

## Project Development Phase Model Performance Test

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|---------------|--|
| Date          | 10 June 2025                                     |
| Team ID       | LTVIP2025TMID41359                               |
| Project Name  | Hematovision: Advanced Blood Cell Classification |
| 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.                 | Metrics        | <b>Classification Model:</b><br>Accuracy Score- 0.893   | <pre>import numpy as np import seaborn as sns from sklearn.metrics import confusion_matrix  class_labels = ['EOSINOPHIL', 'LYMPHOCYTE', 'MONOCYTE', 'NEUTROPHIL']  cm = confusion_matrix(y_test, pred2)  plt.figure(figsize=(10, 10)) sns.heatmap(cm, annot=True,             fmt='g', vmin=0, cmap='Blues') plt.xticks(rotation=45, labels=[i, j, k, l, m], labels=[class_labels[i], class_labels[j], class_labels[k], class_labels[l], class_labels[m]]) plt.yticks(rotation=45, labels=[i, j, k, l, m], labels=[class_labels[i], class_labels[j], class_labels[k], class_labels[l], class_labels[m]]) plt.xlabel('Predicted') plt.ylabel('Actual') plt.title('Confusion Matrix') plt.show()</pre> <table><caption>Confusion Matrix Data</caption><thead><tr><th>Actual \ Predicted</th><th>EOSINOPHIL</th><th>LYMPHOCYTE</th><th>MONOCYTE</th><th>NEUTROPHIL</th></tr></thead><tbody><tr><th>EOSINOPHIL</th><td>100</td><td>52</td><td>5</td><td>76</td></tr><tr><th>LYMPHOCYTE</th><td>4</td><td>757</td><td>0</td><td>1</td></tr><tr><th>MONOCYTE</th><td>1</td><td>17</td><td>729</td><td>12</td></tr><tr><th>NEUTROPHIL</th><td>124</td><td>16</td><td>10</td><td>101</td></tr></tbody></table> | Actual \ Predicted | EOSINOPHIL     | LYMPHOCYTE   | MONOCYTE | NEUTROPHIL | EOSINOPHIL | 100 | 52   | 5    | 76 | LYMPHOCYTE | 4    | 757 | 0    | 1    | MONOCYTE | 1    | 17   | 729 | 12   | NEUTROPHIL | 124 | 16 | 10 | 101 |
| Actual \ Predicted | EOSINOPHIL     | LYMPHOCYTE  | MONOCYTE   | NEUTROPHIL         |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| EOSINOPHIL         | 100            | 52  | 5  | 76                 |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| LYMPHOCYTE         | 4              | 757   | 0  | 1                  |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| MONOCYTE           | 1              | 17  | 729  | 12                 |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| NEUTROPHIL         | 124            | 16  | 10   | 101                |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| 2.                 | Tune the Model | Hyperparameter Tuning - The notebook primarily focuses on training the added dense layers with a pre-trained MobileNetV2 model (frozen base layers). Adam optimizer was used with categorical crossentropy loss. The training ran for 15 epochs, with the best validation accuracy observed around epoch 11.<br>Validation Method - A validation split of 0.2 was used during image data generation (validation_split=0.2). | <pre>pred = model.predict(test) pred = np.argmax(pred, axis=-1) #pick class with highest probability  labels = {train.class_indices} labels = dict((v,k) for k,v in labels.items()) pred2 = [labels[k] for k in pred]  374/376 [.....] - 332s 880ms/step  plt.plot(history.history['accuracy'] + history.history['accuracy']) plt.plot(history.history['val_accuracy'] + history.history['val_accuracy']) plt.title('model accuracy') plt.ylabel('accuracy') plt.xlabel('epoch') plt.legend(['train', 'val'], loc='upper left') plt.show()</pre> <table><caption>Model Accuracy Data</caption><thead><tr><th>Epoch</th><th>Train Accuracy</th><th>Val Accuracy</th></tr></thead><tbody><tr><td>0</td><td>0.40</td><td>0.55</td></tr><tr><td>1</td><td>0.55</td><td>0.65</td></tr><tr><td>2</td><td>0.65</td><td>0.75</td></tr><tr><td>3</td><td>0.75</td><td>0.85</td></tr><tr><td>4</td><td>0.85</td><td>0.90</td></tr><tr><td>5</td><td>0.90</td><td>0.95</td></tr></tbody></table>  | Epoch              | Train Accuracy | Val Accuracy | 0        | 0.40       | 0.55       | 1   | 0.55 | 0.65 | 2  | 0.65       | 0.75 | 3   | 0.75 | 0.85 | 4        | 0.85 | 0.90 | 5   | 0.90 | 0.95       |     |    |    |     |
| Epoch              | Train Accuracy | Val Accuracy  |  |                    |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| 0                  | 0.40           | 0.55  |  |                    |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| 1                  | 0.55           | 0.65  |  |                    |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| 2                  | 0.65           | 0.75  |  |                    |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| 3                  | 0.75           | 0.85  |  |                    |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| 4                  | 0.85           | 0.90  |  |                    |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |
| 5                  | 0.90           | 0.95  |  |                    |                |              |          |            |            |     |      |      |    |            |      |     |      |      |          |      |      |     |      |            |     |    |    |     |