NEURAL NETWORKS AND DEEP LEARNING

ASSIGNMENT -6

Sai Vardhan Reddy Narra

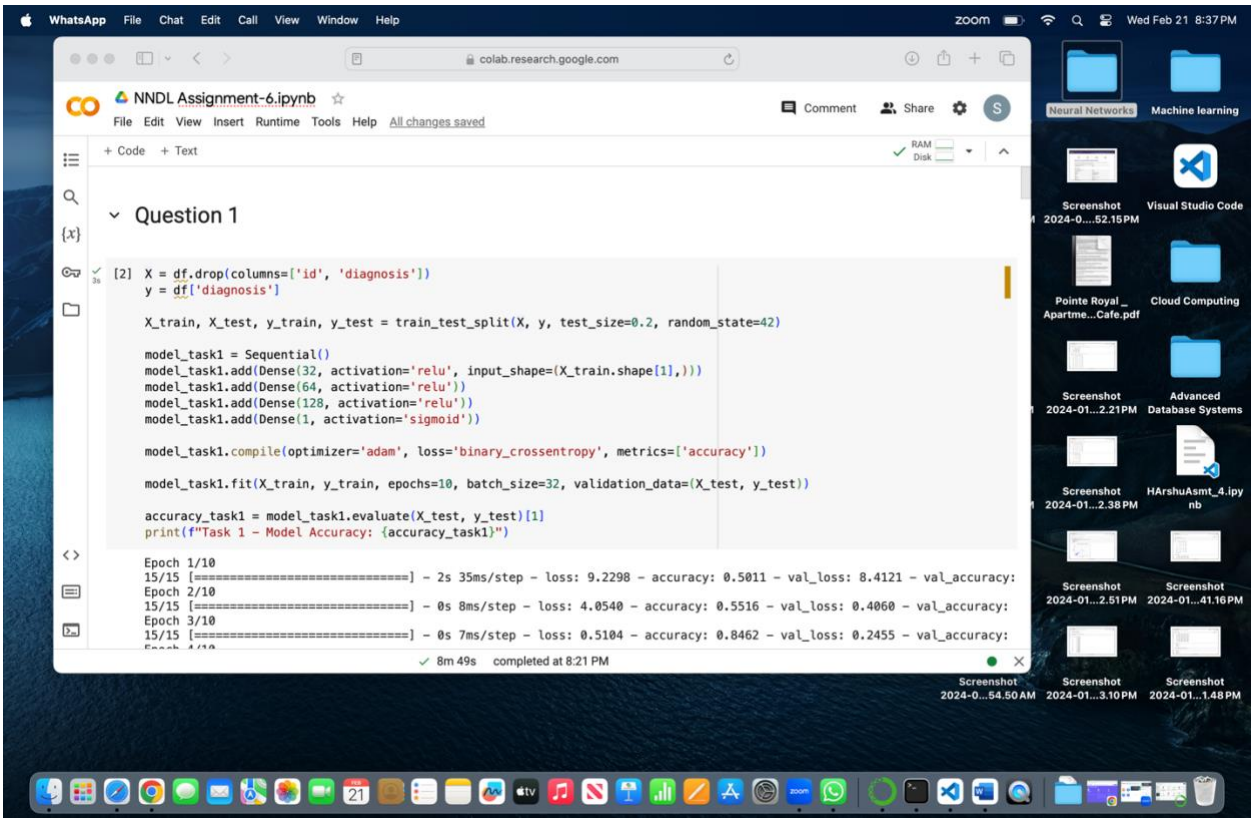
700756163

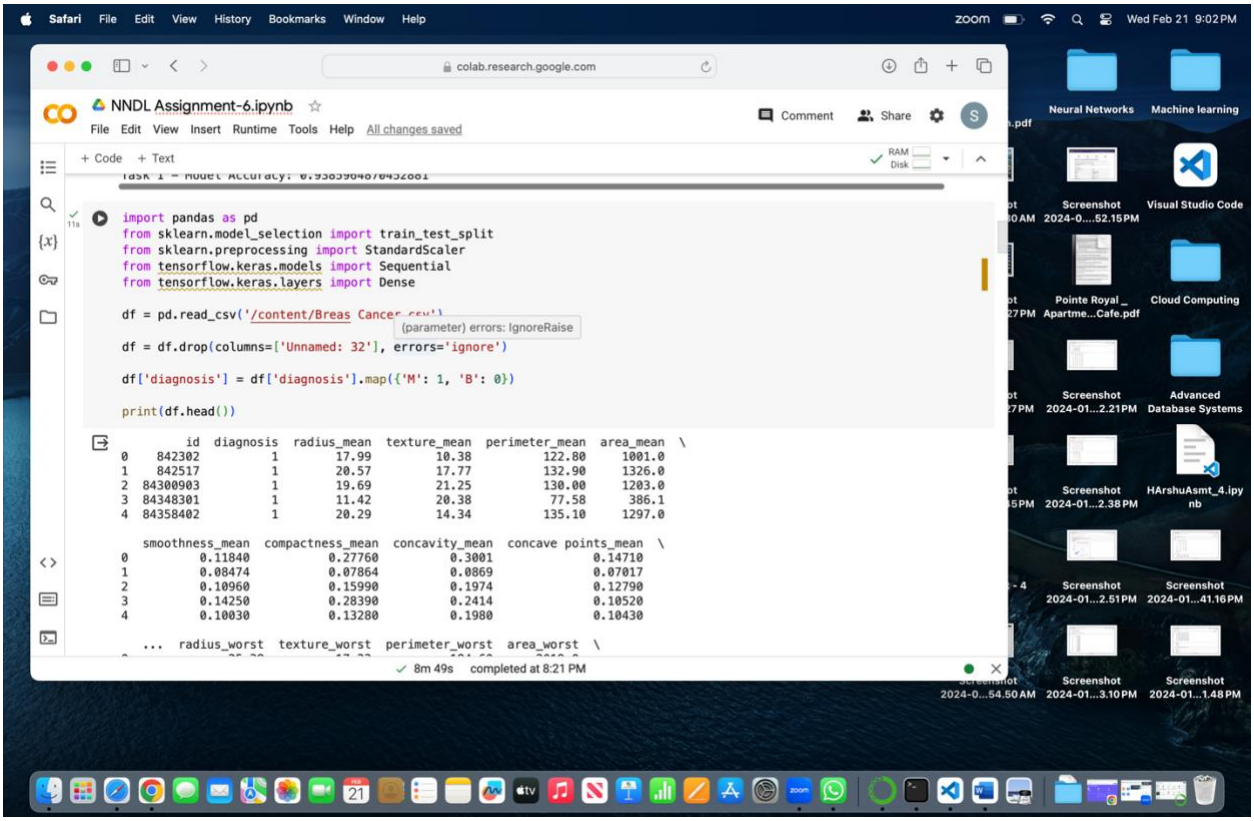
GitHub link: https://github.com/saivardhan-dev/Neural_etworks_Assignment-6_700756163

Video link:https://drive.google.com/file/d/1iMdkFtxV4n-lzjw-ec9vwy-pwOVHQe7V/view?usp=drive_link

CODE SCREENSHOTS:

Question-1

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import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
df = pd.read_csv('/content/Breas Cancer.csv')
(parameter) errors: IgnoreRaise
df = df.drop(columns=['Unnamed: 32'], errors='ignore')
df['diagnosis'] = df['diagnosis'].map({'M': 1, 'B': 0})
print(df.head())
id diagnosis radius_mean texture_mean perimeter_mean area_mean \
0 842302 1 17.99 10.38 122.80 1001.0
1 842517 1 20.57 17.77 132.90 1326.0
2 84300903 1 19.69 21.25 130.00 1203.0
3 84348301 1 11.42 20.38 77.58 386.1
4 84358402 1 20.29 14.34 135.10 1297.0
smoothness_mean compactness_mean concavity_mean concave points_mean \
0 0.11840 0.27760 0.3001 0.14710
1 0.08474 0.07864 0.0869 0.07017
2 0.10960 0.15990 0.1974 0.12790
3 0.14250 0.28390 0.2414 0.10520
4 0.10030 0.13280 0.1980 0.10430
... radius_worst texture_worst perimeter_worst area_worst \
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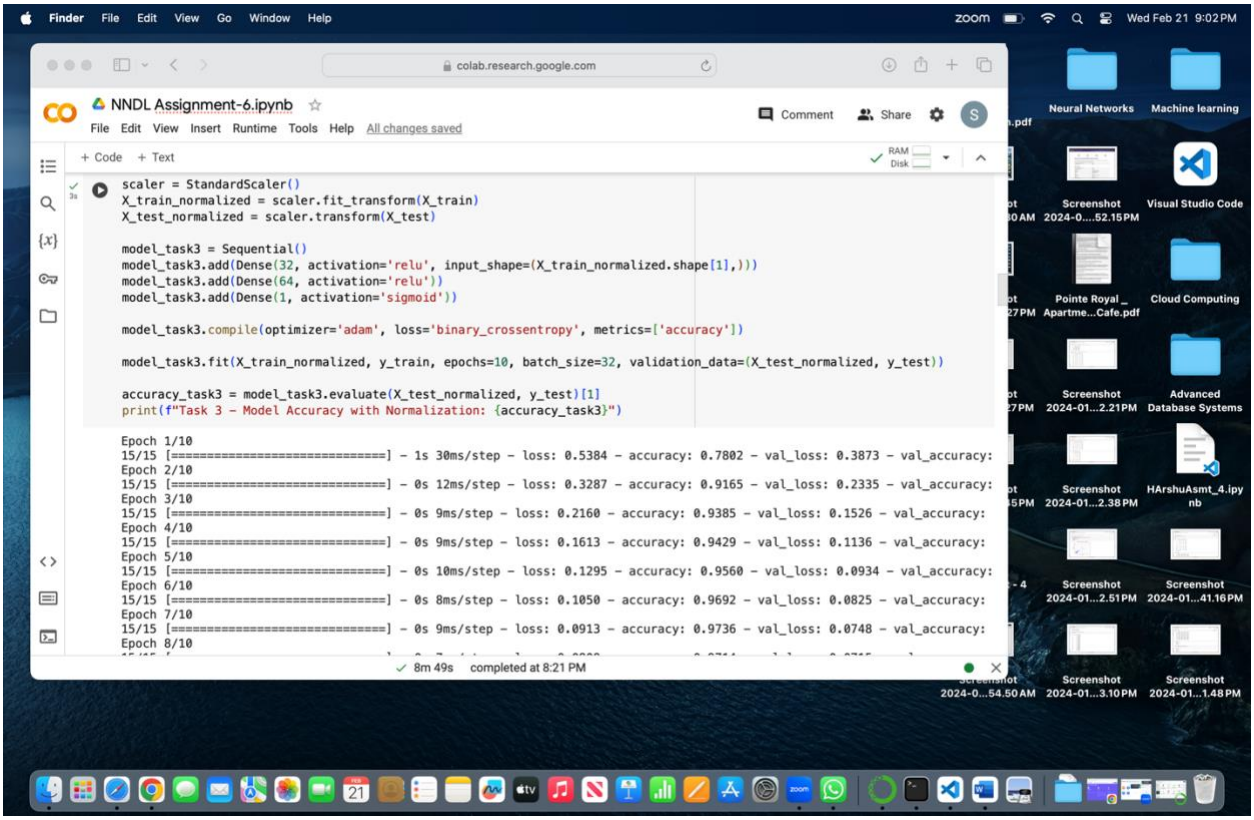
