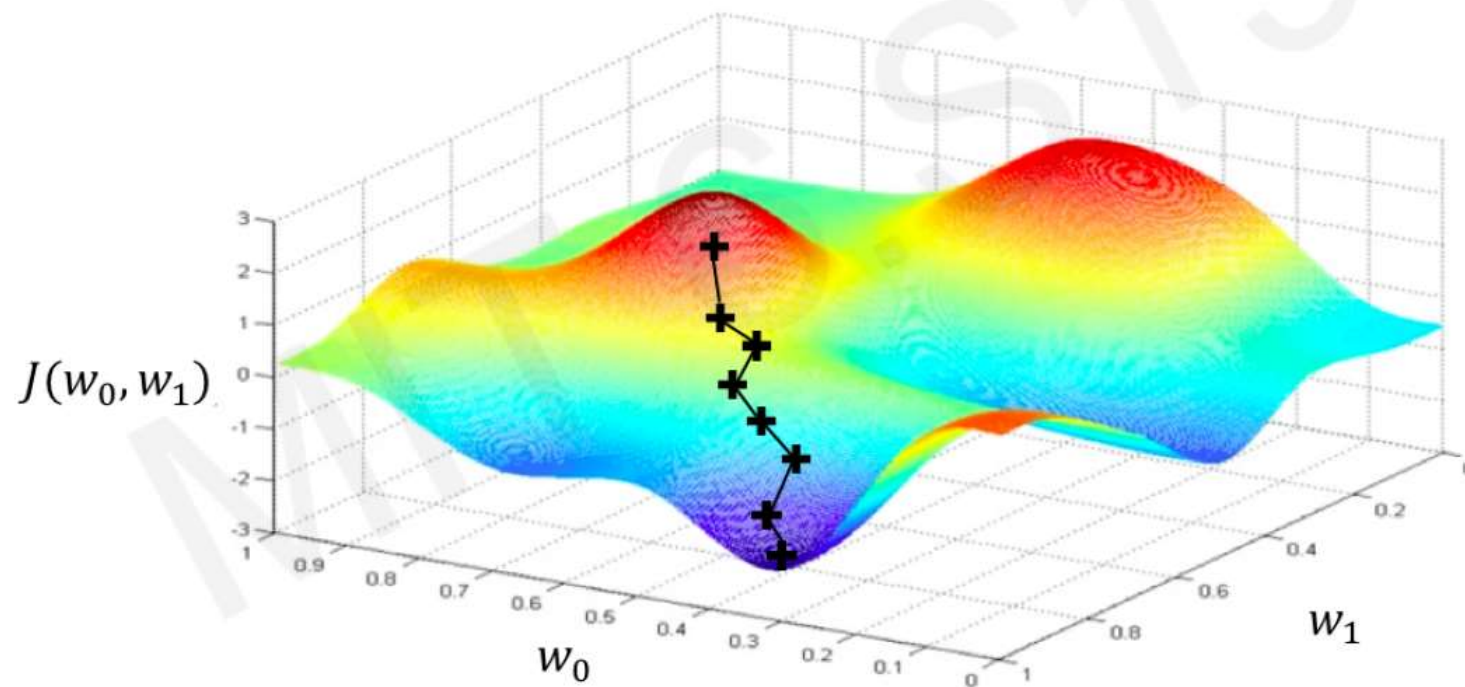
*From Deep Learning with Python, Francois Chollet, 2018

