Weekly Progress Report - 6

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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 6

Progress made in Week:

1. Dataset Organization and Splitting
   - Created a structured dataset of 400 videos (200 real and 200 fake), each containing 200 frames.
   - Implemented a video-wise train/validation/test split to prevent data leakage:
     - 70% train, 15% validation, 15% test.
   - Final frame count:
     - Real frames → 50 per video sampled evenly.
     - Fake frames → 50 per video sampled evenly.

2. Frame Sampling & Redundancy Reduction
   - Developed two approaches to reduce redundant frames:
     1. Step Sampling: Selects evenly spaced frames from each video.
     2. Laplacian Variance (Sharpness-based): Filters out blurred or low-quality frames.
   - Final pipeline uses step sampling for uniform coverage.

3. Data Augmentation
   - Applied Albumentations library for advanced transformations:
     - Horizontal flip, random brightness/contrast.
     - Gaussian noise for robustness to artifacts.
     - JPEG compression to simulate deepfake-specific distortions.
     - Coarse dropout to mimic occlusions.
   - Normalized frames using ImageNet statistics to match XceptionNet pretraining.

4. XceptionNet Integration
   - Loaded pretrained XceptionNet using timm.
   - Replaced the final classifier layer with a binary classification head for deepfake detection.

5. Training Pipeline Setup

- Implemented custom PyTorch training loop:
  - Optimizer → Adam (LR = 1e-4, weight decay = 1e-5)
  - Loss function → CrossEntropyLoss
  - Batch size → 32
- Integrated DataLoaders for efficient data handling with augmentation applied only on the training set.

6. Validation and Visualization

- Created scripts to visualize:
  - Sampled frames.
  - Mini-batch outputs to verify augmentations.
- Implemented functions to track accuracy and loss per epoch.

Future Steps

- Begin full training with XceptionNet and evaluate on validation and test sets.
- Implement Optuna-based hyperparameter tuning for optimizing learning rate, batch size, and augmentation strength.
- Start integrating attention modules into XceptionNet.

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