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scaler = StandardScaler()
X_train_normalized = scaler.fit_transform(X_train)
X_test_normalized = scaler.transform(X_test)
model_task3 = Sequential()
model_task3.add(Dense(32, activation='relu', input_shape=(X_train_normalized.shape[1],)))
model_task3.add(Dense(64, activation='relu'))
model_task3.add(Dense(1, activation='sigmoid'))
model_task3.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])
model_task3.fit(X_train_normalized, y_train, epochs=10, batch_size=32, validation_data=(X_test_normalized, y_test))
accuracy_task3 = model_task3.evaluate(X_test_normalized, y_test)[1]
print(f"Task 3 - Model Accuracy with Normalization: {accuracy_task3}")
Epoch 1/10
15/15 [==========] - 1s 30ms/step - loss: 0.5384 - accuracy: 0.7802 - val_loss: 0.3873 - val_accuracy:
Epoch 2/10
15/15 [==========] - 0s 12ms/step - loss: 0.3287 - accuracy: 0.9165 - val_loss: 0.2335 - val_accuracy:
Epoch 3/10
15/15 [==========] - 0s 9ms/step - loss: 0.2160 - accuracy: 0.9385 - val_loss: 0.1526 - val_accuracy:
Epoch 4/10
15/15 [==========] - 0s 9ms/step - loss: 0.1613 - accuracy: 0.9429 - val_loss: 0.1136 - val_accuracy:
Epoch 5/10
15/15 [==========] - 0s 10ms/step - loss: 0.1295 - accuracy: 0.9560 - val_loss: 0.0934 - val_accuracy:
Epoch 6/10
15/15 [==========] - 0s 8ms/step - loss: 0.1050 - accuracy: 0.9692 - val_loss: 0.0825 - val_accuracy:
