TITLE PAGE

- **Problem Statement ID – SIH25197**
- **Problem Statement Title- AI and ML enabled video analysis and interpretation**
- **Theme - Miscellaneous**
- **PS Category - Software**
- **Team ID-**
- **Team Name - Runtime Terror**

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IDEA TITLE

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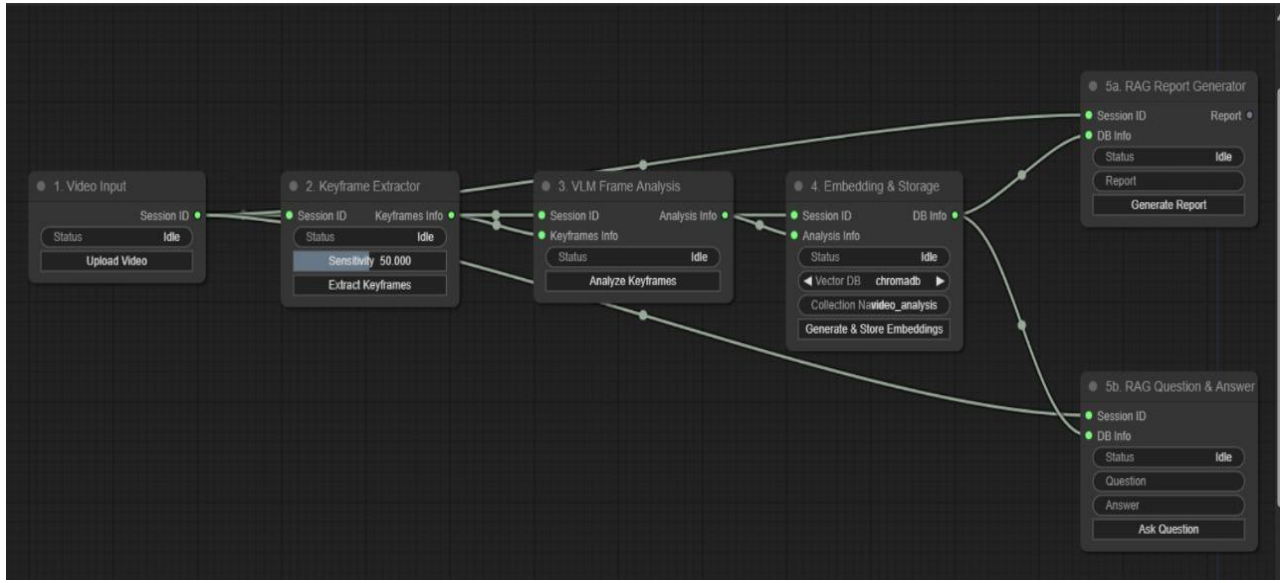
❖ Node-Based Platform for Smart Video Surveillance

- A Video processing Software based on **Node** composer.
- Nodes are Computer Vision tasks/Algorithms/Models (e.g. Object Detection, Tracking , Pose Estimation Node, etc)
- Nodes can be interconnected to build any possible Video processing pipeline.

- Special Nodes:
  - **VLM**: Generates scene-level descriptions
  - **Vector Databases**: **semantic search**
  - **Alert Node**: real-time threat alerts
  - **LLM Node**: generate human readable **Report**



- **New custom Node** can be added as per need.
- Fast & Flexible Pipeline Building.
- Semantic Search over massive video archive.
- Report generation of observation.

- Node based AI pipeline building.
- Seamless integration of advanced CV + LLM/VLM + Vector Databases in one tool.

