

Keras Sequential Model

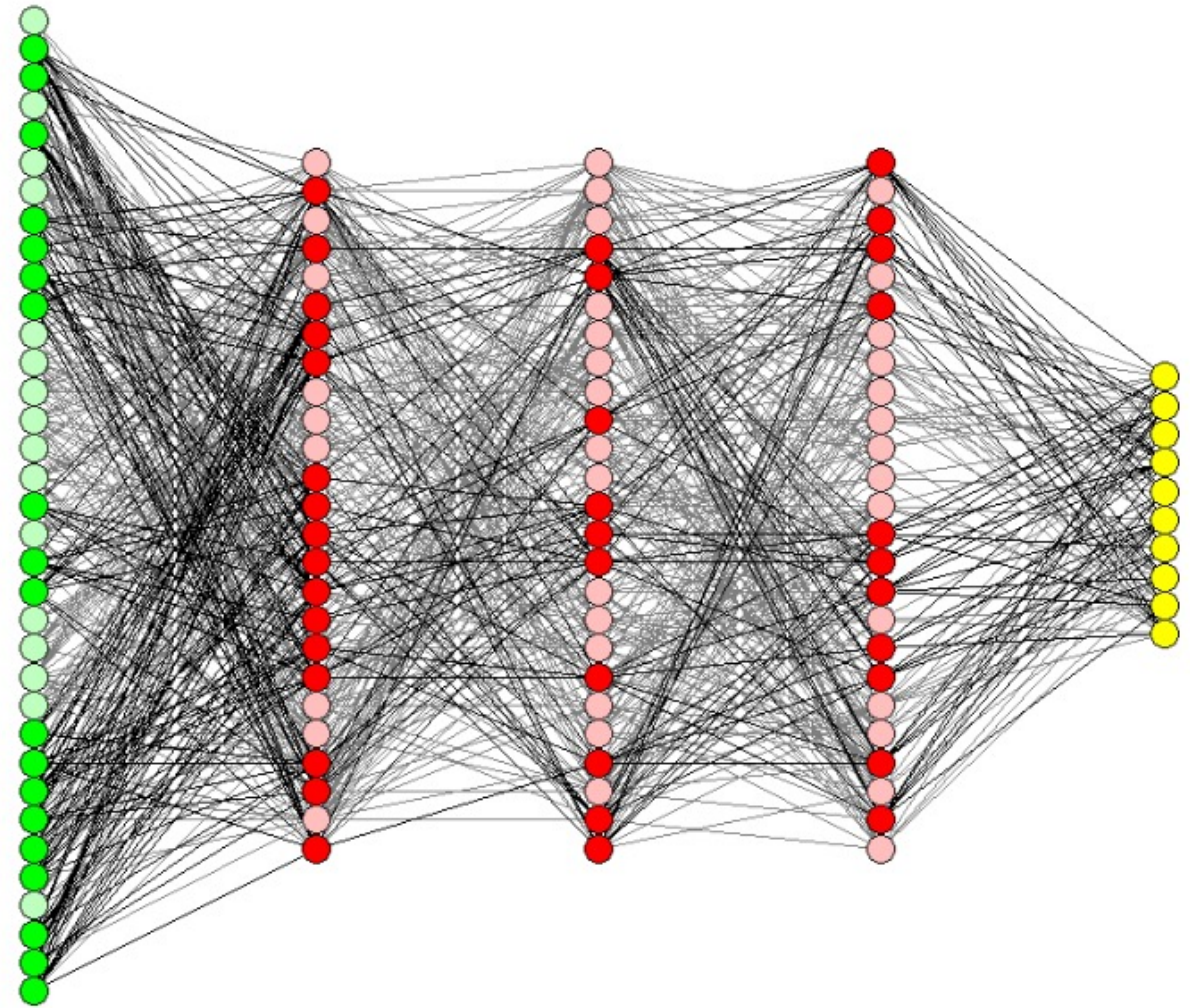
COSC 410: Applied Machine Learning

Spring 2022

Prof. Apthorpe