Epoch 7/10
15/15 [==========] - 0s 9ms/step - loss: 0.0913 - accuracy: 0.9736 - val_loss: 0.0748 - val_accuracy:
Epoch 8/10
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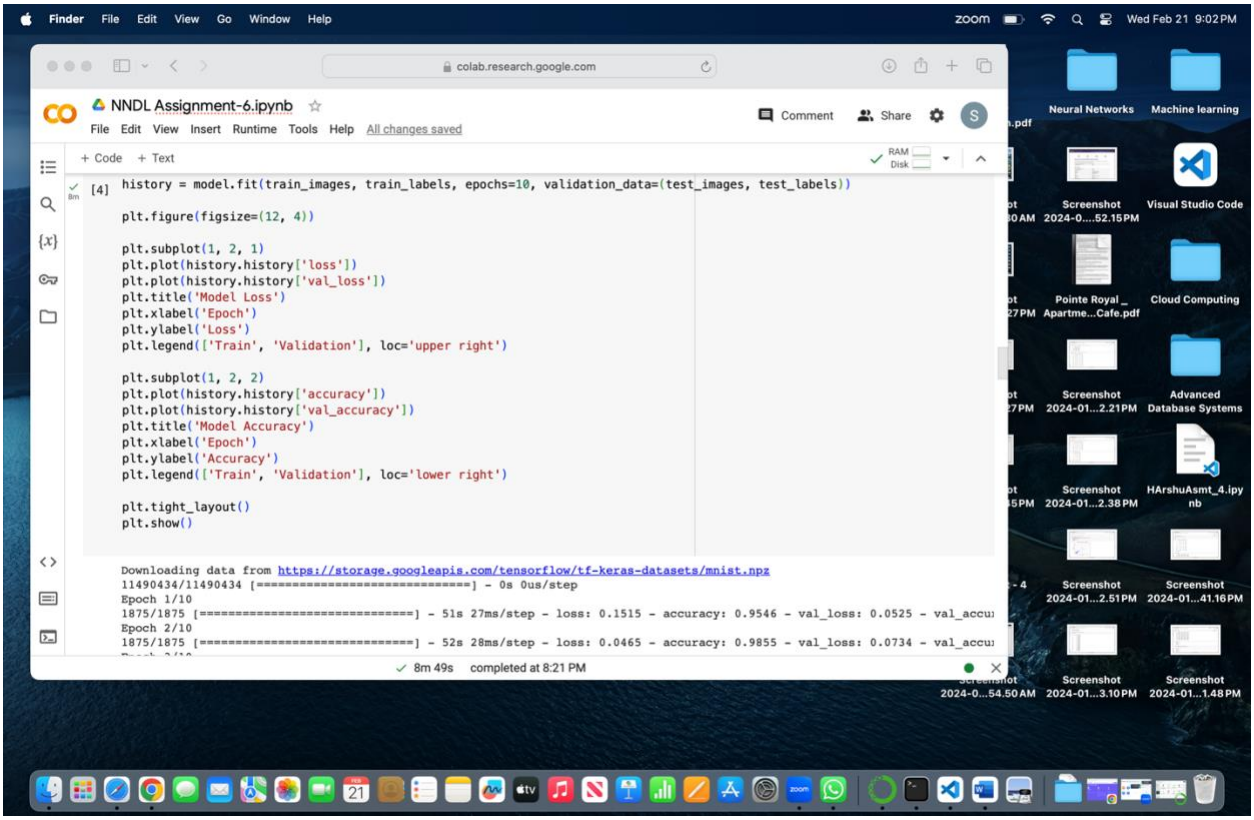
Question-2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[4] history = model.fit(train_images, train_labels, epochs=10, validation_data=(test_images, test_labels))
plt.figure(figsize=(12, 4))
plt.subplot(1, 2, 1)
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('Model Loss')
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.legend(['Train', 'Validation'], loc='upper right')
plt.subplot(1, 2, 2)
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('Model Accuracy')
plt.xlabel('Epoch')
plt.ylabel('Accuracy')
plt.legend(['Train', 'Validation'], loc='lower right')
plt.tight_layout()
plt.show()
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 [==========] - 0s 0us/step
Epoch 1/10
1875/1875 [==========] - 51s 27ms/step - loss: 0.1515 - accuracy: 0.9546 - val_loss: 0.0525 - val_accu
Epoch 2/10
1875/1875 [==========] - 52s 28ms/step - loss: 0.0465 - accuracy: 0.9855 - val_loss: 0.0734 - val_accu
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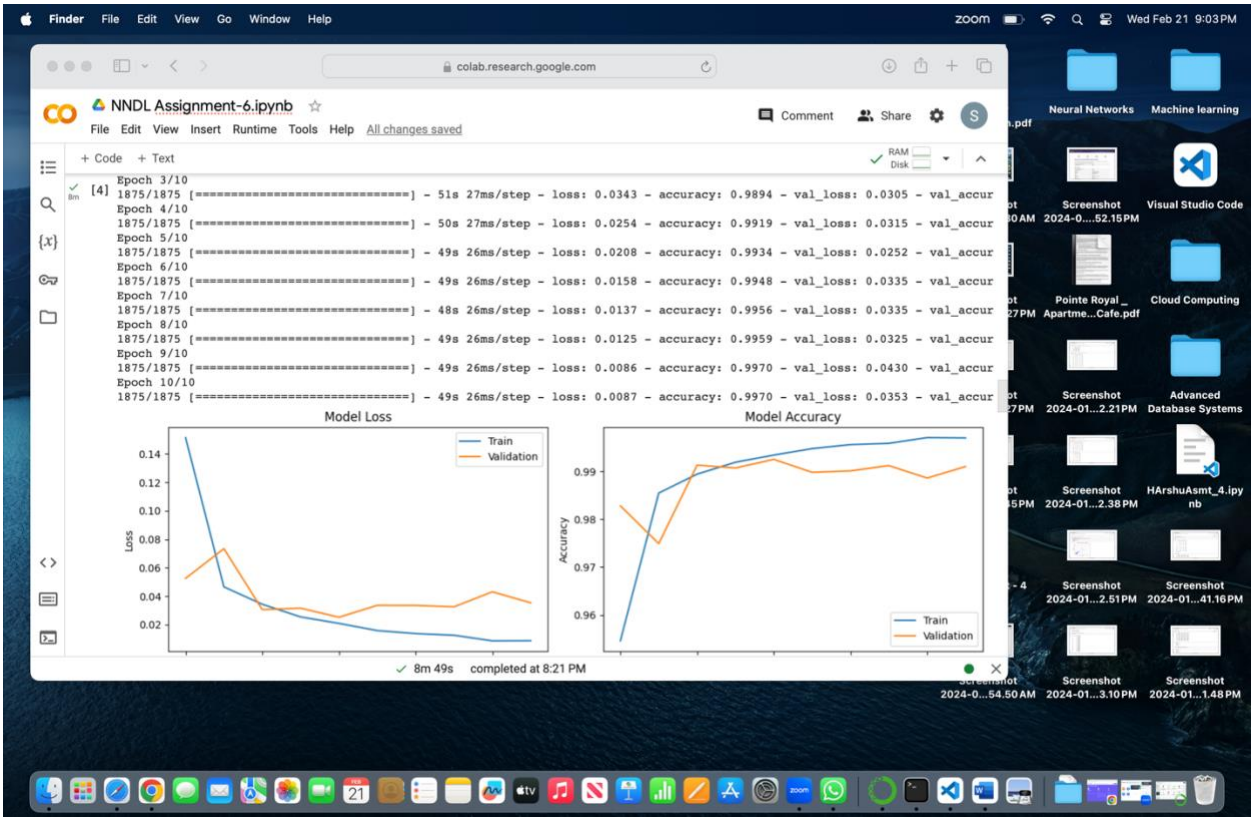
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[4]
Epoch 3/10
1875/1875 [==========] - 51s 27ms/step - loss: 0.0343 - accuracy: 0.9894 - val_loss: 0.0305 - val_accur