Gradient descent



Gradient Descent

Repeat until convergence

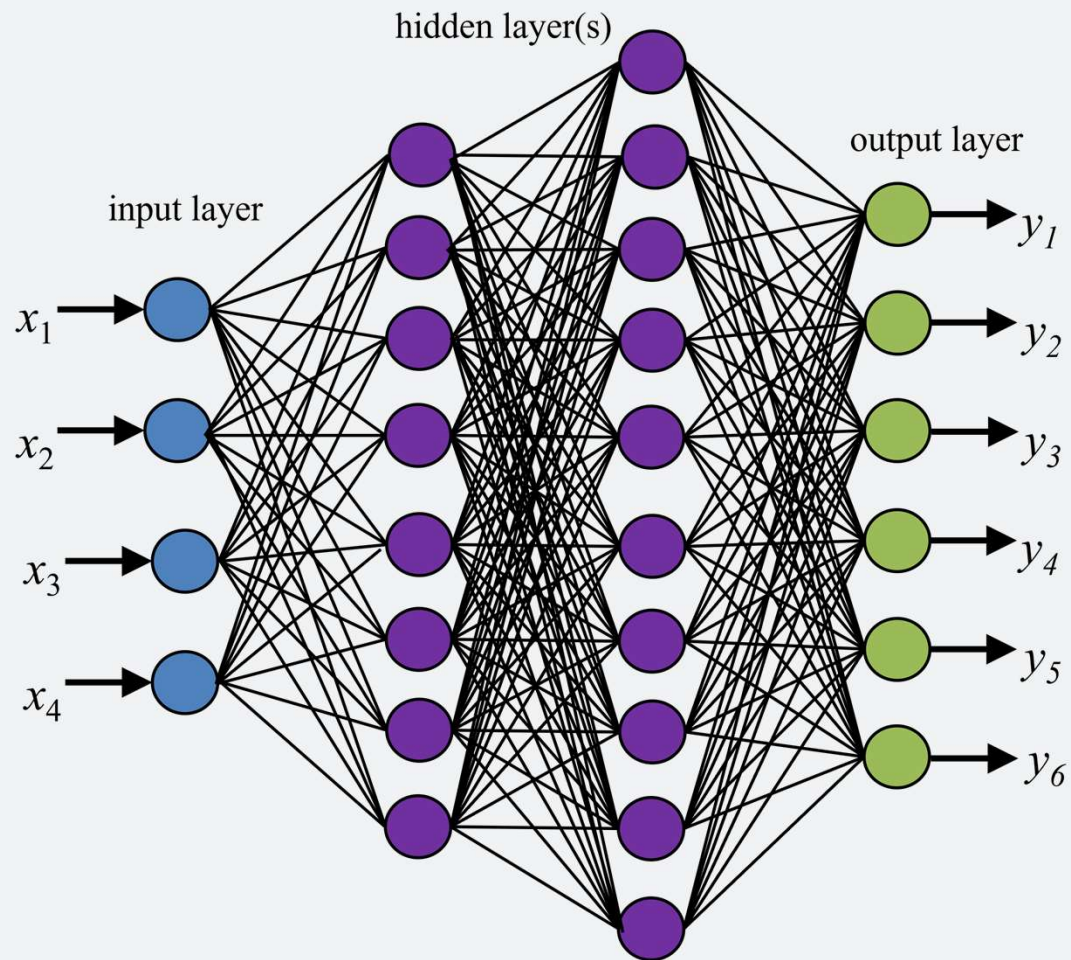


*From MIT 6S191 Deep Learning Lecture 1

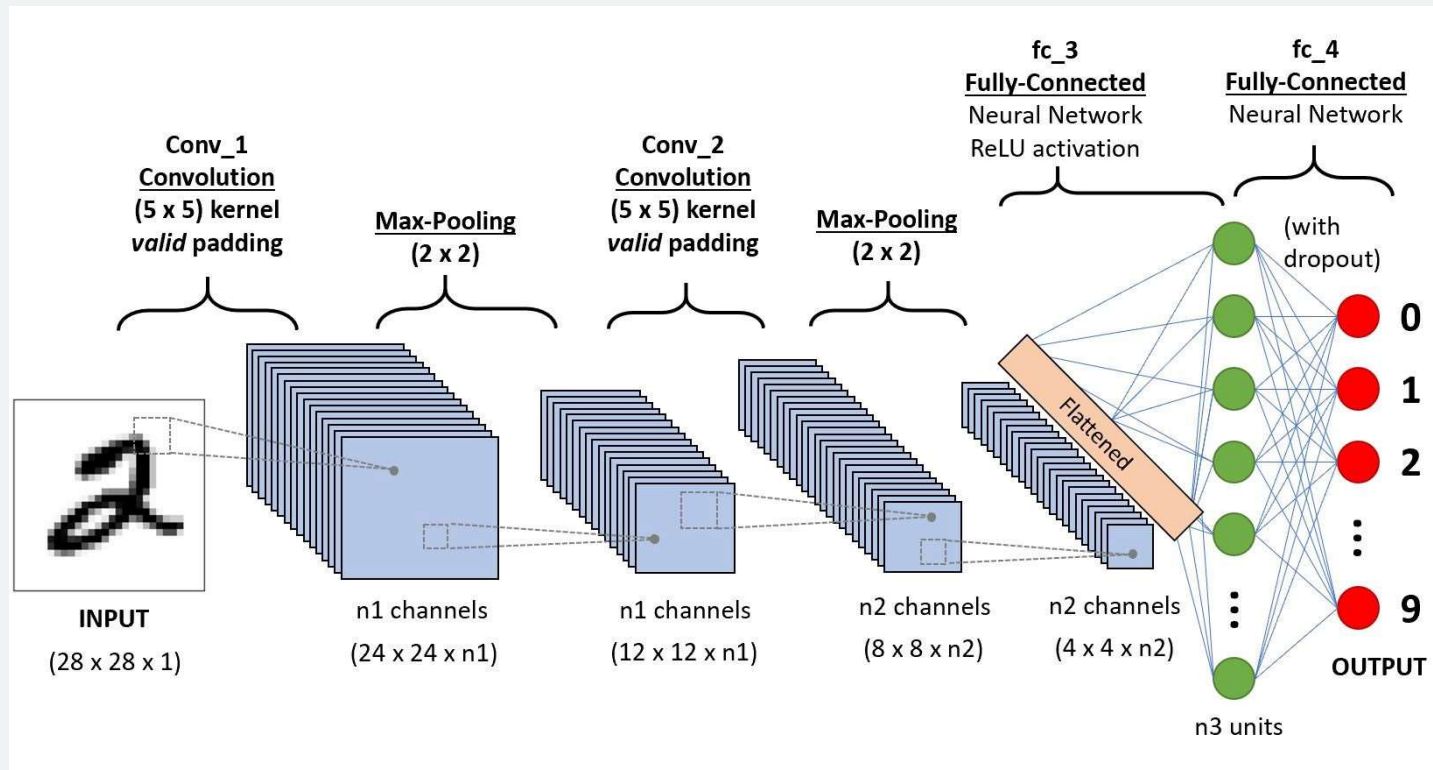


