MULTI-LAYERED ARCHITECTURE FOR ANOMALY DETECTION IN SURVEILLANCE NETWORKS USING DISTRIBUTED COMPUTING

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Objectives

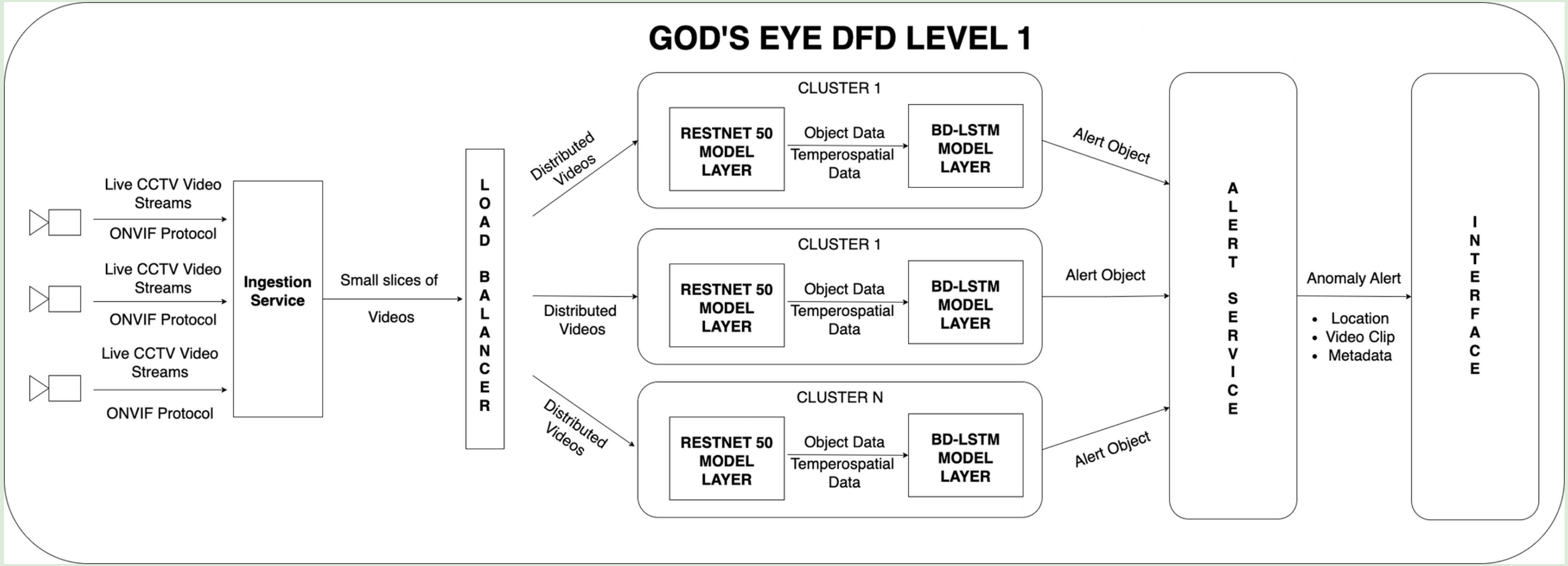
- To develop a distributed and efficient system for anomaly detection in surveillance networks using CNN with bi-directional LSTM and Restnet 50 Models
- To create an admin dashboard for easy monitoring of anomalies and easy sending of alerts to authorities and corresponding personnel.

Project Details

In the past 3 years, there have been over 464,000 international homicides, with a rate of 6.1 incidents per 100,000 people.

MISSION: We aim to develop a software system which will detect anomalies and send timely alerts so that necessary actions can be taken out efficiently

SYSTEM ARCHITECTURE



Project Details

- CCTV cameras are installed at various locations
- Live CCTV feeds will be processed via our backend by sending them as frames
- When anomalies are detected within the frame of the video, these are reported to the authorities who monitor the system via admin dashboard
- The authorities can then dispatch teams to take necessary action depending on the severity of the alert

Project Details

- The software will use Convolutional Neural Networks (CNN) with bi-directional Long-Short-Term Memory (LSTM) and Resnet50 Model to efficiently detect anomalies in CCTV surveillance networks.
- It will have a multi-layered architecture consisting of a distributed system for processing multiple live feeds on a cloud computing platform, allowing for parallelization of anomaly detection.
- Edge computing will be performed incorporating edge caching for efficiency
- The System will be trained using UCSD crime dataset

Expected Result

The project aims to create a multi-layered architecture consisting of a **distributed system** for processing multiple live feeds on a cloud computing platform by dividing work among nodes and achieving parallelization of anomaly detection. The final product will be **a system for effectively identifying anomalies and sending alerts when they are detected**. We will also be making use of edge computing using cloud-flare workers.

Social relevance: increases public safety by 10x and decreases police response time by 6x

Conclusion & What we offer

- Infinitely scalable system that can deployed at any city, at any scale and time.
  - Can accommodate feeds from a large number of cameras
  - Provides 24/7 automated surveillance and anomaly detection
- Can make use of existing surveillance infrastructure in most cities
- Can be deployed in a wide variety of situations without much technical knowledge, serving as a digital public good.
- Operate in CCTV surveillance networks with reduced time complexity using distributed systems.
- Efficient alert system with minimal latency to ensure that response measures are taken as quickly as possible

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Plan Of Action

- Train the initial ML model using UCSD crime dataset
- Buy parts like Raspberry Pi, ESP32 cam etc for getting live video feed.
- Create notification and alert system to quickly send notification in case an anomaly is detected.
- Create Web app for admin dashboard
- Add web socket connectivity to webapp from backend layer
- Configure backend to be distributed by containarising it with docker and using load balancer
- Configure cloudflare edge workers to make the backend run on the edge and be more optimised

Cost Estimation

Sl No	Items	Amount (Rs)
1	Consumables	3D Printing Filament - Rs - ~ 1000 Publishing Fee (For Publishing Research Paper) - Rs - ~ 3000
2	Equipment	Raspberry Pi 4 - 8 gb RAM - Rs. ~8000 Raspberry Pi Camera - Rs. ~1000 GPU - Nvidia RTX 3060 Ti / Google Collab Subscription - Rs ~30000 ESP 32- CAM - Rs - ~1000 Google Cloud for Testing Multi Layered Distributed Architecture Rs- ~5000 Power Supply cables and miscellaneous Rs - ~ 1000
	Total	Rs. 50,000/- Only

Thank you!

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