Epoch 4/10
1875/1875 [==========] - 50s 27ms/step - loss: 0.0254 - accuracy: 0.9919 - val_loss: 0.0315 - val_accur
Epoch 5/10
1875/1875 [==========] - 49s 26ms/step - loss: 0.0208 - accuracy: 0.9934 - val_loss: 0.0252 - val_accur
Epoch 6/10
1875/1875 [==========] - 49s 26ms/step - loss: 0.0158 - accuracy: 0.9948 - val_loss: 0.0335 - val_accur
Epoch 7/10
1875/1875 [==========] - 48s 26ms/step - loss: 0.0137 - accuracy: 0.9956 - val_loss: 0.0335 - val_accur
Epoch 8/10
1875/1875 [==========] - 49s 26ms/step - loss: 0.0125 - accuracy: 0.9959 - val_loss: 0.0325 - val_accur
Epoch 9/10
1875/1875 [==========] - 49s 26ms/step - loss: 0.0086 - accuracy: 0.9970 - val_loss: 0.0430 - val_accur
Epoch 10/10
1875/1875 [==========] - 49s 26ms/step - loss: 0.0087 - accuracy: 0.9970 - val_loss: 0.0353 - val_accur
Model Loss
Train
Validation
Loss
0.14
0.12
0.10
0.08
0.06
0.04
0.02
Model Accuracy
Accuracy
0.99
0.98
0.97
0.96
Train
Validation
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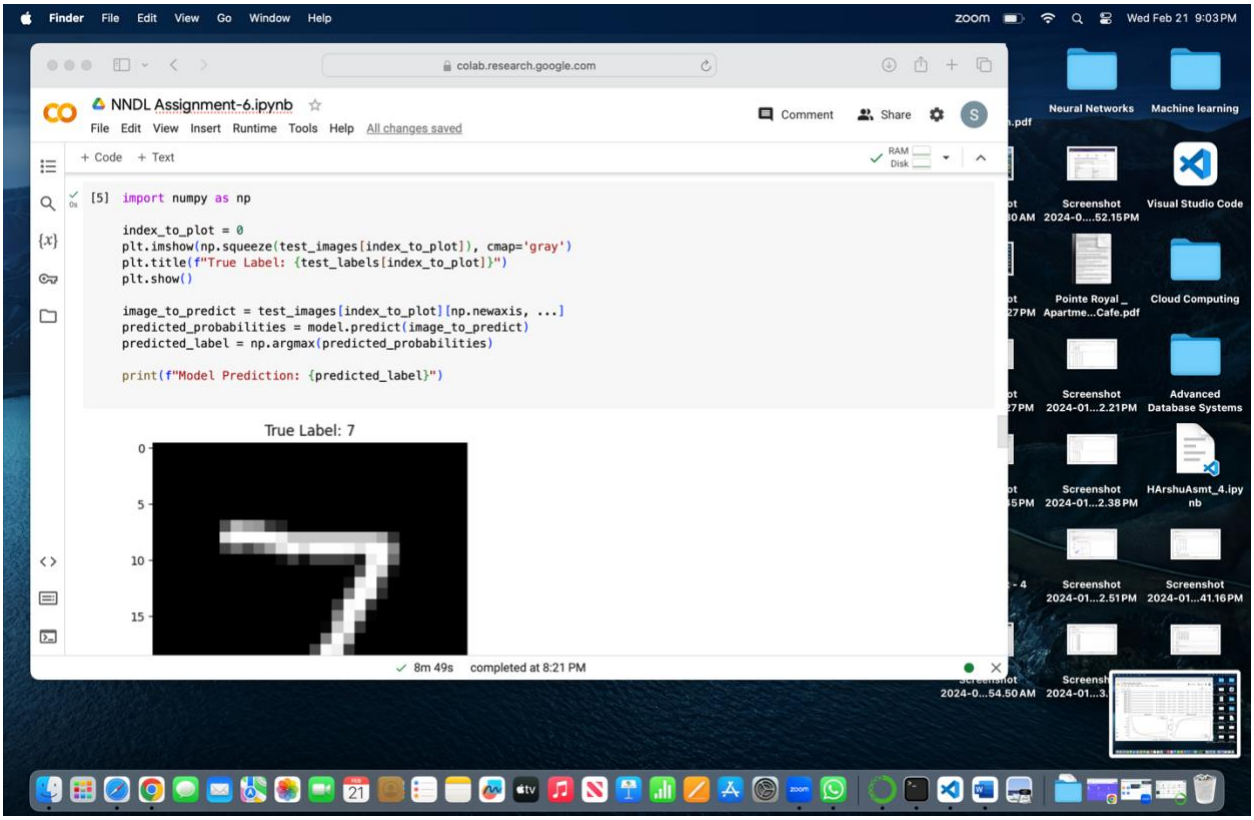
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[5]
import numpy as np
index_to_plot = 0
plt.imshow(np.squeeze(test_images[index_to_plot]), cmap='gray')
plt.title(f"True Label: {test_labels[index_to_plot]}")
plt.show()
image_to_predict = test_images[index_to_plot][np.newaxis, ...]
