Progress Report – AI-Driven 3D Video Generation for Disaster Education (Florida Case Study)

Team 5 – Florida Disaster Education AI
Lead: Adrija Ghosh

1. Summary of Progress since PA3

After PA3, the project advanced into a complete multimodal educational pipeline integrating LLM, Graph-RAG, Stable Diffusion, and Streamlit deployment. Major accomplishments include multi-hop reasoning, visual content generation, and reproducibility artifacts for transparent evaluation.

2. Integration of Week 6 (Graph-RAG / Multi-Hop)

Implemented entity extraction and multi-hop QA modules connecting storm, county, and FEMA relief data. Streamlit app now displays Answer, Evidence, Reasoning Trace, Graph Visualization, and Florida Data tabs. Accuracy increased from 70% to 92% using graph reasoning.

3. Integration of Week 7 (Stable Diffusion / Deployment / Agents)

Week 7 added a LoRA fine-tuned Stable Diffusion pipeline for Hurricane Irma visuals, ControlNet depth conditioning, and Stable Video Diffusion animation. The Streamlit + FastAPI app integrates these models via an autonomous agent loop managing planning and synthesis.

4. Datasets

Sources include NOAA NCEI, FEMA, and news image archives (The Guardian, The Atlantic, Tampa Bay Times). Data undergoes captioning, deduplication, and real-time streaming to RAM to avoid storage limits. The dataset covers textual and visual disaster knowledge for Florida.

5. Prototype Improvements & Deployment

The unified interface links Graph-RAG retrieval to visual generation. The backend FastAPI exposes endpoints for querying, generating, and retrieving evidence. Reproducibility artifacts include env_week7.json, week7_run_config.json, and ablation_results_week7.csv.

6. Benchmarking & Ablation Results

Baseline RAG achieved 70% accuracy. Graph-RAG improved to 87%. Multi-Hop reached 92%, and UI-assisted evaluation hit 94%. Latency rose modestly from 3.2 to 4.7s. Educator

feedback confirmed the usefulness of the generated hurricane imagery for awareness.

7. Team Contributions

Adrija Ghosh – LLM + RAG + Diffusion integration (70%) Member 2 – UI + Deployment (15%) Member 3 – Dataset + Evaluation (15%)

8. Next Steps → PA4-2 Hack-A-Roo (Nov 7)

Planned additions: multimodal RAG (text + image fusion), enhanced LangGraph agent autonomy, extended 24-FPS SVD clips with captioning, and a containerized Streamlit demo for reproducibility.

9. Prototype (GitHub Link)

https://github.com/Ag230602/ani/tree/main/WEEK8 Includes LLM + RAG configs, Stable Diffusion outputs, Streamlit + FastAPI backend, and reproducibility artifacts.