AI–ENABLED AUTONOMOUS DRONES FOR THE FAST CLIMATE CHANGE CRISIS ASSESSMENT

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AGENDA

1. Introduction to the topic
2. Background
3. Research Motivation
4. Problem Statement
5. Dataset
6. Methodology
7. Performance Evaluation
8. Major Contributions
9. Conclusion
10. References

INTRODUCTION TO THE TOPIC

Why Climate Change is an important matter of concern?

- Global impact affecting the entire planet.
- Environmental degradation, loss of biodiversity, and rising sea levels.
- Direct impact on human health, economics, and social equity.
- Implications for future generations and sustainable development goals.
- Necessitates international cooperation and is supported by scientific consensus.

How is climate change related to flooding?

- Climate change intensifies rainfall, leading to more frequent and intense floods.
- Melting glaciers and rising sea levels contribute to coastal flooding.
- Extreme weather events and disrupted weather patterns exacerbate flooding.
- Human activities and land use changes affect soil's ability to absorb water, increasing flood risk.

Crisis Management and Its Importance

- Enables understanding, awareness, and informed policy decisions.
- Helps in risk mitigation, resource allocation, and international collaboration.

BACKGROUND

1. **Introduction to Key Topics**

UAVs, DL, AI and Edge Computing

2. **Growing Importance of UAVs**

Diverse applications

3. **UAVs in Disaster Analysis**

4. **Paper Focus**

AI, IoT, and Edge Computing to process disaster-related images

RESEARCH MOTIVATION

1. Addressing Climate Change Challenge
2. Impact of Climate Change
3. AI-Powered Disaster Image Processing
4. Real-Time Tracking of Disasters
5. Evaluation on Edge Computing Platforms

PROBLEM STATEMENT

1. Image Processing Challenge
2. AI-Powered Image Reduction Pipeline
3. Three Main Pipeline Stages
4. Execution on Edge Computing Platforms
5. Objective to reduce workload
6. Pipeline Evaluation

DATASET

1. Dataset Used:

Aerial Image Dataset for Emergency Response Applications (AIDER)

2. Dataset Categories:

Fire/Smoke, Flood, Collapsed Building/Rubble, Traffic Accidents, and Normal.

3. Categories Used in Experiments:

Images from the Normal and Flood categories.

4. Dataset Imbalance:

Approx 500 images for each disaster class and over 4000 images for the control class.

