Weekly Progress Report - 8

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Project Title	Combating Digital Misinformation: Deepfake Detection Using Deep Neural Networks
Name of the Supervisor (Mentor) at PDEU	Dr. Samir Patel
Week Number	Week 8

Progress Made in Week:

1. Comprehensive Hyperparameter Tuning (Optuna)

- **Objective:** Maximize validation accuracy and combat overfitting from Week 7 by tuning hyperparameters using the **Optuna** framework (10 trials, 3 epochs/trial).
- **Parameters Optimized:** Learning Rate, Dropout Rate, and strengths of five **Albumentations** augmentations (Flip, Noise, Compression, etc.).
- **Performance Improvement:** Validation accuracy significantly increased from a baseline of $\approx 80\%$ to a more robust **$\approx 85.5\%$**, confirming effective mitigation of initial overfitting.

2. Attention Module Research

- **Goal:** Enhance the XceptionNet model's focus on subtle, localized deepfake artifacts (e.g., blending edges).
- **Modules Explored:** Researched **Squeeze-and-Excitation (SE)** and **Convolutional Block Attention Module (CBAM)** implementations.
- **Outcome:** Developed a clear strategy to integrate **CBAM blocks** into XceptionNet layers to combine both channel and spatial attention, crucial for better artifact localization.

Limitations & Challenges

- **Computational Cost:** The Optuna hyperparameter search was highly **GPU-intensive** due to the complexity of the XceptionNet base model.
- **Integration Challenge:** Integrating custom CBAM attention blocks into the pre-trained Xception architecture requires precise code adjustments.

Future Steps (Week 9)

- **Implement CBAM:** Integrate and test the **CBAM attention mechanism** within the optimized XceptionNet.
- **Final Training:** Conduct the **final, full-epoch training** run using the best Optuna parameters and the new Attention-Enhanced XceptionNet.
- **Evaluation:** Perform comprehensive final testing and generate all key metrics (Accuracy, ROC-AUC, F1-Score)

on the held-out test set.

Hetanshi Bhatt	Kunal Solanki	Samir Patel
		
Name and Signature of Student 1	**Name and Signature of Student 2**	**Name and Signature of Supervisor (Mentor)**