

## Lab 2 Deep Learning

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## **FC Model:**

```
def build_fc_model():
    fc_model = tf.keras.Sequential([
        tf.keras.layers.Flatten(),
        tf.keras.layers.Dense(128, input_shape=(784,), activation=tf.nn.relu),
        tf.keras.layers.Dense(10, input_shape=(128,), activation=tf.nn.softmax)
    ])
    return fc_model
```

- Using Adam with lr=0.0009 We reached an accuracy for training set which is 98.49% and for testing set 97.71%, we tried regularization but there is no remarkable change as there is no overfitting, it takes 37 second in running
- We tried another optimizer ( SGD ) but the results was not better than Adam
- We tried also tanh on FC model but Relu is better than tanh. Relu is 97.71% while tanh reaches 97.01%

## **CNN Model:**

```
def build_cnn_model():
    cnn_model = tf.keras.Sequential([
        tf.keras.layers.Conv2D(24, kernel_size=(3, 3), activation=tf.nn.relu, input_shape=(28, 28, 1)),
        tf.keras.layers.MaxPooling2D(pool_size=(2, 2), strides=2),
        tf.keras.layers.Conv2D(36, kernel_size=(3, 3), activation=tf.nn.relu, input_shape=(13, 13, 24)),
        tf.keras.layers.MaxPooling2D(pool_size=(2, 2), strides=2),
        tf.keras.layers.Flatten(),
        tf.keras.layers.Dense(748, input_shape=(900,), activation=tf.nn.relu),
        tf.keras.layers.Dense(128, input_shape=(784,), activation=tf.nn.relu),
        tf.keras.layers.Dense(10, input_shape=(128,), activation=tf.nn.softmax)
    ])
    return cnn_model
```

- Using Adam with lr= 0.0009 We reached an accuracy for training set which is 99.46% and for testing set 99.23%, we tried regularization but there is no remarkable change as there is no overfitting, it takes 308 seconds in running
- We tried another optimizer ( SGD ) but the results was not better than Adam
- We tried also tanh on FC model but Relu is better than tanh. Relu is 97.71% while tanh reaches 97.01%

