Weekly Project Progress Report

Index

Final Dataset after preprocessing

Dataset Overview

Total Dataset Details

Total Samples: 11,192
Feature Columns: 5

- `PositionImage_FileName`
- `Room Lighting`
- `Both hands on table?`
- `Can able to see student along with full table?`
- `Computer Screen Visible?`
- `Final Decision for uploaded Image`

Modified Classes in the Dataset

- **Subclasses:**
  - `Room Lighting`
  - `Both hands on table?`
  - `Can able to see student along with full table?`
  - `Computer Screen Visible?`
- **Final Output Class:**
  - `Final Decision for uploaded Image`

Dataset

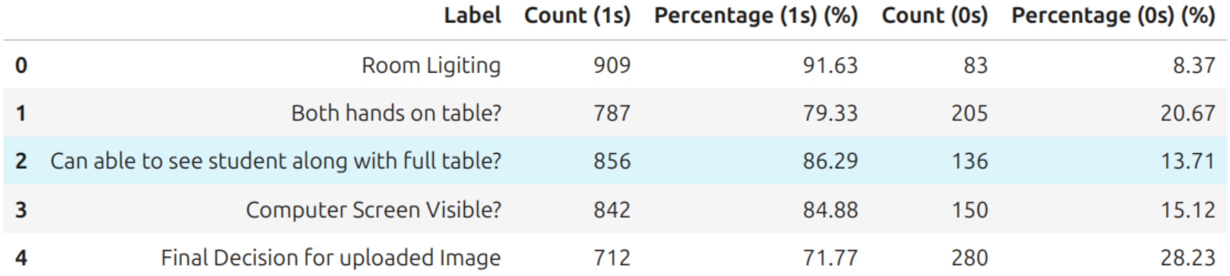
Dataset Link

Model Training

Dataset Sampling

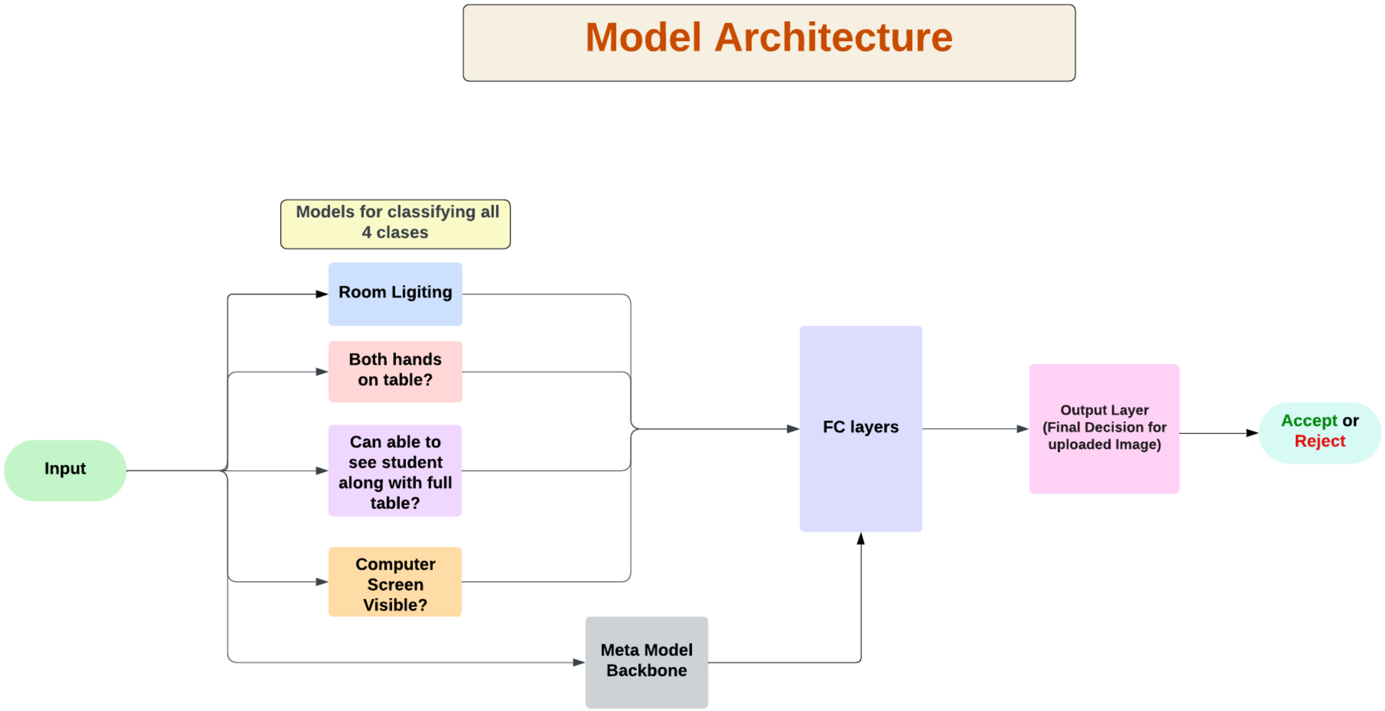
- Create a sampled dataset of **size** 992.
- Ensure the sampled dataset maintains the same distribution as the original dataset.

