Comparison Report: CNN vs EfficientNet for Blood Cancer Detection

Introduction

This report compares the performance of two deep learning models — a traditional Convolutional Neural Network (CNN) and a more optimized EfficientNet model — for the task of classifying blood cancer types using image data.

Evaluation Metrics

The models were evaluated using four primary metrics:

- Accuracy
- Precision
- Recall
- F1 Score

CNN Model Results

- **Accuracy:** 0.95
- **Precision:** 0.96
- **Recall:** 0.95
- **F1 Score:** 0.94

Confusion Matrix Overview:

- Normal — TP: 18, TN: 4, FP: 0, FN: 0
- Myeloma — TP: 1, TN: 36, FP: 0, FN: 2
- Leukemia — TP: 10, TN: 20, FP: 0, FN: 0
- Lymphoma — TP: 9, TN: 22, FP: 2, FN: 0

EfficientNet Model Results

- **Accuracy:** 1.00
- **Precision:** 1.00
- **Recall:** 1.00
- **F1 Score:** 1.00

Confusion Matrix Overview:

- Normal — TP: 18, TN: 4, FP: 0, FN: 0
- Myeloma — TP: 3, TN: 34, FP: 0, FN: 0
- Leukemia — TP: 10, TN: 20, FP: 0, FN: 0
- Lymphoma — TP: 9, TN: 22, FP: 0, FN: 0

Comparison and Conclusion

The EfficientNet model clearly outperforms the traditional CNN in all evaluated metrics. With perfect precision, recall, and accuracy, EfficientNet demonstrates its superiority in detecting and classifying blood cancer types more effectively.

Conclusion: EfficientNet is the preferred algorithm for this problem due to its high accuracy and efficiency on local hardware environments.

Hardware Used

- **CPU:** Standard Intel Xeon processors, suitable for light training and inference tasks.
- **GPU:** NVIDIA Tesla K80 / T4 / P100 / V100 (depending on availability). Used for faster training of deep learning models.
- **TPU:** Tensor Processing Units (v2 and v3). Optimized for large-scale machine learning tasks using TensorFlow.

For this project, both models were trained using the **GPU runtime** to accelerate model training and evaluation.

References

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