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TECHNICAL APPROACH

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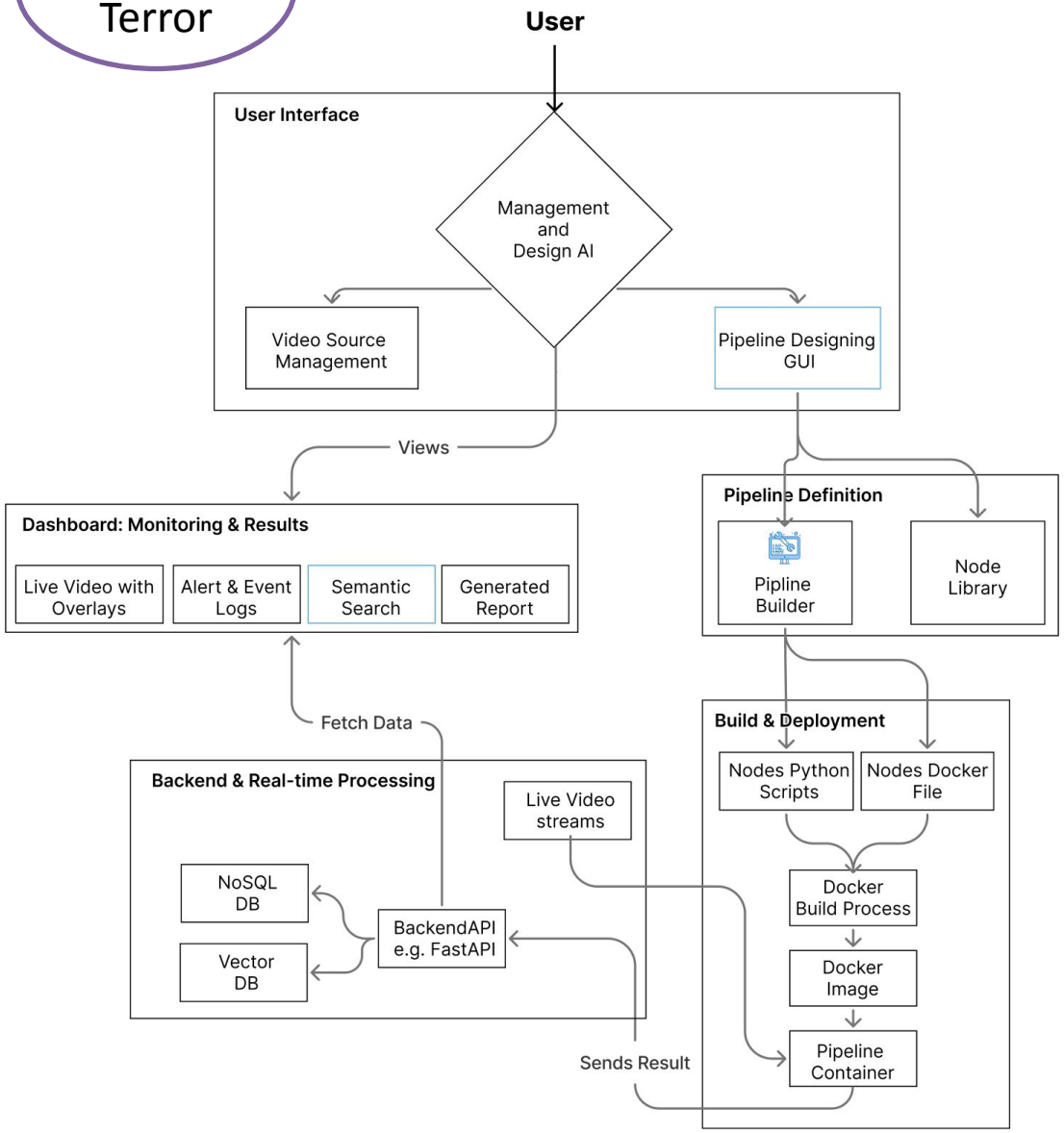

- **User Interface:** React.js, JavaScript, WebSockets, Litegraph (for building Node Composer based Pipeline Designing GUI)
- **Pipeline Definition:** Python Objects, LangChain
- **Build & Deploy:** Docker, Python, OpenCV & GStreamer, Pytorch, Cuda, Hugging Face (Transformer),
- **Backend & Real-time Processing:** FastAPI, RabbitMQ, MongoDB, Hugging Face(Transformers), Milvus(VectorDB)

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FEASIBILITY AND VIABILITY

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Feasibility:

- **Uses what you have:** Integrates seamlessly with NSG's existing drones, body cams, and cameras.
- **Built on trusted tech:** Leverages established AI and computer vision models.
- **Ready for anything:** Using Nodes provides modular design means we can easily customize new capabilities as you need them.

Viability:

The Challenge | Our Solution

- **Too much data** | **Hybrid Edge + Cloud:** Processes video both on-site and in the cloud.
- **Need for real-time speed** | **Smart Indexing:** Focuses analysis on only the most important video moments
- **Keeping data safe** | **Secure Storage:** Protects all information with strong encryption.
- **Complex System Integration** | **Minimal-Code, Node-Based Interface**: Users build workflows visually with minimal coding.

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IMPACT AND BENEFITS

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Impacts

- **Faster Threat Detection :** AI and machine learning identify risks in real time, making tasks faster, scalable, and more accurate.
- **Optimized Resource Utilization:** Reduces human workload from continuous surveillance, so team can focus on critical tasks.
- **Efficient Decision-Making :** actionable alerts & summaries in the form of reports.
- **Semantic Search:** Retrieves critical events instantly from hours of surveillance data.
- **Node-based Pipeline:** Enables customizable, drag-and-drop workflows from different missions.

Benefits

- **Social**: Safer communities, faster emergency response, and increased public confidence.
- **Economic**: Lower manpower costs, reuse of legacy infrastructure, and long-term cost savings.
- **Operational**: Automated alerts, daily summaries, and scalable surveillance.

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RESEARCH AND REFERENCES

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Inspiration: Node-RED, n8n (no-code automation)

Research Papers:

1.1 Cabanillas-Carbonell, Michael & Rivera, Jhordan & Muñoz, Jhoel. (2025). Artificial intelligence in video surveillance systems for suspicious activity detection and incident response: A systematic review. Advances in Science and Technology Research Journal. 19. 389-405. 10.12913/22998624/196795.

Other documents:

2.1 Artificial Intelligence in defense: Presenting AI preparedness of the country in defense. (https://www.ddpmod.gov.in/sites/default/files/2023-11/ai.pdf)