Data Distribution



	Label	Count (1s)	Percentage (1s) (%)	Count (0s)	Percentage (0s) (%)
0	Room Ligiting	909	91.63	83	8.37
1	Both hands on table?	787	79.33	205	20.67
2	Can able to see student along with full table?	856	86.29	136	13.71
3	Computer Screen Visible?	842	84.88	150	15.12
4	Final Decision for uploaded Image	712	71.77	280	28.23

Model architecture


Model Architecture
Models for classifying all 4 clases
Room Ligiting
Both hands on table?
Can able to see student along with full table?
Computer Screen Visible?
Input
Meta Model Backbone
FC layers
Output Layer (Final Decision for uploaded Image)
Accept or Reject

Training base model

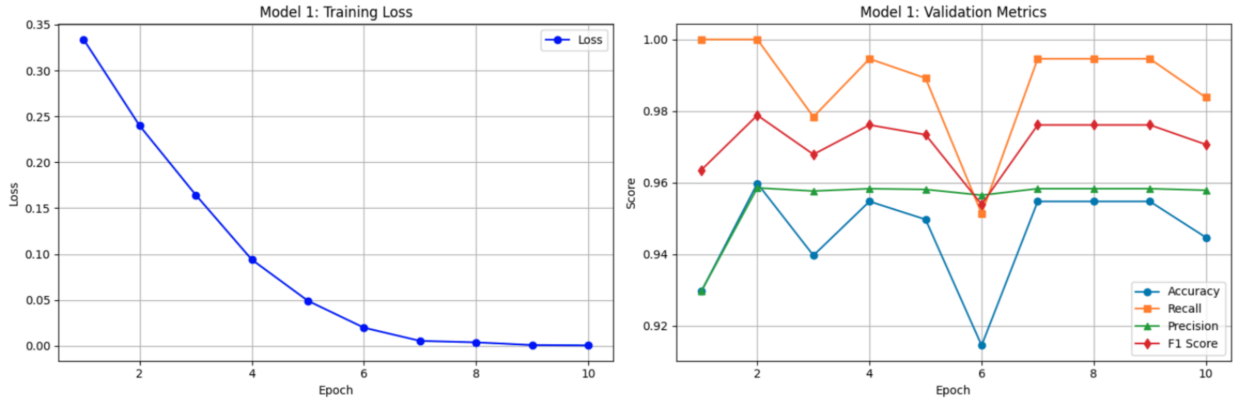
Base Model

The **CustomCNN** model is used as the backbone for all feature models as well as the meta model.