SOME COMMON NEURAL NETWORK ARCHITECTURES

Dense Neural Networks (DNN)

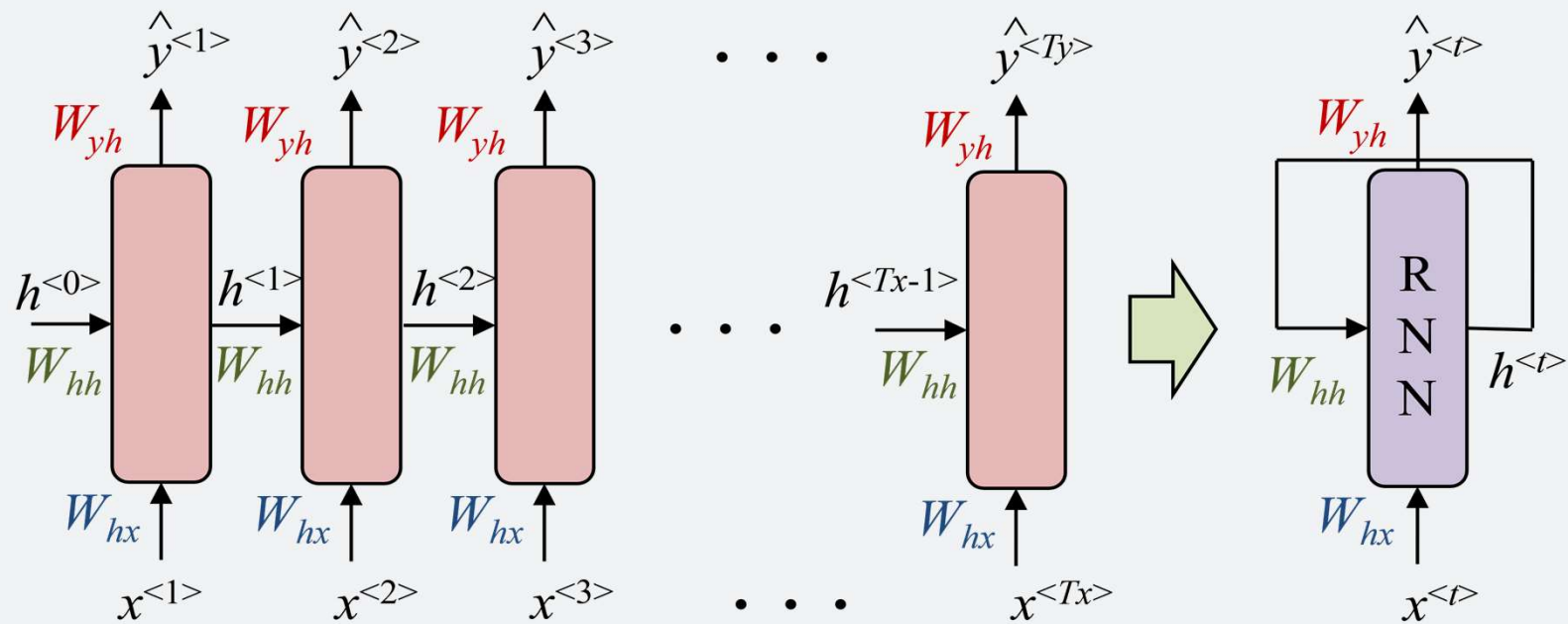


Convolutional Neural Networks (CNN)