predicted_probabilities = model.predict(image_to_predict)
predicted_label = np.argmax(predicted_probabilities)
print(f"Model Prediction: {predicted_label}")
True Label: 7
0
5
10
15
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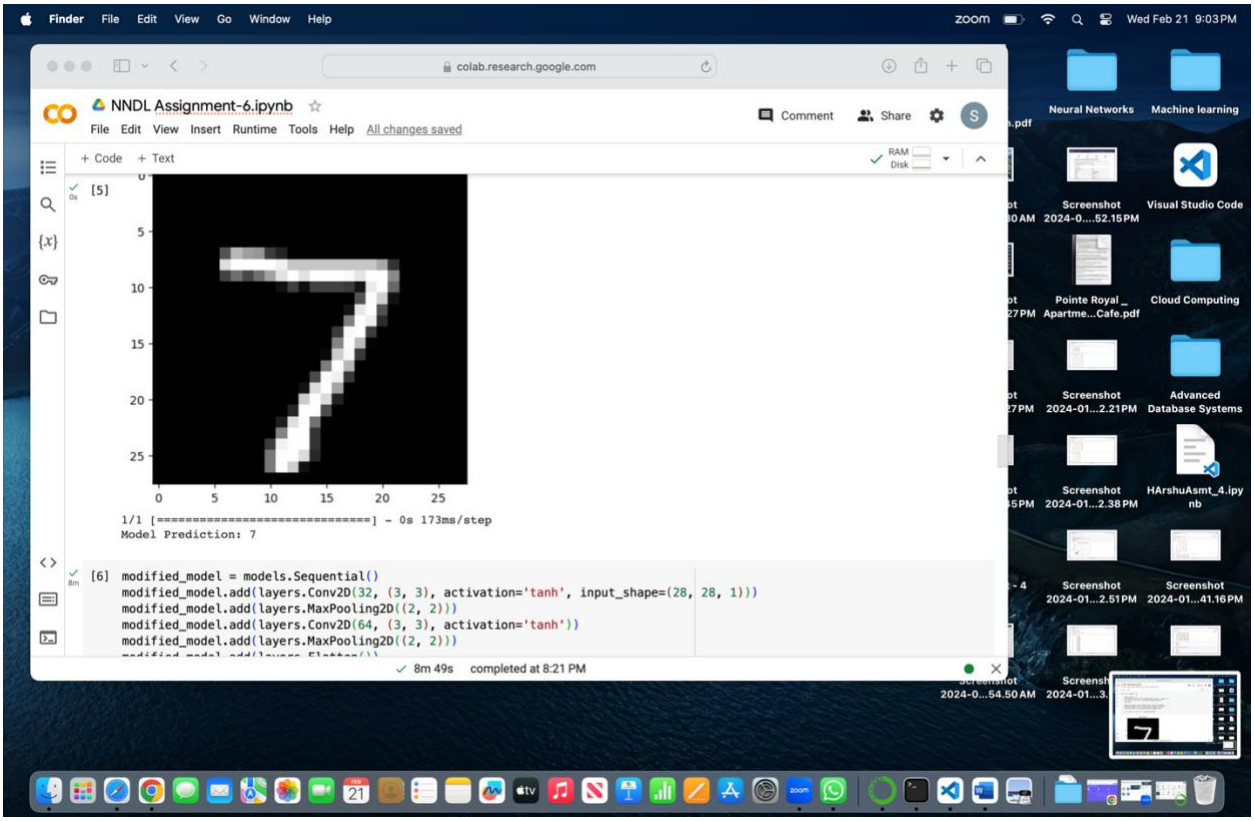
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[5]
1/1 [==============================] - 0s 173ms/step
Model Prediction: 7
[6] modified_model = models.Sequential()
modified_model.add(layers.Conv2D(32, (3, 3), activation='tanh', input_shape=(28, 28, 1)))
modified_model.add(layers.MaxPooling2D((2, 2)))
modified_model.add(layers.Conv2D(64, (3, 3), activation='tanh'))
modified_model.add(layers.MaxPooling2D((2, 2)))
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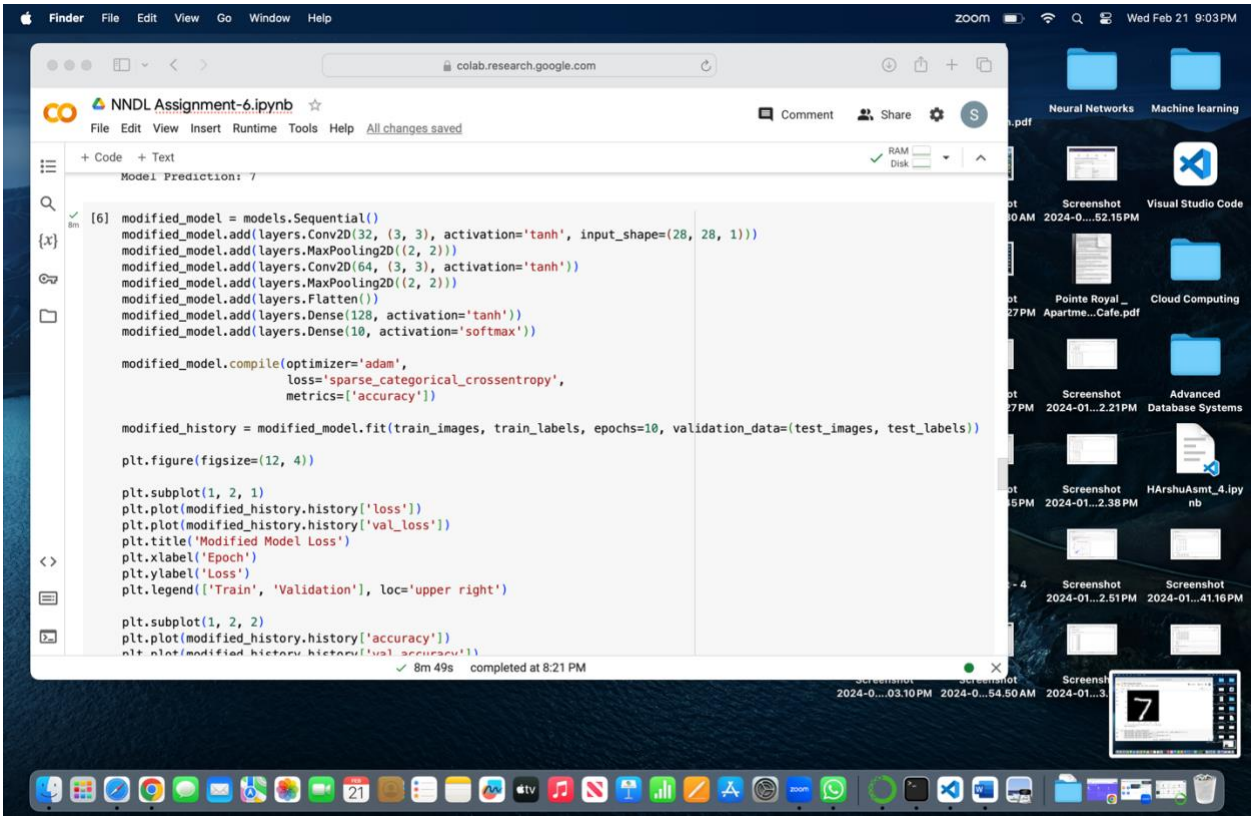
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Model Prediction: 7
[6] modified_model = models.Sequential()
modified_model.add(layers.Conv2D(32, (3, 3), activation='tanh', input_shape=(28, 28, 1)))
modified_model.add(layers.MaxPooling2D((2, 2)))
modified_model.add(layers.Conv2D(64, (3, 3), activation='tanh'))
modified_model.add(layers.MaxPooling2D((2, 2)))
modified_model.add(layers.Flatten())
modified_model.add(layers.Dense(128, activation='tanh'))
modified_model.add(layers.Dense(10, activation='softmax'))
modified_model.compile(optimizer='adam',
loss='sparse_categorical_crossentropy',
metrics=['accuracy'])