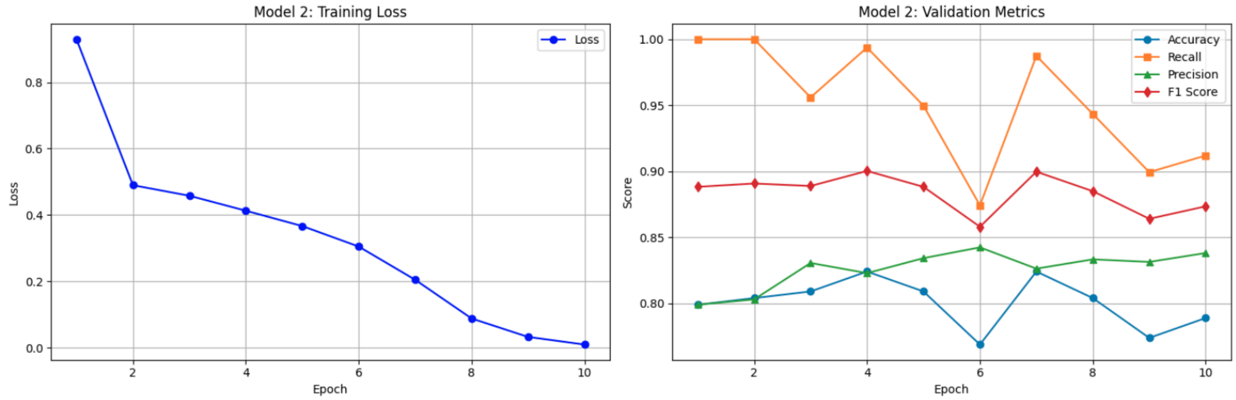
CustomCNN Architecture:
Conv2d → MaxPool2d → Conv2d → MaxPool2d → Conv2d → MaxPool2d → Fully Connected (fc)

Feature Models Performance

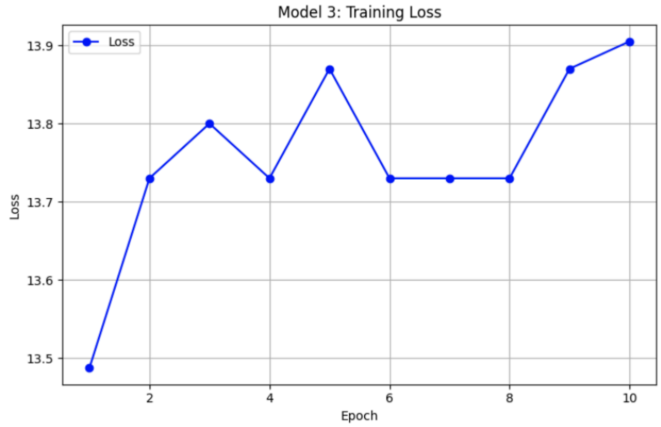
Room Lighting

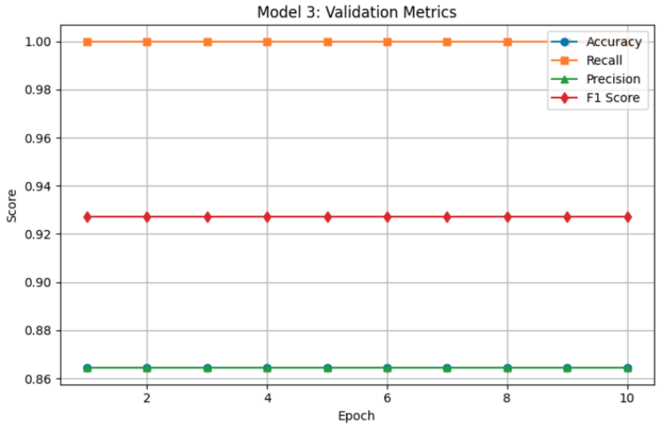


Both hands on table?