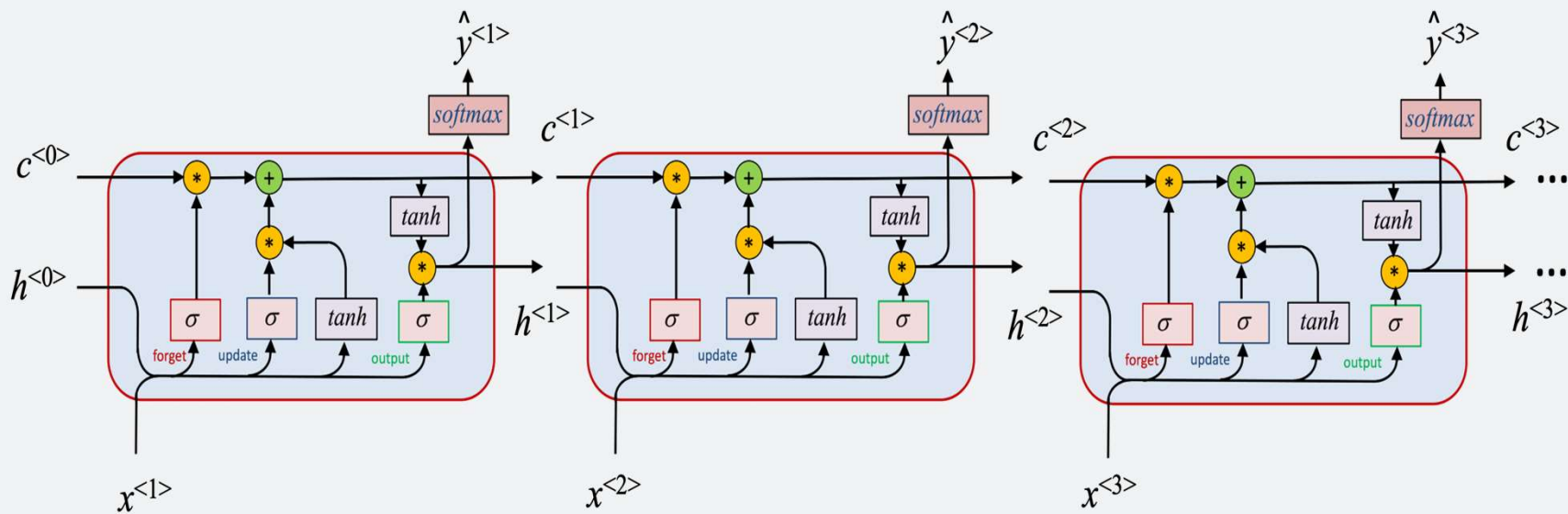


<https://towardsdatascience.com/a-comprehensive-guide-to-convolutional-neural-networks-the-eli5-way-3bd2b1164a53>