modified_history = modified_model.fit(train_images, train_labels, epochs=10, validation_data=(test_images, test_labels))
plt.figure(figsize=(12, 4))
plt.subplot(1, 2, 1)
plt.plot(modified_history.history['loss'])
plt.plot(modified_history.history['val_loss'])
plt.title('Modified Model Loss')
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.legend(['Train', 'Validation'], loc='upper right')
plt.subplot(1, 2, 2)
plt.plot(modified_history.history['accuracy'])
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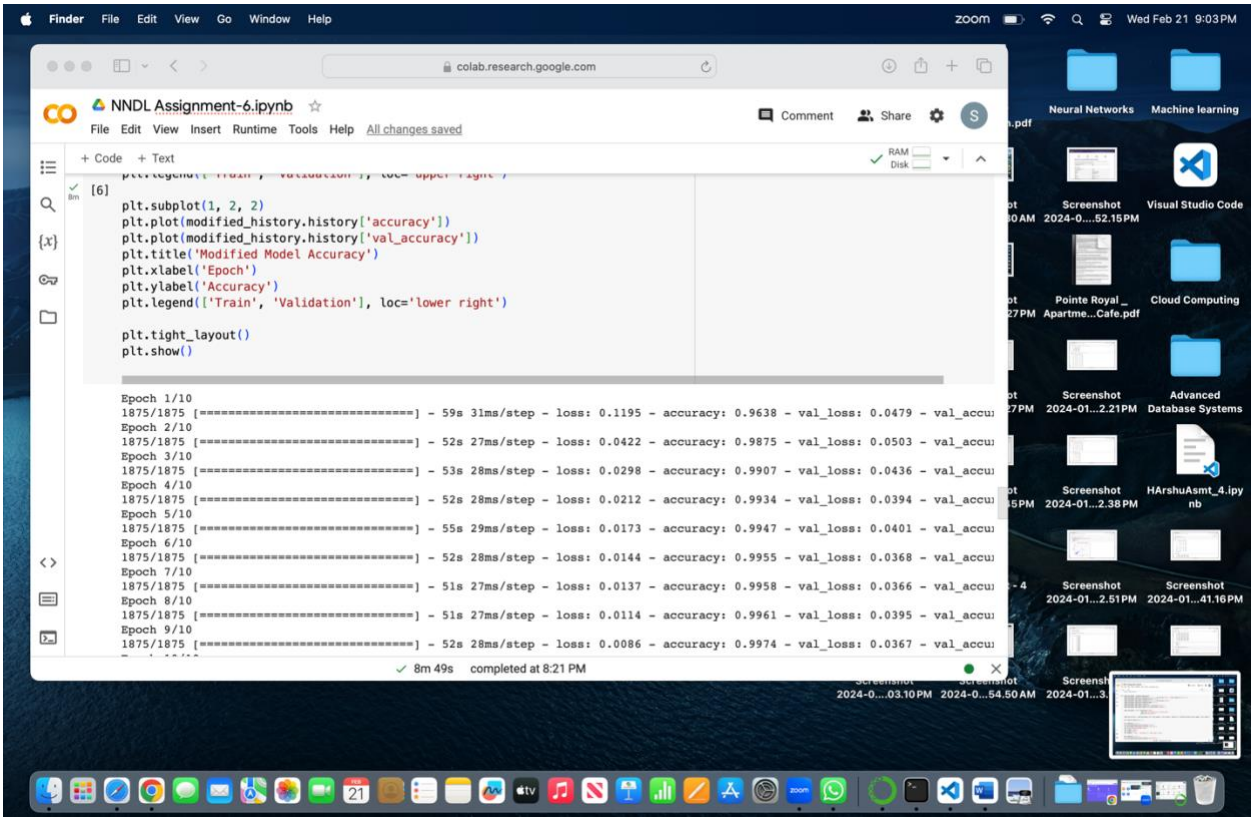
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[6]
plt.subplot(1, 2, 2)
plt.plot(modified_history.history['accuracy'])
plt.plot(modified_history.history['val_accuracy'])
plt.title('Modified Model Accuracy')
plt.xlabel('Epoch')
plt.ylabel('Accuracy')
plt.legend(['Train', 'Validation'], loc='lower right')
plt.tight_layout()
plt.show()
Epoch 1/10
1875/1875 [==========] - 59s 31ms/step - loss: 0.1195 - accuracy: 0.9638 - val_loss: 0.0479 - val_accu
Epoch 2/10
1875/1875 [==========] - 52s 27ms/step - loss: 0.0422 - accuracy: 0.9875 - val_loss: 0.0503 - val_accu
Epoch 3/10
1875/1875 [==========] - 53s 28ms/step - loss: 0.0298 - accuracy: 0.9907 - val_loss: 0.0436 - val_accu
Epoch 4/10
1875/1875 [==========] - 52s 28ms/step - loss: 0.0212 - accuracy: 0.9934 - val_loss: 0.0394 - val_accu
Epoch 5/10
1875/1875 [==========] - 55s 29ms/step - loss: 0.0173 - accuracy: 0.9947 - val_loss: 0.0401 - val_accu