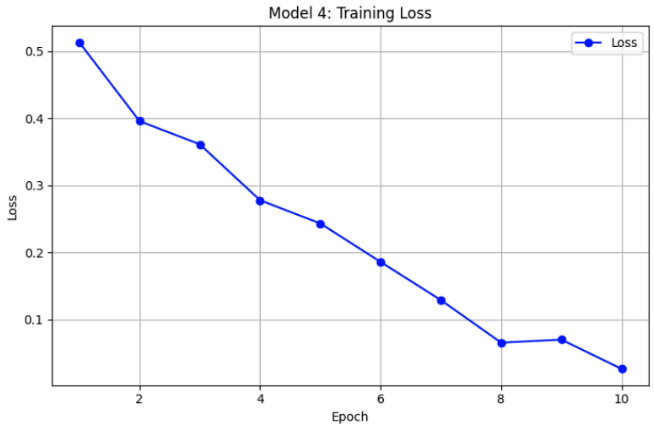


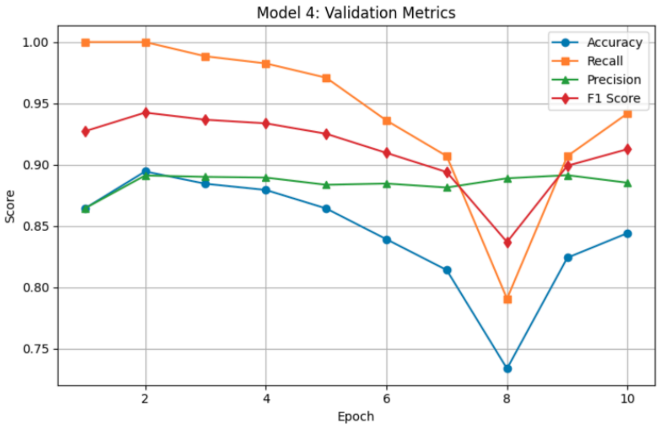
Can able to see student along with full table?





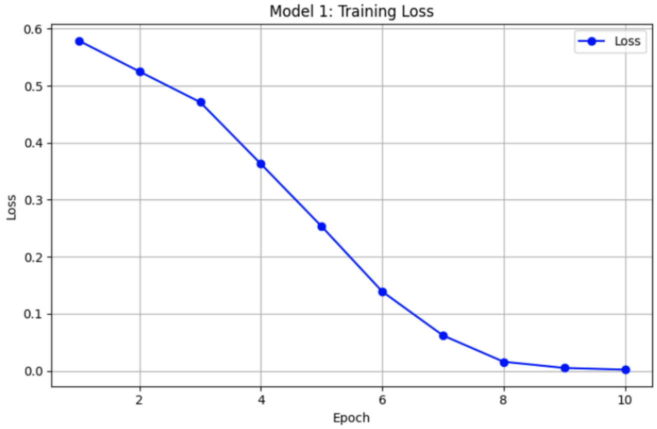
Computer Screen Visible?