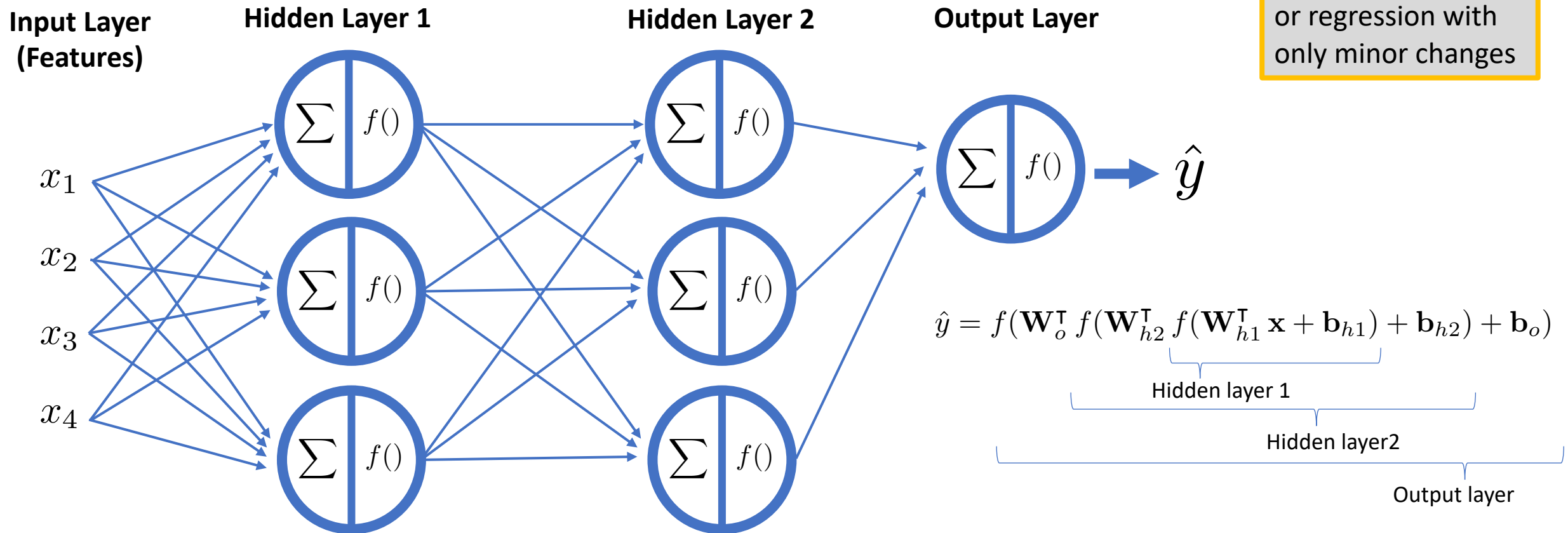
Outline

- FNN Review
- Hyperparameters Review
- Keras
- Fashion MNIST
- Programming Practice