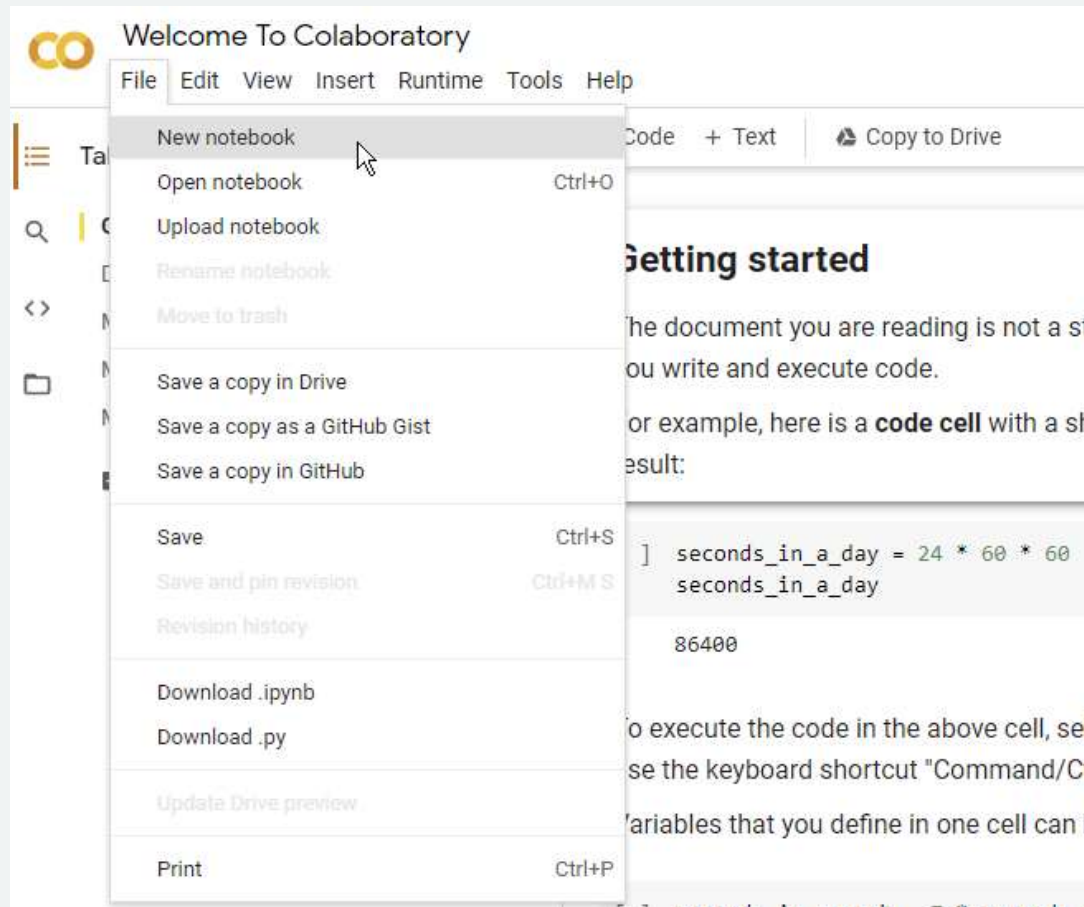
Recurrent Neural Networks (RNN)



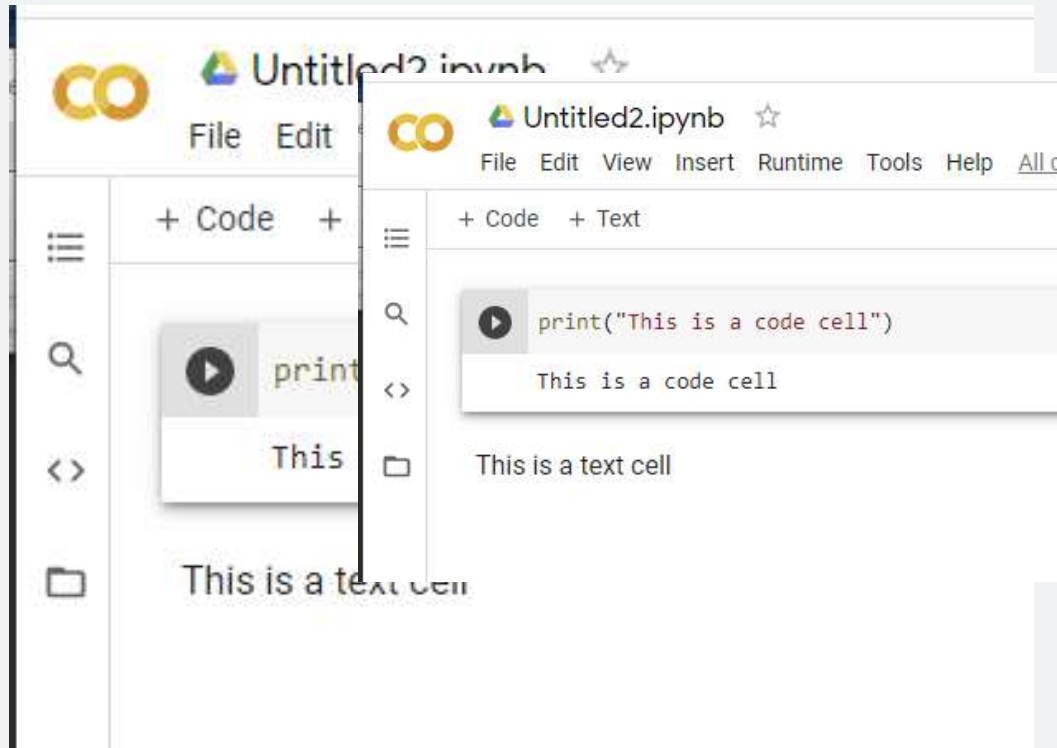
Long Short Term Memory (LSTM)