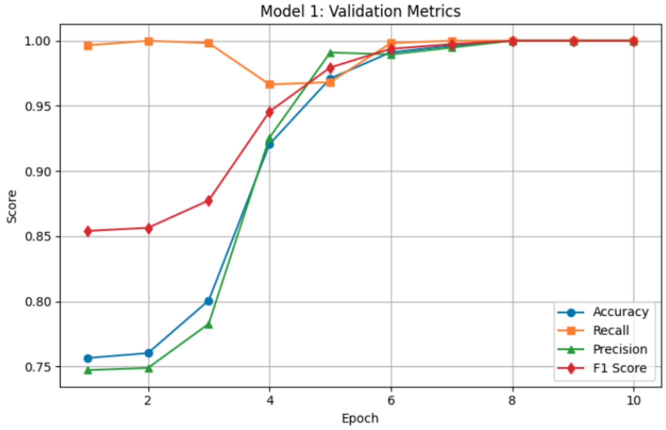




Final Model Performance

Final Decision for uploaded Image

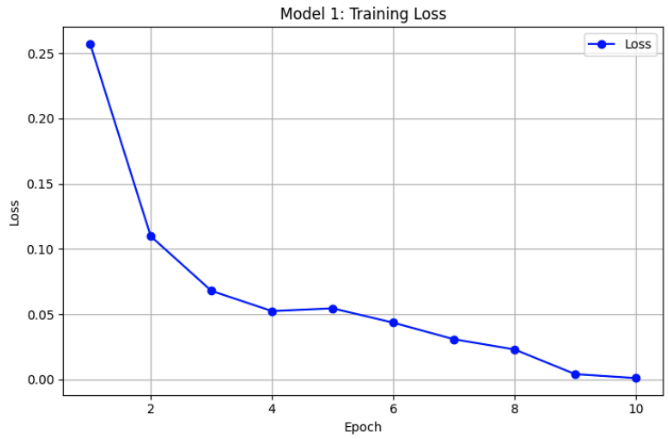


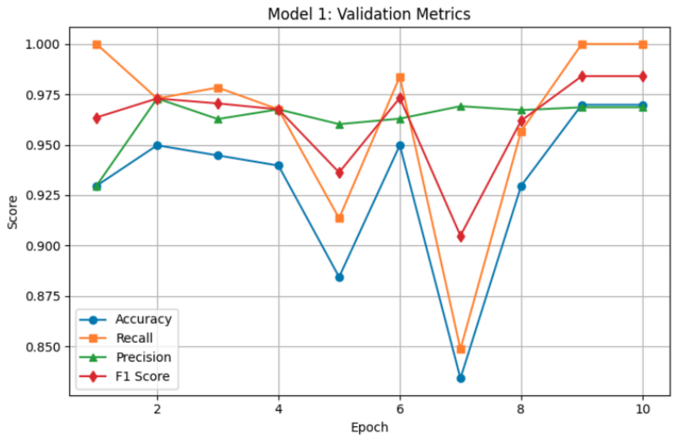


MobileNetv2 model (as backbone)