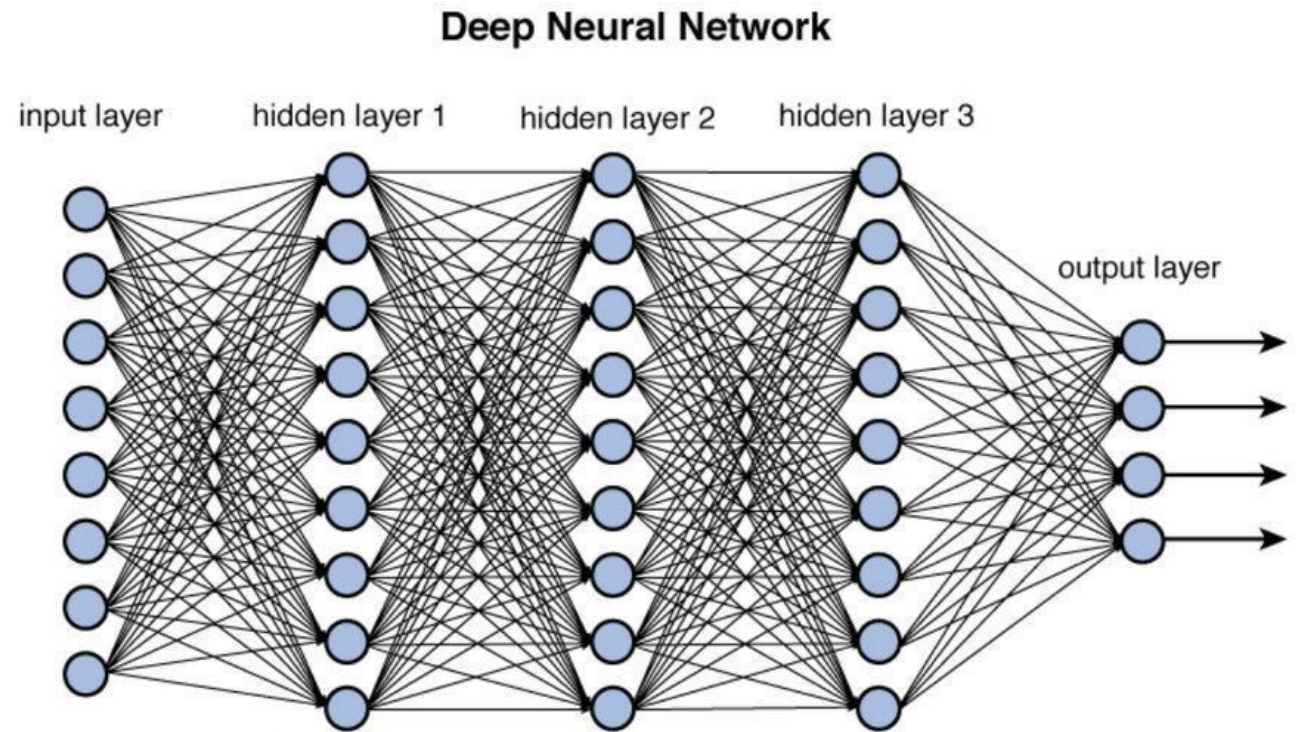
Feed-Forward Neural Network

- Several layers to model complicated nonlinear functions



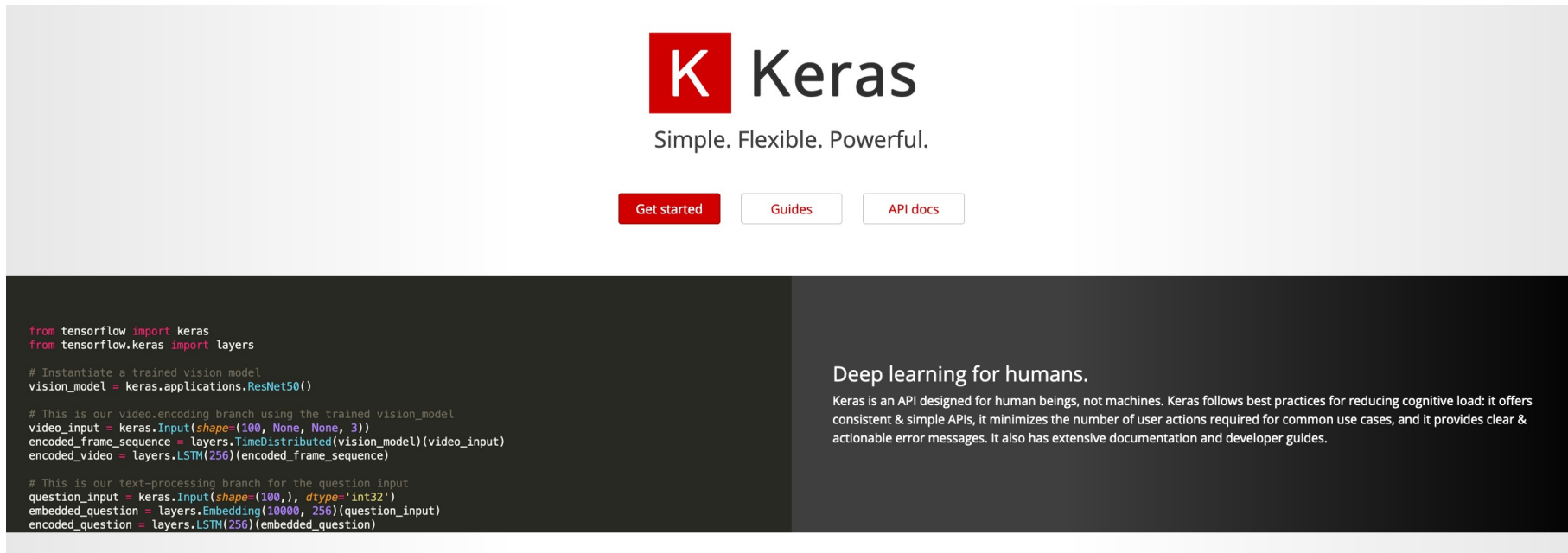
FNN Hyperparameters

- FNNs have many hyperparameters before we even get to the training algorithm
 - Number of layers
 - Number of nodes per layer
 - Activation function
 - Parameter initialization method
 - Learning rate schedule
 - Overfitting prevention
 - ...



Keras

- Python library for deep learning
- High-level API (wrapper) for TensorFlow



The image shows a screenshot of the Keras website. At the top, there is a large red square with a white 'K' inside, followed by the word 'Keras' in a bold, sans-serif font. Below this, the tagline 'Simple. Flexible. Powerful.' is displayed. Underneath the tagline, there are three buttons: 'Get started' (red), 'Guides' (white), and 'API docs' (white). Below the buttons, there is a dark gray section containing a code snippet on the left and a text block on the right. The code snippet is a Python script that demonstrates how to use Keras to build a deep learning model for video and text processing. The text block on the right is titled 'Deep learning for humans.' and contains a paragraph describing Keras as an API designed for human beings, not machines, and highlighting its focus on reducing cognitive load and providing clear error messages.

K Keras
Simple. Flexible. Powerful.