Epoch 6/10
1875/1875 [==========] - 52s 28ms/step - loss: 0.0144 - accuracy: 0.9955 - val_loss: 0.0368 - val_accu
Epoch 7/10
1875/1875 [==========] - 51s 27ms/step - loss: 0.0137 - accuracy: 0.9958 - val_loss: 0.0366 - val_accu
Epoch 8/10
1875/1875 [==========] - 51s 27ms/step - loss: 0.0114 - accuracy: 0.9961 - val_loss: 0.0395 - val_accu
Epoch 9/10
1875/1875 [==========] - 52s 28ms/step - loss: 0.0086 - accuracy: 0.9974 - val_loss: 0.0367 - val_accu
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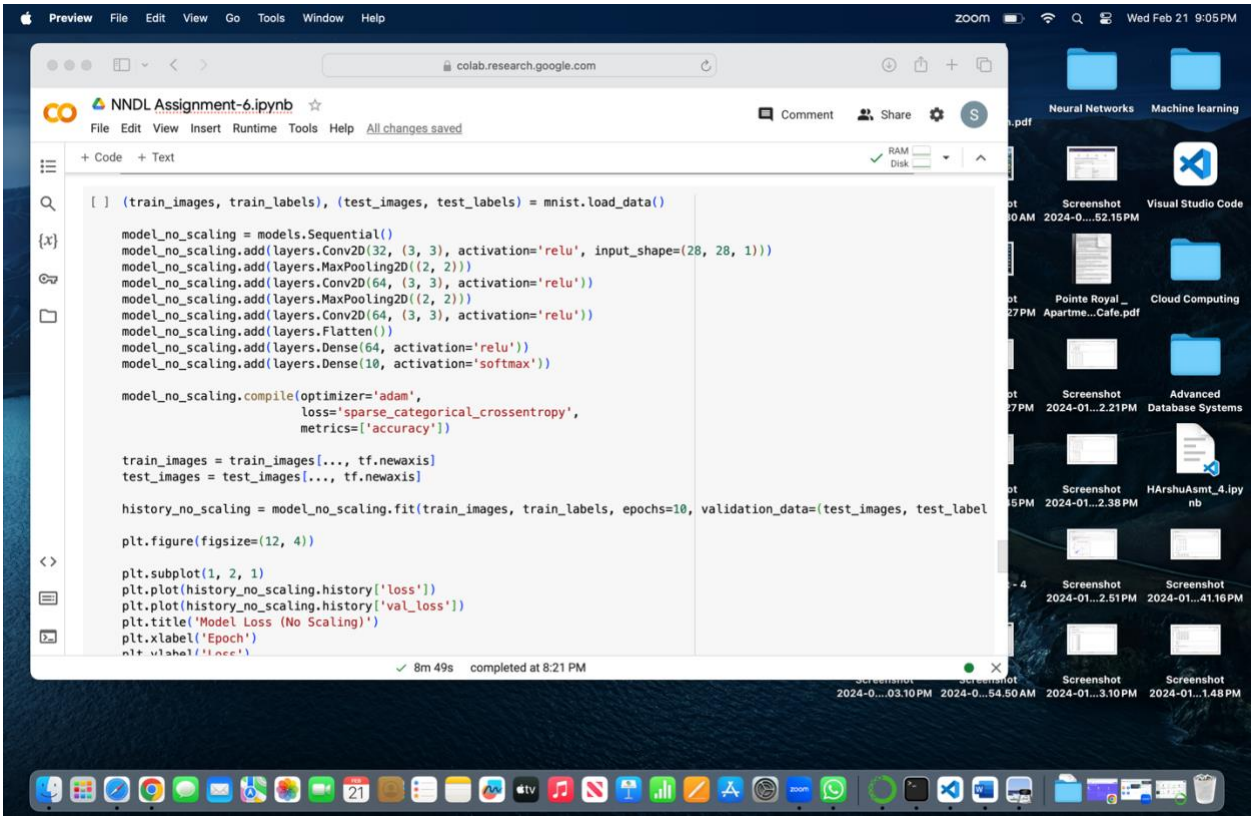
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[ ] (train_images, train_labels), (test_images, test_labels) = mnist.load_data()
model_no_scaling = models.Sequential()
model_no_scaling.add(layers.Conv2D(32, (3, 3), activation='relu', input_shape=(28, 28, 1)))
model_no_scaling.add(layers.MaxPooling2D((2, 2)))
model_no_scaling.add(layers.Conv2D(64, (3, 3), activation='relu'))
model_no_scaling.add(layers.MaxPooling2D((2, 2)))
model_no_scaling.add(layers.Conv2D(64, (3, 3), activation='relu'))
model_no_scaling.add(layers.Flatten())
model_no_scaling.add(layers.Dense(64, activation='relu'))
model_no_scaling.add(layers.Dense(10, activation='softmax'))
model_no_scaling.compile(optimizer='adam',
loss='sparse_categorical_crossentropy',
metrics=['accuracy'])
train_images = train_images[..., tf.newaxis]
test_images = test_images[..., tf.newaxis]
