RWF-2000 Video Violence Detection System: Daily Progress Log

Project Duration: 30 Days (September 24, 2025, to October 24, 2025)
Goal: Develop and deploy a temporal-aware video detection system (X3D-M).

Day	Date	Activity / Milestone Achieved	Phase	Status / Key Finding
1	2025-09-24	**Research & Environment Setup (Day 1 of 3)**: Review of guide-suggested algorithms (R3D, SlowFast, X3D).	1: Research	Confirmed R3D-18 as the initial test focus.
2	2025-09-25	**Research & Environment Setup (Day 2 of 3)**: Explored RWF-2000, Kinetics datasets. Installed PyTorch/CUDA dependencies.	1: Research	Environment set up. Identified video loading complexity.
3	2025-09-26	**Research & Data Loading Strategy (Day 3 of 3)**: Finalized research on video decoding	1: Research	Identified the need for robust video handling utilities.

		(Decord/PyAV).		
4	2025-09-27	**V1.0 Development (R3D-18 Start)**: Developed RWF2000VideoDataset structure and R3DViolenceDetector model (Kinetics pre-trained).	1: R3D PoC	Model architecture complete.
5	2025-09-28	**V1.0 Critical Flaw Discovery**: Attempted first fine-tuning run. Discovered the **Critical Data Failure** (placeholder tensor used for video data).	1: R3D PoC	**V1.0 Abandoned.** Required immediate pivot to fix data stability.
6	2025-09-29	**Pivot to Keras/2D Approach**: Initiated V2.0 development using TensorFlow/Keras and MobileNetV2 for faster image-based prototyping.	2: V2.0 Pivot	Architecture frozen; head model added.

7	2025-09-30	**V2.0 Data Pipeline Development**: Implemented frame extraction (cv2) and aggressive imgaug augmentation.	2: V2.0 Pivot	Limited processing to 700 videos due to memory constraints.
8	2025-10-01	**V2.0 Training Setup**: Defined Keras callbacks (LR Scheduler, Early Stopping, Checkpointing). Started initial training.	2: V2.0 Pivot	Training shows fast convergence on image features.
9	2025-10-02	**V2.0 Training & Evaluation**: Completed full training runs. Achieved high test accuracy (approx 96%).	2: V2.0 Pivot	Metrics confirm successful image classifier.
10	2025-10-03	**V2.0 Critical Flaw Identification**: Reviewed V2.0. Concluded the model suffers from the **Critical Temporal Flaw** (destroyed motion	2: V2.0 Pivot	**V2.0 Abandoned** as a true video solution.

		context).		
11	2025-10-04	**Refocus on 3D (V3.0 Prep)**: Commenced development of a robust, standardized video pre-processing utility (raw video to padded, fixed-length NumPy array clips).	2: Fix & Prep	Pre-processing script designed.
12	2025-10-05	**Pre-processing Execution**: Executed the batch pre-processing script on the full dataset, saving clips to .npy files.	2: Fix & Prep	Data pipeline is now stable and temporal-aware.
13	2025-10-06	**V3.0 Architecture Assembly & Code Completion**: Integrated the stable .npy loader with the **X3D-M** model structure (PyTorch). Model customization complete.	2: Fix & Prep	**Key Milestone:** Code structure complete. Begin V3.0 training phase.

14	2025-10-07	**V3.0 Initialization & Run 1**: Loaded X3D-M, set up DataParallel. Initiated the first 100-epoch training run.	3: V3.0 Training	Initial convergence is slow.
15	2025-10-08	**Training Monitoring & Procedural Flaw Identification**: Identified the **missing channel-wise normalization** and static 0.001 LR as optimization flaws.	3: V3.0 Training	Training is stable but sub-optimal.
16	2025-10-09	**Optimization Attempt**: Implemented a temporary manual LR decay logic to improve convergence. Continued 100-epoch training.	3: V3.0 Training	Convergence stability improved.
17	2025-10-10	**Training Continuation**: Training proceeding toward	3: V3.0 Training	Evaluation scripts finalized.

		convergence. Began preparation of test evaluation scripts (Confusion Matrix).		
18-20	2025-10-11 To 2025-10-13	**V3.0 Training Complete & Final Evaluation**: Training finished (100 epochs). Loaded the best_model and ran final, unbiased evaluation on the test set..	3: V3.0 Training	**Key Milestone:** Final Test Accuracy of **96.50%** achieved.
21	2025-10-14	**Metrics Analysis & Documentation Draft**: Analyzed Confusion Matrix and Classification Report. Commenced drafting the comprehensive V3.0 project report.	3: V3.0 Documentation	Documentation draft 80% complete.
22	2025-10-15	**Documentation Review & Finalization**: Finalized the project	3: V3.0 Documentation	**Key Milestone:** Project documentation complete.

		synthesis report, highlighting flaw resolutions and final performance.		
23	2025-10-16	**Deployment Platform Setup**: Selected Tkinter/OpenCV for the real-time application GUI development.	4: Deployment	UI mockup and basic video feed implemented.
24	2025-10-17	**Real-Time Prediction Logic (1/2)**: Integrated the trained X3D-M model and developed the 16-frame buffer logic for continuous inference.	4: Deployment	Successful model loading and buffer creation confirmed.
25	2025-10-18	**Real-Time Prediction Logic (2/2)**: Completed the core update_frame loop, handling tensor stacking, PyTorch inference, and	4: Deployment	Live prediction functional.

		Softmax output.		
26	2025-10-19	**GUI Integration and Feedback**: Integrated prediction confidence scores and the event history listbox into the Tkinter GUI.	4: Deployment	Functional CCTV Monitoring System GUI complete.
27	2025-10-20	**Deployment Packaging & Testing**: Packaged the application files (app.py, model_utils.py, best_model.pth). Performed final system tests.	4: Deployment	Deployment stable.
28	2025-10-21	**Final Review and Code Cleanup**: Reviewed all Python files, ensured smooth dependencies, and removed all unnecessary code.	4: Deployment	Project repository clean.
29	2025-10-22	**Handover Material**	4: Deployment	All materials prepared.

		Preparation: Prepared documentation for running the real-time application and finalized the project synthesis report for presentation.		
30	2025-10-23	**Project Closure**: Final delivery of all code, documentation, and the deployed application.	4: Deployment	**Project Complete.**