5. Preprocessing:

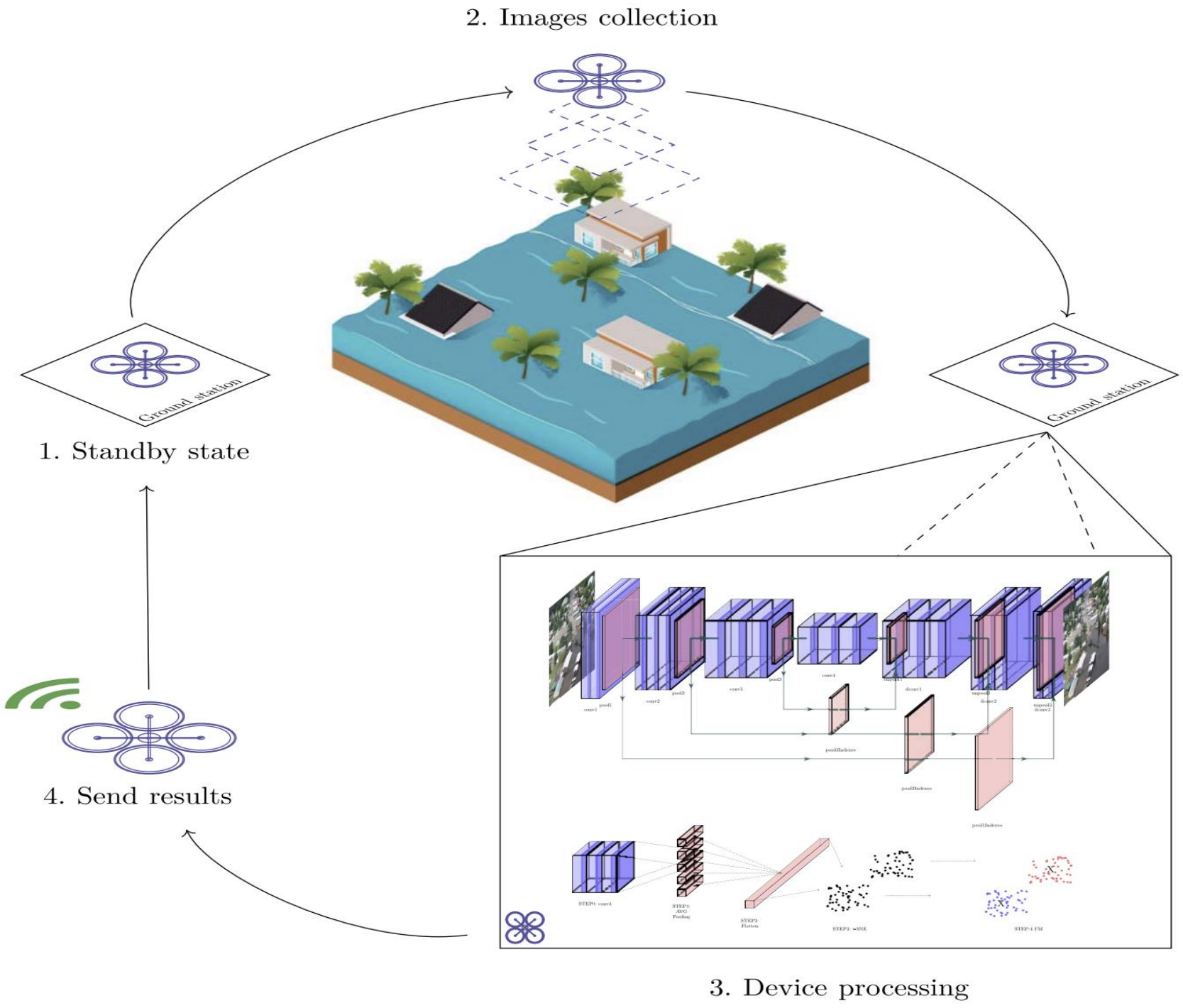
all images were resized to 255 pixels and centrally cropped.

