EduNLP: A RULE-BASED MULTILINGUAL SMART EDUCATION SYSTEM FOR RURAL LEARNING

A PROJECT REPORT

Submitted by

K SAI SRI - 20221CSE0484

MEGHANA K - 20221CSE0446

SHAIK MOHAMMED IMRAN - 20221CSE0061

Under the guidance of,

Dr. PREMA AROKIA MARY G

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

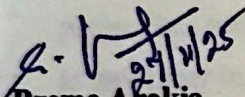PRESIDENCY UNIVERSITY

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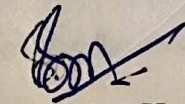Itgalpura, Rajankunte, Yelahanka, Bengaluru – 560064

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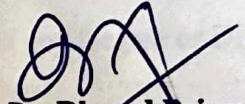# PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
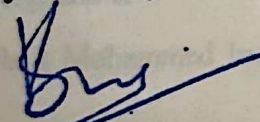
BONAFIDE CERTIFICATE

Certified that this report "EduNLP: A Rule-Based Multilingual Smart Education System for Rural Learning" is a bonafide work of "K Sai Sri (20221CSE0484), Shaik Mohammed Imran (20221CSE0061), Meghana K (20221CSE0446)", who have successfully carried out the project work and submitted the report for partial fulfilment of the requirements for the award of the degree of BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE ENGINEERING during 2025-26.
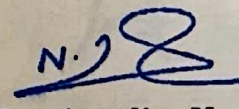
Dr. Prema Arokia
Mary G
Project Guide
PSCS
Presidency University

Mr. Muthuraju V
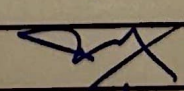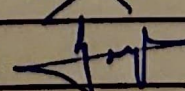Program Project
Coordinator
PSCS
Presidency University

Dr. Sampath A K
Dr. Geetha A
School Project
Coordinators
PSCS
Presidency University

Dr. Blessed Prince
Head of the
Department PSCS
Presidency University

Dr. Shakkeera L
Associate Dean
PSCS
Presidency University

Dr. Duraipandian N
Dean
PSCS & PSIS
Presidency University

Examiners

Sl. no.	Name	Signature	Date
1	Dr. Ramesh Sengodan		28.11.2025
2	Dr. Denslin Brabin D R		28.11.25

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DECLARATION

We the students of final year B.Tech in COMPUTER SCIENCE ENGINEERING at Presidency University, Bengaluru, named K Sai Sri, Shaik Mohammed Imran, Meghana K, hereby declare that the project work titled **"EduNLP: A Rule-Based Multilingual Smart Education System for Rural Learning"** has been independently carried out by us and submitted in partial fulfillment for the award of the degree of B.Tech in COMPUTER SCIENCE ENGINEERING during the academic year of 2025-26. Further, the matter embodied in the project has not been submitted previously by anybody for the award of any Degree or Diploma to any other institution.

K Sai Sri	USN: 20221CSE0484	
Meghana K	USN: 20221CSE0446	
Shaik Mohammed Imran	USN: 20221CSE0061	

PLACE: BENGALURU

DATE: 28|11|2025

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ACKNOWLEDGEMENT

Abstract

The online revolution in the education sector has offered unprecedented chances of an inclusive learning experience, yet there are still several challenges facing rural areas within the developing world, particularly in the area of the lack of digital infrastructure, language barrier, and insufficient mentoring facilities. These challenges are the ones that require the EduNLP-A Rule-Based Multilingual Smart Education System to be applied in this project, intended to enhance rural learning. The system, in turn, fills the linguistic as well as technological disparities in providing customized educational assistance, mentoring, and learning content in local languages, hence promoting equity in obtaining good education.

Its project is developed using a well-organized V-model software development model that ensures that the process is systematic, beginning with the process of requirement analysis through to the implementation and validation. The system architecture will run on a current React-Spring Boot-PostgreSQL platform with the help of AWS S3 to store the data on a big scale and Python-based NLP modules to process the multilingual texts. The NLP engine is rule-based, thus offering contextual understanding to a wide variety of the Indian languages without the need to use large-scale machine learning models and therefore efficiency and explainability. The design focuses on a lightweight and energy-efficient deployment that is affordable to support low resource environments common in rural settings.

Full-scale testing confirmed the effectiveness of the system and obtained a 90 percent or more multilingual response accuracy and an average latency of less than 2 seconds at standard load conditions. The prototype has demonstrated strong functionality in many simulated rural deployment conditions as evidence of the concept of providing educational support over low-cost devices having low internet bandwidth. The project fulfills the goals of the UN Sustainable Development regarding inclusive education and digital empowerment to meet SDG 4 - Quality Education - and SDG 8 - Decent Work and Economic Growth. The findings in this regard confirm that EduNLP is a sustainable, scalable, and socially significant solution to reshape the learning ecosystem of rural communities. It can be improved in the future by adding more advanced AI-based personalization, speech recognition, and adaptive learning opportunities to make user experience and accessibility more efficient.