[Get started](#) [Guides](#) [API docs](#)

```
from tensorflow import keras
from tensorflow.keras import layers

# Instantiate a trained vision model
vision_model = keras.applications.ResNet50()

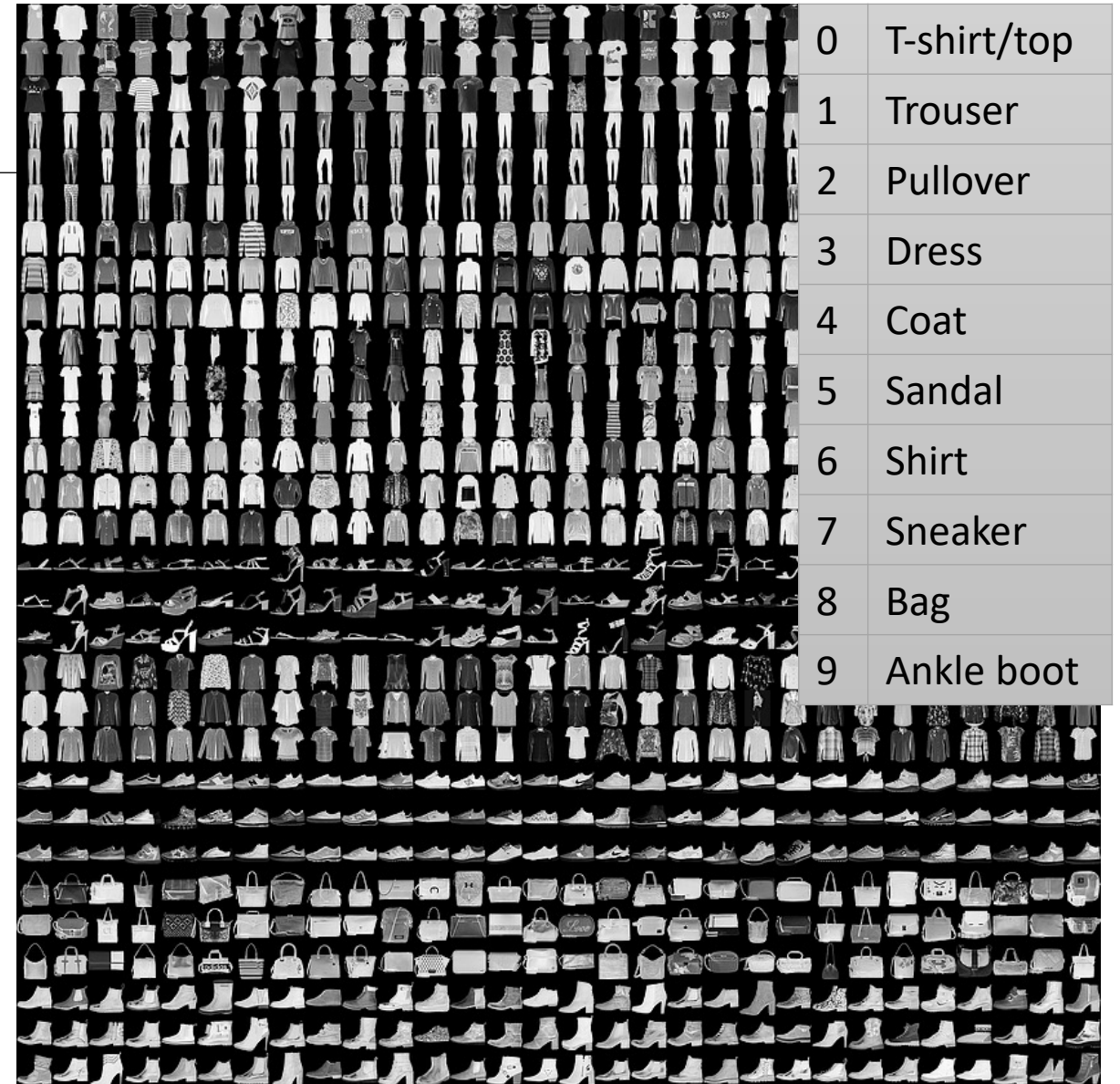
# This is our video.encoding branch using the trained vision_model
video_input = keras.Input(shape=(100, None, None, 3))
encoded_frame_sequence = layers.TimeDistributed(vision_model)(video_input)
encoded_video = layers.LSTM(256)(encoded_frame_sequence)

# This is our text-processing branch for the question input
question_input = keras.Input(shape=(100,), dtype='int32')
embedded_question = layers.Embedding(10000, 256)(question_input)
encoded_question = layers.LSTM(256)(embedded_question)
```

Deep learning for humans.
Keras is an API designed for human beings, not machines. Keras follows best practices for reducing cognitive load: it offers consistent & simple APIs, it minimizes the number of user actions required for common use cases, and it provides clear & actionable error messages. It also has extensive documentation and developer guides.

