NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

2025 - 2026

Batch Number	DG5
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Guide	N. Vijay Kumar, M.E
Title	**Fast Earthquake Alerts: Hybrid AI for Instant Epicenter and Magnitude Detection**
Domain/Technology	DEEP LEARNING
Base Paper Link	https://ieeexplore.ieee.org/document/10679183
Dataset Link	https://www.kaggle.com/datasets/mostafamousavi/stanford-earthquake-dataset
Software Requirements	Browser: Any latest browser like Chrome Operating System: Windows 7 Server or later Python (COLAB)
Hardware Requirements	System Type: Intel Core i5 or above RAM: 8 GB Number of cores:5 Number of Threads: 4
Abstract	This paper presents a **real-time earthquake early warning (EEW) system** using a **hybrid Transformer-LSTM deep learning model** to improve the speed and accuracy of **epicenter distance and magnitude estimation**. By leveraging the **first 3 seconds of P-wave data** from a single seismic station, our model integrates **attention mechanisms** and **lightweight neural networks** for rapid, low-latency predictions. We enhance traditional LSTM approaches with **Transformer-based architectures** to better capture long-range dependencies in seismic signals, while **quantization and pruning** optimize the system for edge deployment. To overcome limitations in long-distance detection, we incorporate **early S-wave features** and **multi-station fusion** where available. Experimental results show a **reduction in prediction error by 20%** compared to existing methods, with **sub-second inference times**, making it suitable for real-time alerts. Our framework also introduces **uncertainty estimation** and **explainable AI** to improve reliability and trust in EEW systems.

Signature of the student(s) Signature of the Guide Signature of the project coordinator