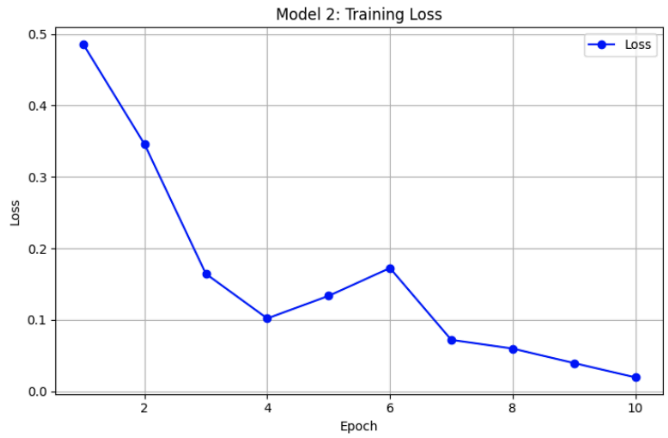
Feature Models Performance

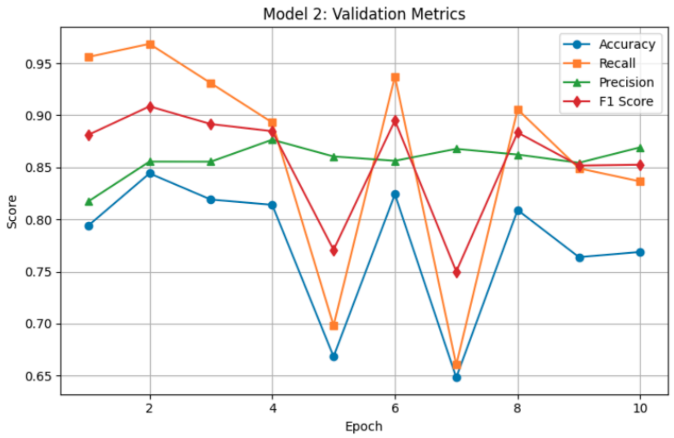
Room Lighting



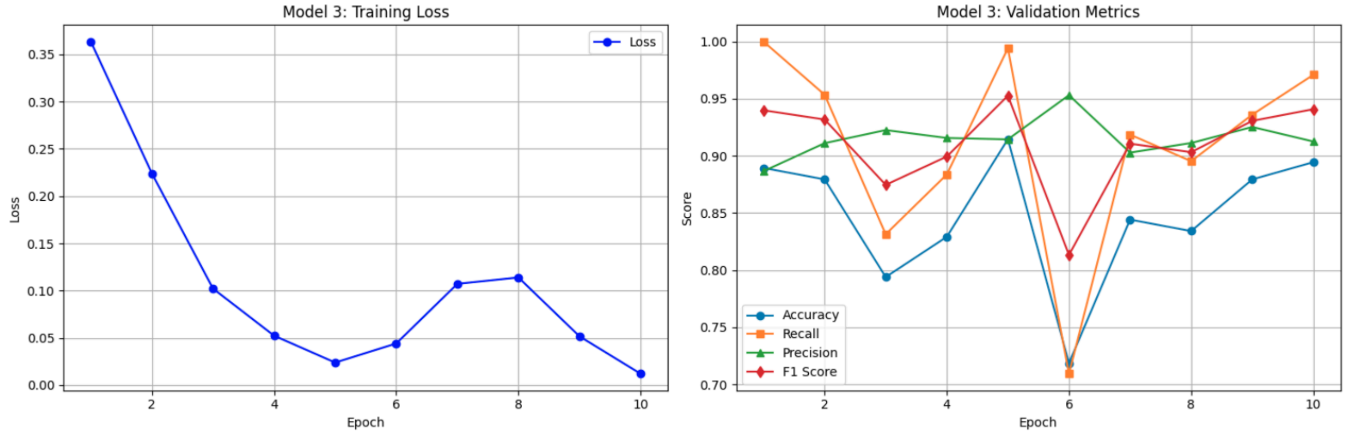


Both hands on table?

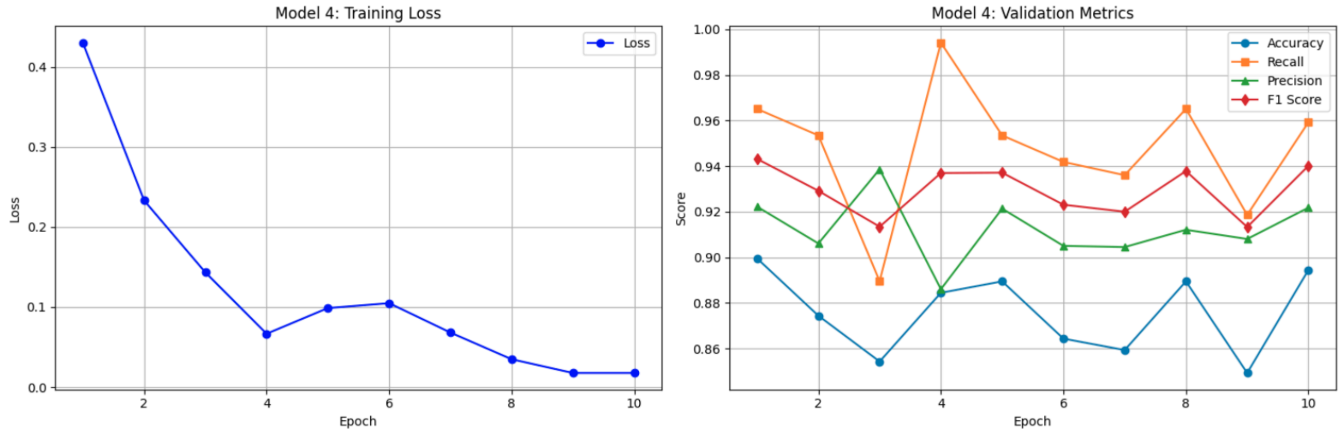




Can able to see student along with full table?