6. Dataset Utilization:

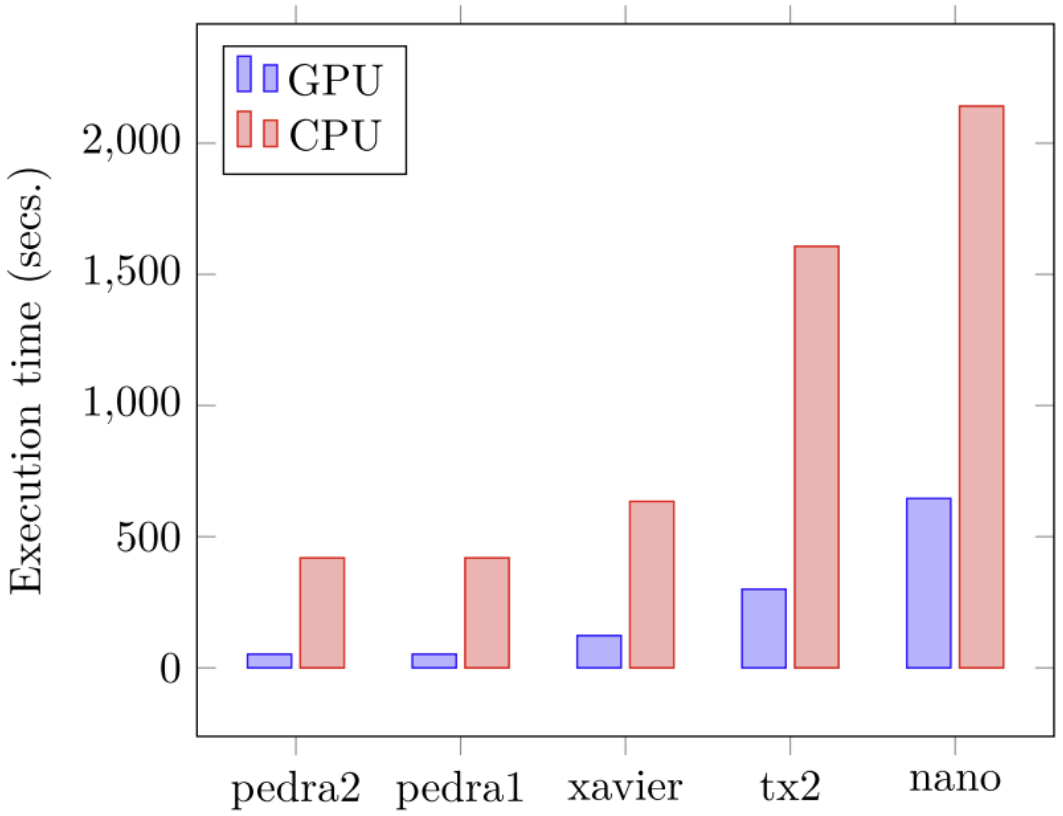
Autoencoder Training and Pipeline Evaluation

METHODOLOGY

AI-Pipeline Proposed For Management Of Natural Disasters



PERFORMANCE EVALUATION



Inference comparison of GPU/CPU for the entire data set.

1.GPU Boosts Performance

2.Edge GPU Efficiency

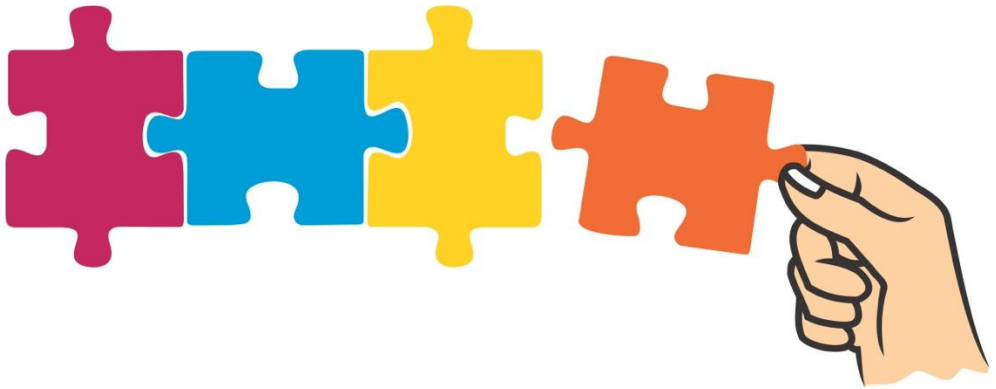
3.Cloud vs. Edge Performance

4.Inference Stage Speed

5.Later Pipeline Stages

6.Best Platform Performance

MAJOR CONTRIBUTIONS



1. A deep-learning-based lightweight autoencoder is proposed to identify the main features of aerial flood images.
2. An AI-based pipeline to reduce the amount of information to be supervised by first responders in natural disasters is designed.
3. An in-depth performance evaluation of different low power GPU-based edge computing devices is provided to assess the feasibility of autonomous AI drones in natural disasters.
4. A particular case study that targets flooding scenarios is under study

CONCLUSION

1. UAVs for Climate Action
2. Hardware and Software Advancements
3. AI at the Edge
4. Efficient AI Pipeline
5. GPU Boosts Performance
6. Future Development Focus
7. Challenges and Future Prospects
8. Potential for Swarm Operations
9. Further AI Pipeline Enhancements

REFERENCES

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Thank You!