EpiMap: A Comprehensive Framework for Real-Time Mapping and Prediction of Epidemic Spread

A PROJECT REPORT

Submitted by,

Miss. B N BHAVANA - 20211CSD0038
Mr. ULLAS GOWDA M - 20211CSD0042
Miss. PRARTHANA S P - 20211CSD0005
Mr. SANCHIT A - 20211CSD0150

Under the guidance of,

Prof. TINTU VIJAYAN

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING,

At

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY

BENGALURU, JANUARY 2025

PRESIDENCY UNIVERSITY

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the Project report **"EpiMap: A Comprehensive Framework for Real-Time Mapping and Prediction of Epidemic Spread"** being submitted by B N Bhavana, Ullas Gowda M, Prarthana S P, Sanchit A bearing roll number(s) 20211CSD0038, 20211CSD0042, 20211CSD0005, 20211CSD0150 in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering, Data Science is a bonafide work carried out under my supervision.

Prof. TINTU VIJAYAN
Assistant Professor
Presidency School of CSE
Presidency University

Dr. SAIRA BANU ATHAM
Professor & HoD
Presidency School of CSE
Presidency University
20 Jan 25

Dr. L. SHAKKEERA
Associate Dean
Presidency School of CSE
Presidency University

Dr. MYDHILI NAIR
Associate Dean
Presidency School of CSE
Presidency University

Dr. SAMEERUDDIN KHAN
Pro-VC School of Engineering
Dean -School of CSE&IS
Presidency University

PRESIDENCY UNIVERSITY

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **EpiMap: A Comprehensive Framework for Real-Time Mapping and Prediction of Epidemic Spread** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering**, is a record of our own investigations carried under the guidance of **Prof. Tintu Vijayan, Assistant Professor, Presidency School of Computer Science and Engineering, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

Student Names	Roll numbers	Signatures
B N Bhavana	20211CSD0038	Bhavana.
Ullas Gowda M	20211CSD0042	ullas
Prarthana S P	20211CSD0005	Pra
Sanchit A	20211CSD0150	Sanchit

ABSTRACT

Epidemics pose significant global health challenges, necessitating advanced, data-driven approaches for effective management and mitigation. This research introduces EpiMap, a comprehensive framework that integrates machine learning, time-series analysis, and geospatial visualization for real-time epidemic mapping and prediction. The framework utilizes Random Forest and Gradient Boosting for predictive accuracy, ARIMA and Vector Autoregression (VAR) for time-series forecasting, and Folium for dynamic geospatial visualization. It incorporates multivariate data, including epidemiological, environmental, and demographic factors, to analyze the spread of 15 diseases across Indian states, identifying high-risk areas and forecasting outbreak dynamics.

The study overcomes limitations of traditional models by addressing static datasets, lack of real-time visualization, and insufficient multivariate integration. Key findings demonstrate improved predictions for diseases like Dengue Fever, Hepatitis B, and Leptospirosis, enabling targeted public health interventions. By leveraging real-time data and predictive modeling, EpiMap achieves actionable insights, enhancing response times and optimizing resource allocation for epidemic control. This work significantly advances epidemic forecasting, offering an adaptable and accurate tool for proactive health management and policy planning.

One of the key contributions of EpiMap is its ability to address the limitations of traditional models by incorporating real-time data, enabling timely updates and decision-making. By integrating multivariate analysis with dynamic visualization, the framework offers a practical tool for policymakers and public health authorities. The application of EpiMap demonstrates improved predictive accuracy for diseases such as Dengue Fever, Hepatitis B, and Leptospirosis, which are influenced by environmental and socio-economic factors. For instance, the framework effectively predicts disease surges in regions with high rainfall or inadequate healthcare infrastructure, facilitating focused public health responses like vaccination drives, vector control, and resource allocation.

ACKNOWLEDGEMENT

First of all, we indebted to the **GOD ALMIGHTY** for giving me an opportunity to excel in our efforts to complete this project on time.

We express our sincere thanks to our respected dean **Dr. Md. Sameeruddin Khan**, Pro-VC, School of Engineering and Dean, School of Computer Science Engineering & Information Science, Presidency University for getting us permission to undergo the project.

We express our heartfelt gratitude to our beloved Associate Deans **Dr. Shakkeera L and Dr. Mydhili Nair,** Presidency School of Computer Science and Engineering , Presidency University, and **Dr.Saira Banu Atham** Head of the Department, Presidency School of Computer Science and Engineering, Presidency University, for rendering timely help in completing this project successfully.

We are greatly indebted to our guide **Prof. Tintu Vijayan, Assistant Professor** and Reviewer **Dr.Sandeep Albert Mathias, Assistant Professor,** Presidency School of Computer Science and Engineering, Presidency University for his inspirational guidance, and valuable suggestions and for providing us a chance to express our technical capabilities in every respect for the completion of the project work.

We would like to convey our gratitude and heartfelt thanks to the PIP2001 Capstone Project Coordinators **Dr. Sampath A K, Dr. Abdul Khadar and Mr. Md Zia Ur Rahman,** department Project Coordinators **Dr. H M Manjula** and Git hub coordinator **Mr. Muthuraj.**

We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

B N Bhavana
Ullas Gowda M
Prarthana S P
Sanchit A