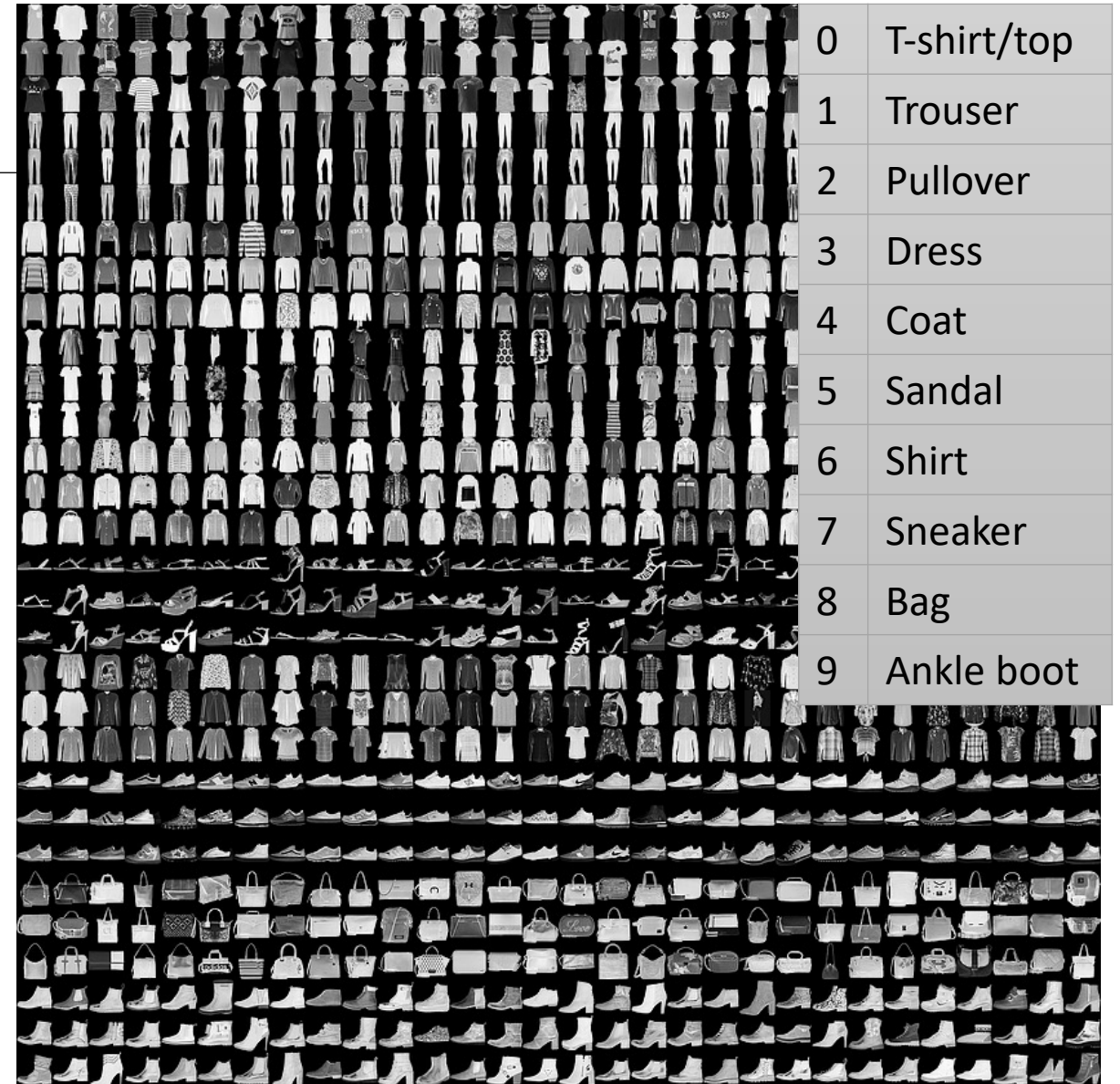
Fashion MNIST

- Images of clothes in 10 categories
- Each image is 28x28 pixels grayscale
 - How many features per image?



Fashion MNIST

- Images of clothes in 10 categories
- Each image is 28x28 pixels grayscale
 - 784 features per image
- 60,000 example training set
10,000 example test set



Programming Practice

FNN-KerasSequential.ipynb