



Application of AI Classification for Analysing Distress Messages in a Decentralized Emergency Network

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Research Context & Background

Emergency Communication Challenges

- Natural disasters, wars, and infrastructure failures often disable centralised communication systems
- Traditional systems rely on:
 - Telecommunications
 - Internet

Emergency Decentralised Networks

- Mesh networks
- Blockchain-based
- Ad-hoc mobile network
- Wi-Fi HaLow

Role of Artificial Intelligence

- Natural Language Processing (NLP)
- Real-time text classification
- Prioritisation of emergency messages

Current Developments

Recent studies show:

- Disaster tweet classification [1][2][3]
- Emergency call classification [4]
- Emergency call prioritisation [5]
- Decentralised communication systems are gaining attention for disaster resilience [6][7][8][9]

However:

- Most AI-based emergency classification systems are designed for centralized cloud-based architectures

Gap Identified:

- Limited research on integrating AI classification within decentralized emergency networks.

Research Problem

Problem Statement

Despite advances in AI-based emergency message classification, existing systems:

- Depend on centralized infrastructure
- Lack robustness in infrastructure-collapse scenarios
- Do not address AI deployment in decentralized environments

Core Research Problem:

How can AI classification models be effectively implemented within decentralized emergency networks to analyse and prioritize distress messages in real time?

Research Aim

To design and evaluate an AI-based classification model for analysing and prioritizing distress messages within a decentralized emergency communication network.

Research Objectives

1. Analyse the current literature to understand current AI classification methods applied against disaster messages
2. Develop and train a machine learning / NLP model for distress messaging categorisation
3. Evaluate the performance of the developed models and their potential applications in a decentralised network
4. Design and implement a decentralised architecture integrating the best performing models

Brief Literature Review

AI in Emergency Message Classification

- Crisis tweet classification [1][2][3]
- Urgency detection [4]
- Resource allocation [4][5]

Decentralized Emergency Networks

- Mesh networking increases disaster resilience [6][8][9]
- Peer-to-peer communication reduces single-point failure [6][8]

Identified Literature Gap, studies don't combine:

- Fully decentralized communication architecture
- Classification and Prioritisation of Emergency messages

Proposed Research Methodology

Philosophy: Positivism

Research Approach: Deductive

Research Strategy: Experiment, Software Development, Action research

Methodological choice: Mixed method

Data Collection & Evaluation

Cross-Sectional Research

- Publicly available disaster message datasets
- Synthetic dataset for decentralized simulation
- Categorisation and prioritisation of events

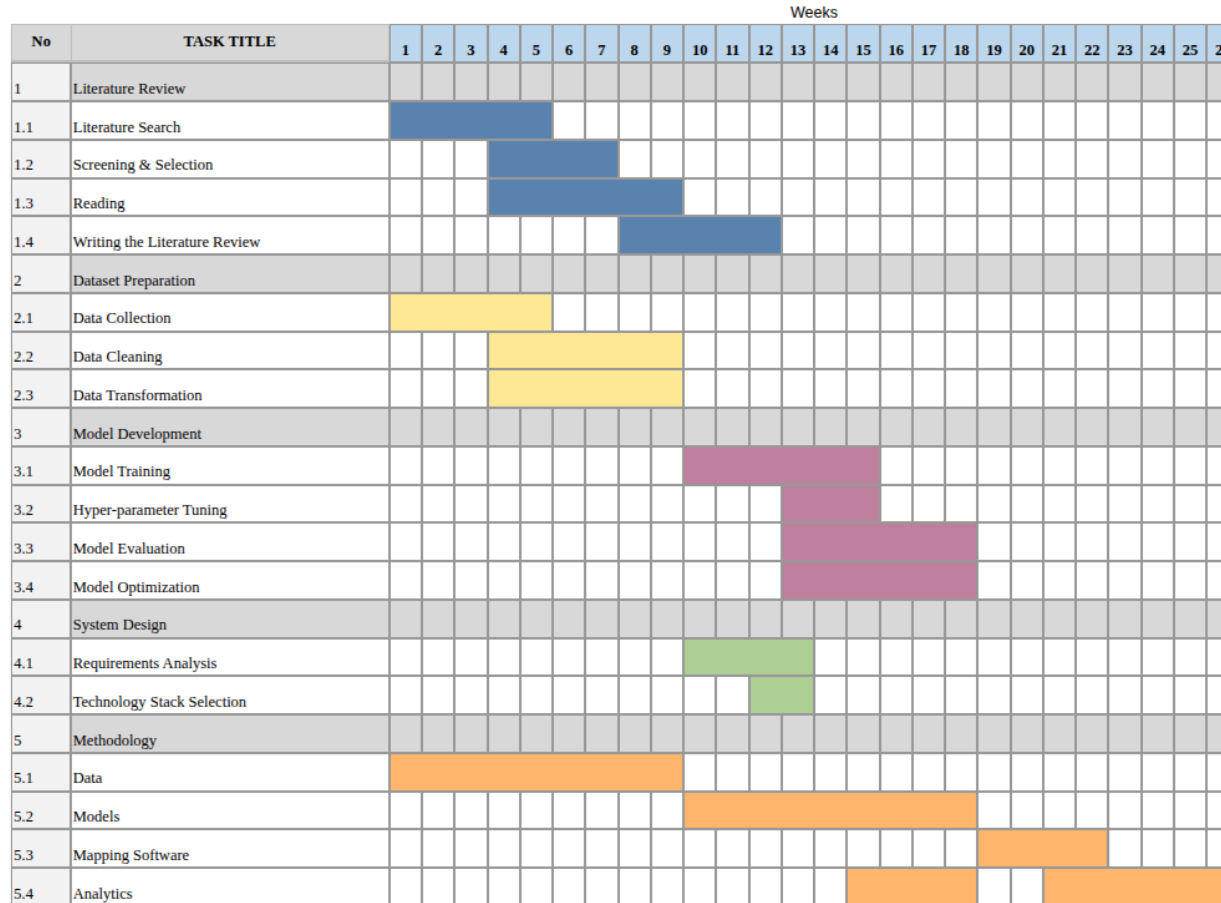
Data cleaning

- Includes categorisation and/or prioritisation

Statistical Analysis

- Gather disaster categories
- Category prioritisation

Project Planning



Resources Required

Software

- Python
- TensorFlow / PyTorch
- PyTransformers
- Node
- React
- Leaflet

Hardware

- Standard Workstation
- Single board computer (optional)
- Communication devices (optional)

Human Resources

- Supervisor guidance
- Peer reviewers

Potential Impact

- Faster emergency response
- Reduced manual triage workload
- Improved disaster resilience
- Scalable emergency communication infrastructure

Limitations

- Dataset bias (limited by open-source datasets)
- Real-world deployment challenges
- Privacy concerns
- Limited real decentralized field testing

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Thank you