history_no_scaling = model_no_scaling.fit(train_images, train_labels, epochs=10, validation_data=(test_images, test_label
plt.figure(figsize=(12, 4))
plt.subplot(1, 2, 1)
plt.plot(history_no_scaling.history['loss'])
plt.plot(history_no_scaling.history['val_loss'])
plt.title('Model Loss (No Scaling)')
plt.xlabel('Epoch')
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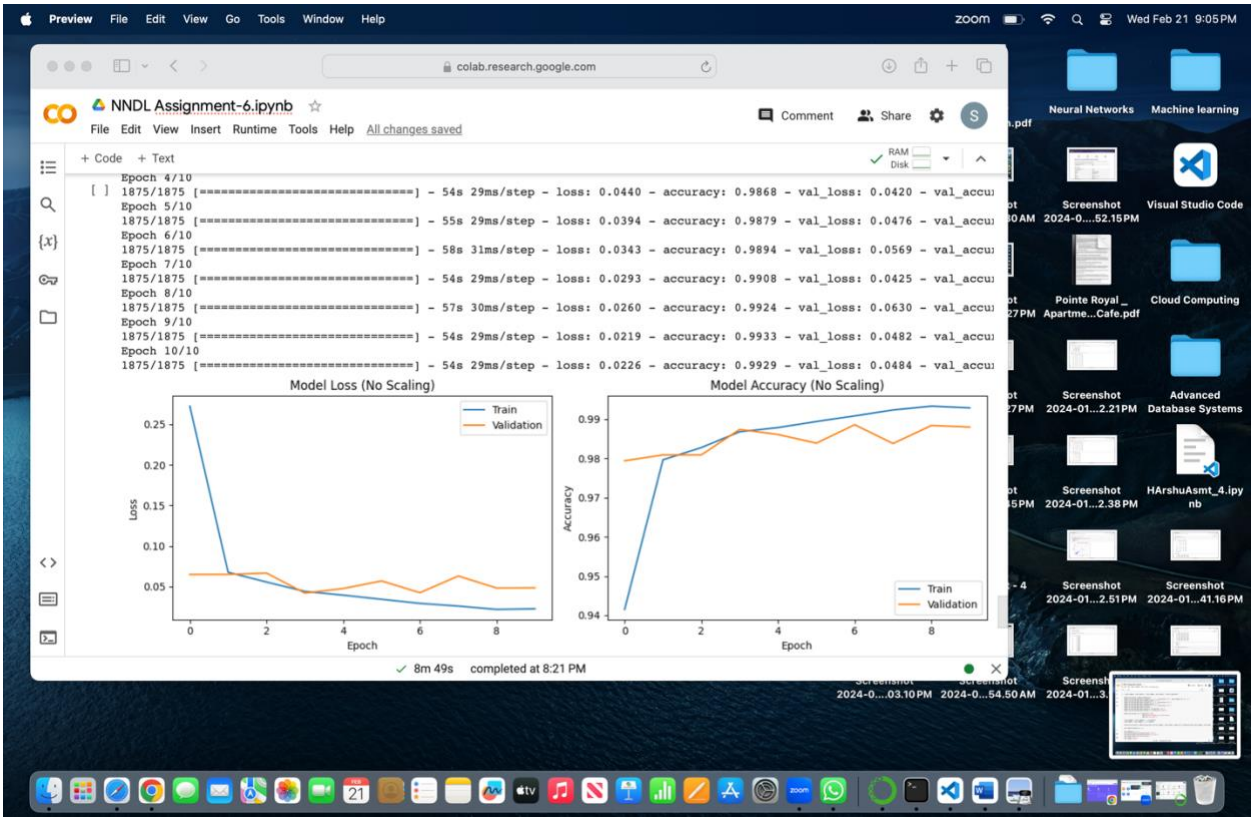
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Epoch 4/10
1875/1875 [==========] - 54s 29ms/step - loss: 0.0440 - accuracy: 0.9868 - val_loss: 0.0420 - val_accu
Epoch 5/10
1875/1875 [==========] - 55s 29ms/step - loss: 0.0394 - accuracy: 0.9879 - val_loss: 0.0476 - val_accu
Epoch 6/10
1875/1875 [==========] - 58s 31ms/step - loss: 0.0343 - accuracy: 0.9894 - val_loss: 0.0569 - val_accu
Epoch 7/10
1875/1875 [==========] - 54s 29ms/step - loss: 0.0293 - accuracy: 0.9908 - val_loss: 0.0425 - val_accu
Epoch 8/10
1875/1875 [==========] - 57s 30ms/step - loss: 0.0260 - accuracy: 0.9924 - val_loss: 0.0630 - val_accu
Epoch 9/10
1875/1875 [==========] - 54s 29ms/step - loss: 0.0219 - accuracy: 0.9933 - val_loss: 0.0482 - val_accu
Epoch 10/10
1875/1875 [==========] - 54s 29ms/step - loss: 0.0226 - accuracy: 0.9929 - val_loss: 0.0484 - val_accu
Model Loss (No Scaling)
Train
Validation
Loss
Epoch
Model Accuracy (No Scaling)
Accuracy
Epoch
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