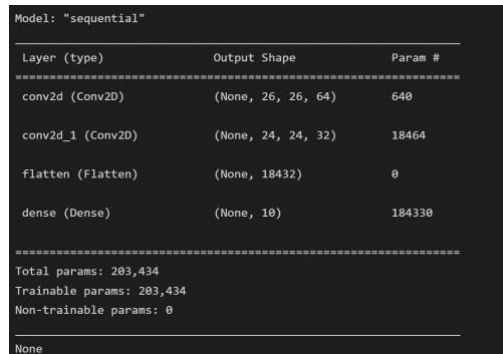
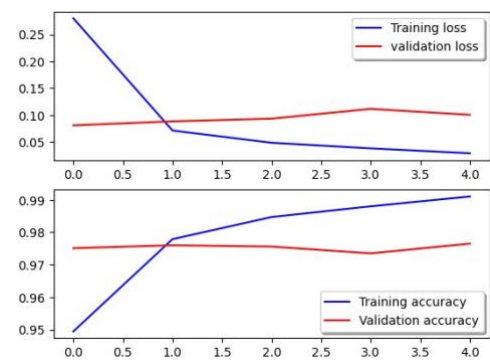


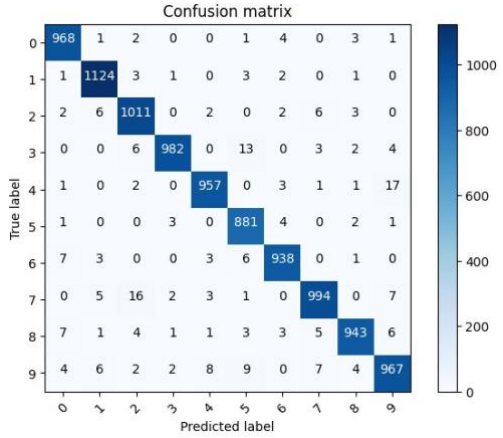
## Project Development Phase Model Performance Test

Date	16 November 2022
Team ID	PNT2022TMID36712
Project Name	Project - A Novel Method For Handwritten Digit Recognition System.
Maximum Marks	10 Marks

### Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Values	Screenshot
1.	Model Summary		 <pre> Model: "sequential"  Layer (type)                 Output Shape              Param # ----- conv2d (Conv2D)              (None, 26, 26, 64)       640 conv2d_1 (Conv2D)            (None, 24, 24, 32)       18464 flatten (Flatten)            (None, 18432)             0 dense (Dense)                (None, 10)               184338 ----- Total params: 203,434 Trainable params: 203,434 Non-trainable params: 0 </pre>
2.	Accuracy	<p>Training Accuracy - 99%</p> <p>Validation Accuracy - 97%</p>	 <p>The top graph displays training and validation loss over 4 epochs. The training loss (blue line) starts at approximately 0.25 and decreases to about 0.05 by epoch 4. The validation loss (red line) starts at approximately 0.08 and remains relatively stable, ending at about 0.10. The bottom graph displays training and validation accuracy over 4 epochs. The training accuracy (blue line) starts at approximately 0.95 and increases to about 0.99 by epoch 4. The validation accuracy (red line) starts at approximately 0.975 and remains relatively stable, ending at about 0.975.</p>

