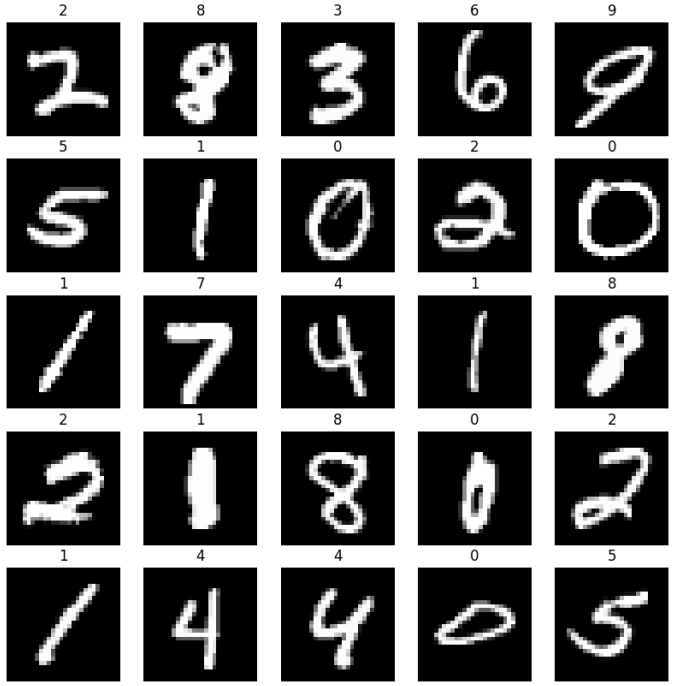

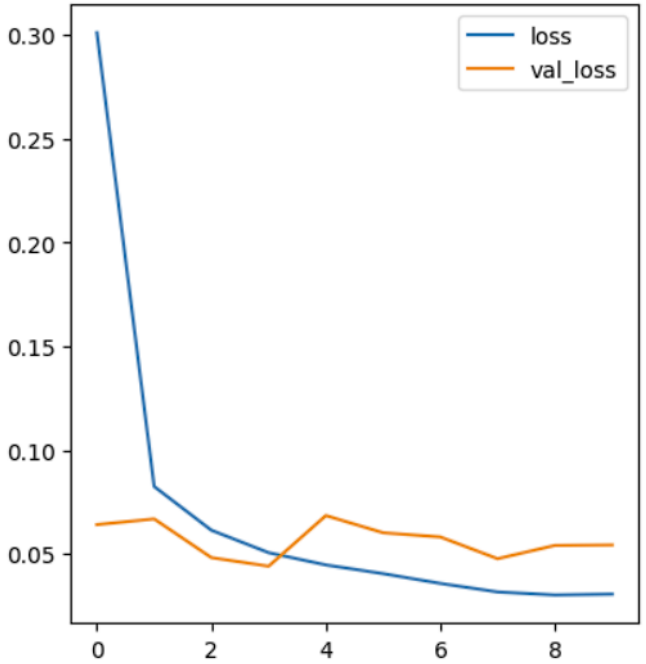

The y-axis is the loss and the x-axis is the number of epochs. The blue line is the training loss.

```python
def build_model():
    model = tf.keras.Sequential()

    # Stage 1
    model.add(layers.Conv2D(8, (3, 3), padding="same", activation="relu", input_shape=(28, 28, 1)))
    model.add(layers.MaxPooling2D((2, 2)))
    # output shape: (14, 14, 8)

    # Stage 2
    model.add(layers.Conv2D(16, (3, 3), padding="same", activation="relu"))
    model.add(layers.MaxPooling2D((2, 2)))
    # output shape: (7, 7, 16)

    # Stage 3
    model.add(layers.Conv2D(32, (3, 3), padding="same", activation="relu"))
    # output shape: (7, 7, 32)

    # Stage 4
    model.add(layers.Flatten())
    # output shape: (1568)

    # Stage 5
    model.add(layers.Dense(128, activation="relu"))
    model.add(layers.Dropout(0.2))
    # output shape: (128)

    # Stage 6
    model.add(layers.Dense(10, activation="softmax"))
    # output shape: (10)

    return model

model = build_model()
model.summary()
```

Five activation functions:
1) ReLU
2) Sigmoid
3) Tanh
4) Softplus
5) Sign (Signum)

a) **What is *adam*?**
The optimizer, i.e. a type of stochastic gradient decent with momentum using first- and second-order momentum.

b) **What does *sparse_categorical_crossentropy* mean?**
The loss function for two or more mutually exclusive classes. The “sparse” part means we’re not doing 1-hot encoding but instead representing each output class as an integer. In our case, for the MNIST digit dataset, this is perfect as the classes/categories are already the integers themselves.

What does “epoch” mean?
Epoch means training on the entire dataset one time.

```
accuracy: 0.9911
```

The test accuracy for the 10th epoch is 99.11%.

Name: Tolga Keskinoglu
Matriculation #: 23188690
IdM: ke89cyno