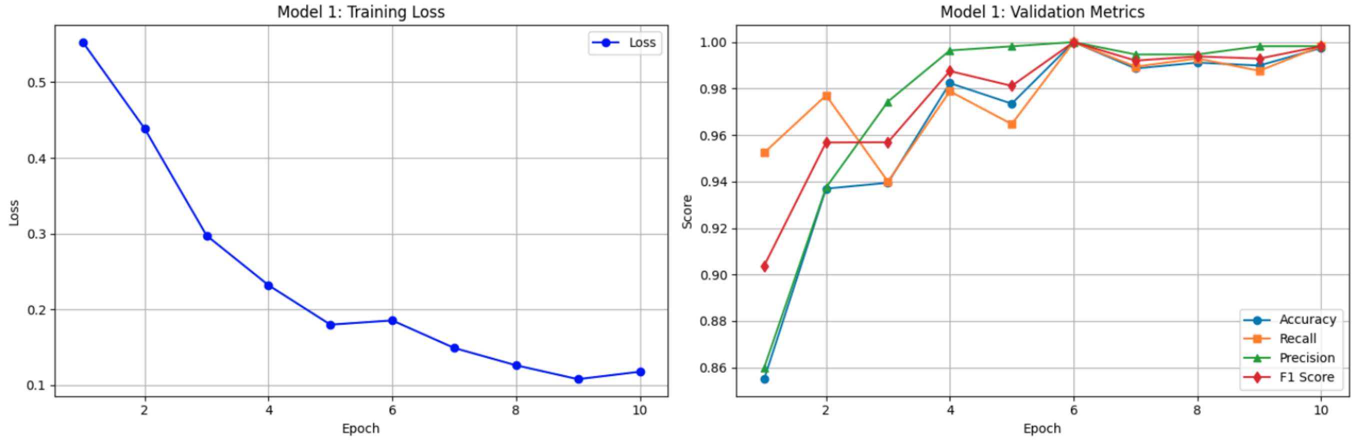


Computer Screen Visible?



Final Model Performance

Final Decision for uploaded Image



Performance Metrics Analysis

Custom 2/3-CNN Layers Model as Backbone

- The custom model, consisting of 2 or 3 CNN layers, serves as the backbone for all feature models as well as the final meta model.
- **Base Model Performance**: The performance of the four individual feature models varies, with metric scores ranging from 0.7 to 1 across different metrics (Accuracy, Precision, Recall, F1-Score).
- **Meta Model Performance**: By combining the outputs of the base models at the fully connected (fc) layer and utilizing a separate but identical backbone, the meta model performs exceptionally well. It achieves a perfect validation score of **1** across all metrics, showcasing its ability to integrate and leverage the base models effectively.

MobileNet Model as Backbone

- Similarly, MobileNet serves as the backbone for all feature models as well as the final meta model.
- **Base Model Performance**: The performance of the individual feature models varies, with scores ranging between 0.7 to 1 for all metrics.
- **Meta Model Performance**: The meta model, combining the outputs of the base models at the fc layer and using a separate MobileNet backbone, demonstrates strong performance. However, some variability in performance, likely due to overfitting, was observed. Nevertheless, it eventually achieves a perfect validation score of **1** across all metrics.

Challenges Encountered

- **GPU Memory Constraints**: The complex model architecture caused out-of-memory issues on Kaggle's P100 (16 GB) GPU, even with a sampled dataset.
- **Optimization Strategies**: To overcome this, the batch size was reduced to **4**, and GPU memory was cleared after each epoch, ensuring successful training and evaluation.

Updated Requirements

System Requirements for Further Analysis and Model Building

- **CPU**: 8 or more cores (preferable)
- **RAM**: 16GB or higher(preferable).
- **GPU**: 32GB or higher (preferable) with CUDA support