3.	Confusion Matrix	 <table><caption>Confusion matrix</caption><tr><th>True label \ Predicted label</th><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th></tr><tr><th>0</th><td>968</td><td>1</td><td>2</td><td>0</td><td>0</td><td>1</td><td>4</td><td>0</td><td>3</td><td>1</td></tr><tr><th>1</th><td>1</td><td>1124</td><td>3</td><td>1</td><td>0</td><td>3</td><td>2</td><td>0</td><td>1</td><td>0</td></tr><tr><th>2</th><td>2</td><td>6</td><td>1011</td><td>0</td><td>2</td><td>0</td><td>2</td><td>6</td><td>3</td><td>0</td></tr><tr><th>3</th><td>0</td><td>0</td><td>6</td><td>982</td><td>0</td><td>13</td><td>0</td><td>3</td><td>2</td><td>4</td></tr><tr><th>4</th><td>1</td><td>0</td><td>2</td><td>0</td><td>957</td><td>0</td><td>3</td><td>1</td><td>1</td><td>17</td></tr><tr><th>5</th><td>1</td><td>0</td><td>0</td><td>3</td><td>0</td><td>881</td><td>4</td><td>0</td><td>2</td><td>1</td></tr><tr><th>6</th><td>7</td><td>3</td><td>0</td><td>0</td><td>3</td><td>6</td><td>938</td><td>0</td><td>1</td><td>0</td></tr><tr><th>7</th><td>0</td><td>5</td><td>16</td><td>2</td><td>3</td><td>1</td><td>0</td><td>994</td><td>0</td><td>7</td></tr><tr><th>8</th><td>7</td><td>1</td><td>4</td><td>1</td><td>1</td><td>3</td><td>3</td><td>5</td><td>943</td><td>6</td></tr><tr><th>9</th><td>4</td><td>6</td><td>2</td><td>2</td><td>8</td><td>9</td><td>0</td><td>7</td><td>4</td><td>967</td></tr></table>	True label \ Predicted label	0	1	2	3	4	5	6	7	8	9	0	968	1	2	0	0	1	4	0	3	1	1	1	1124	3	1	0	3	2	0	1	0	2	2	6	1011	0	2	0	2	6	3	0	3	0	0	6	982	0	13	0	3	2	4	4	1	0	2	0	957	0	3	1	1	17	5	1	0	0	3	0	881	4	0	2	1	6	7	3	0	0	3	6	938	0	1	0	7	0	5	16	2	3	1	0	994	0	7	8	7	1	4	1	1	3	3	5	943	6	9	4	6	2	2	8	9	0	7	4	967
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4.	Classification Report	<table><tr><th></th><th>precision</th><th>recall</th><th>f1-score</th><th>support</th></tr><tr><td>0</td><td>0.98</td><td>0.99</td><td>0.98</td><td>980</td></tr><tr><td>1</td><td>0.98</td><td>0.99</td><td>0.99</td><td>1135</td></tr><tr><td>2</td><td>0.97</td><td>0.98</td><td>0.97</td><td>1032</td></tr><tr><td>3</td><td>0.99</td><td>0.97</td><td>0.98</td><td>1010</td></tr><tr><td>4</td><td>0.98</td><td>0.97</td><td>0.98</td><td>982</td></tr><tr><td>5</td><td>0.96</td><td>0.99</td><td>0.97</td><td>892</td></tr><tr><td>6</td><td>0.98</td><td>0.98</td><td>0.98</td><td>958</td></tr><tr><td>7</td><td>0.98</td><td>0.97</td><td>0.97</td><td>1028</td></tr><tr><td>8</td><td>0.98</td><td>0.97</td><td>0.98</td><td>974</td></tr><tr><td>9</td><td>0.96</td><td>0.96</td><td>0.96</td><td>1009</td></tr><tr><td>accuracy</td><td></td><td></td><td>0.98</td><td>10000</td></tr><tr><td>macro avg</td><td>0.98</td><td>0.98</td><td>0.98</td><td>10000</td></tr><tr><td>weighted avg</td><td>0.98</td><td>0.98</td><td>0.98</td><td>10000</td></tr></table>		precision	recall	f1-score	support	0	0.98	0.99	0.98	980	1	0.98	0.99	0.99	1135	2	0.97	0.98	0.97	1032	3	0.99	0.97	0.98	1010	4	0.98	0.97	0.98	982	5	0.96	0.99	0.97	892	6	0.98	0.98	0.98	958	7	0.98	0.97	0.97	1028	8	0.98	0.97	0.98	974	9	0.96	0.96	0.96	1009	accuracy			0.98	10000	macro avg	0.98	0.98	0.98	10000	weighted avg	0.98	0.98	0.98	10000																																																			
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