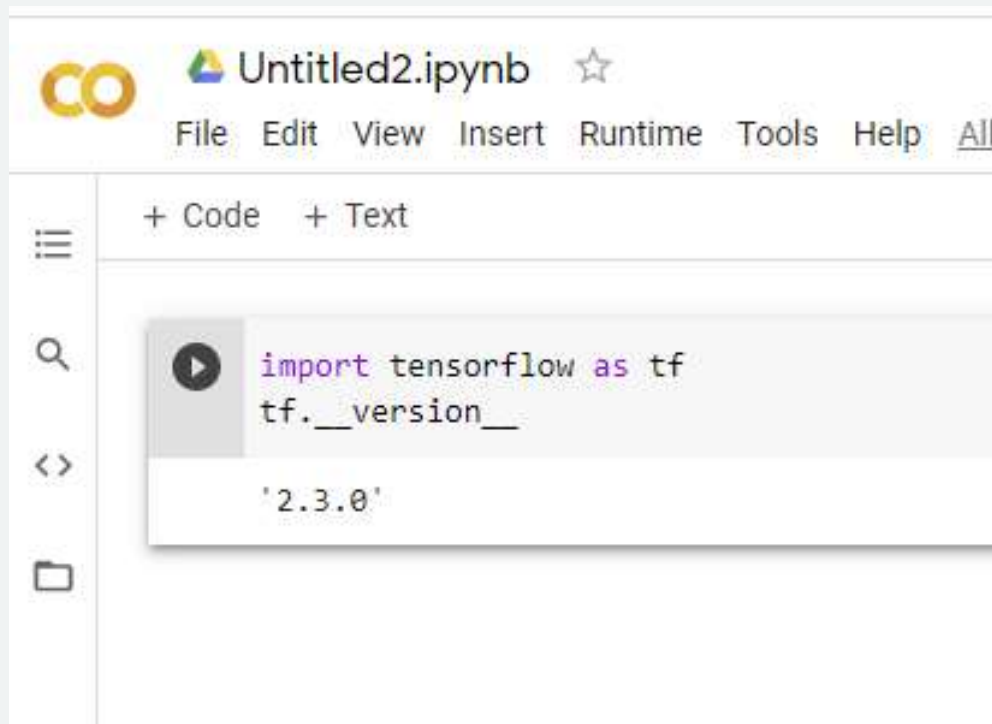
Begin Deep Learning Development in Colab



2 types of cell in notebook



TensorFlow is already installed in Colab



The screenshot shows the Google Colab interface. At the top, the Colab logo is on the left, followed by the file name 'Untitled2.ipynb' and a star icon. Below this is a menu bar with 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', 'Help', and 'All'. On the left side, there is a sidebar with icons for a menu, search, code editor, and file explorer. The main area has a '+ Code' button and a '+ Text' button. A code cell is selected, showing a play button icon and the following code:

```
import tensorflow as tf
tf.__version__
```

 The output of the code cell is displayed below the code, showing the string `'2.3.0'`.

```
import tensorflow as tf
tf.__version__
```

'2.3.0'

Install TensorFlow locally

See instructions from

<https://github.com/dewdotninja/books/blob/main/th/anndl/appendixB.ipynb>

Exercises:

เข้าสู่หน้าเพจของบทที่ 1 ของหนังสือ “โครงข่ายประสาทเทียมและการเรียนรู้เชิงลึก”
และรันตัวอย่าง 1.1, 1.2 ใน Google colab หรือ Jupyter notebook ที่ติดตั้งบนเครื่อง

<https://github.com/dewdotninja/books/blob/main/th/anndl/chapter1.ipynb>

References

- **F. Chollet. Deep Learning with Python 2ed. Manning Publications Co. 2021.**
- **A. Geron. Machine Learning with Scikit-Learn, Keras & TensorFlow. O'Reilly Media, Inc. 2019.**
- **I. GoodFellow, Y. Bengio and A. Courville. Deep Learning. www.deeplearningbook.org.**
- **Coursera**
 - Deep Learning Specialization. Deeplearning.ai.
 - DeepLearning.AI TensorFlow Developer
- **MIT 6.S191 Introduction to Deep Learning**
<http://introtodeeplearning.com/>