VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama", Belagavi-560014, Karnataka

A PROJECT REPORT ON

"DETECTION OF TUBERCULOSIS USING DEEP LEARNING CONCEPT"

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE

BACHELOR OF ENGINEERING
IN
COMPUTER SCIENCE & ENGINEERING

Submitted By

SHRAVAN KUMAR T [1SV20CS045]
VENKATESH DALAWAI [1SV20CS056]
SHARIBA FIRDOSE [1SV20CS042]
SUSHMITHA K [1SV20CS050]

Under the guidance of

Dr. Basavesha D BE.,M.Tech.,PhD

Associate Professor & HOD

Dept. of CSE, SIET,Tumakuru

SHRIDEVI EDUCATION

Department of Computer Science and Engineering

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Affiliated To Visvesvaraya Technological University)
Sira Road, Tumakuru – 572106, Karnataka.

2023-2024

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
Sira Road, Tumkur - 572 106, Karnataka, India.
Phone: 0816 - 2212629 | Principal: 0816 - 2212627, 9686114899 | Telefax: 0816 - 2212628
Email: info@shrideviengineering.org, principal@shrideviengineering.org | Website: www.shridevi engineering.org
(Approved by AICTE, New Delhi, Recognised by Govt. of Karnataka and Affiliated to Visvesvaraya Technological University, Belagavi)

ESTD:2002

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that, Project report of entitled "DETECTION OF TUBERCULOSIS DISEASE USING DEEP LERANING CONCEPT" has been Successfully carried out by SHRAVAN KUMAR[1SV20CS045], VENKATESH DALAWAI [1SV20CS056], SHARIBA FIRDOSE[1SV20CS042],SUSHMITHA K [1SV20CS050] in partial fulfillment for the project report of **Bachelor of Engineering** in **Computer Science & Engineering** of the **Visvesvaraya Technological University, Belagavi** during the academic year **2023-24.** It is certified that all the corrections/suggestions indicated for internal assessments have been incorporated in the report. The Project report has been approved as it certifies the academic requirements in respect of Project work prescribed for the Bachelor of Engineering Degree.

29/5/24

Signature of Guide
Dr. Basavesha D BE.,M.Tech.,PhD
Associate Professor & HOD
Dept. of CSE,
SIET, Tumakuru.

29/5/24

Signature of H.O.D
Dr. Basavesha D BE.,M.Tech.,PhD
Associate Professor & HOD
Dept. of CSE,
SIET, Tumakuru.

Signature of Principal

Dr.Narendra Viswanath M.E., Ph.D., MIE, MISTE, MIWS., FIV.,
Principal, SIET, Tumakuru

Name of the Examiners	Signature with date
1. Dr. Basavesha D	29/5/24
2.	29/5/24

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
Sira Road, Tumkur - 572 106, Karnataka, India.
Phone: 0816 - 2212629 | Principal: 0816 - 2212627, 9686114899 | Telefax: 0816 - 2212628
Email: info@shridevienggineering.org, principal@shridevienggineering.org | Website: www.shridevienggineering.org
(Approved by AICTE, New Delhi, Recognised by Govt. of Karnataka and Affiliated to Visvesvaraya Technological University, Belagavi)
ESTD:2002

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DECLARATION

We, SHRAVAN KUMAR T[1SV20CS045],VENKATESH DALAWAI[1SV20CS056], SHARIBA FIRDOSE[1SV20CS042],SUSHMITHA K[1SV20CS050] student of VIII semester B.E in Computer Science & Engineering, at Shridevi Institute of Engineering & Technology, Tumakuru, here by declare that,the Project work entitled "DETECTION OF TUBERCULOSIS DISEASE USING DEEP LEARNING CONCEPT" embodies the report of our Project work carried out under the guidance of **Dr. Basavesha D, Associate Professor, Department of CSE, SIET,Tumakuru** as partial fulfillment of requirements for the Project report in **Bachelor of Engineering in Computer Science & Engineering of Visvesvaraya Technological University, Belagavi**, during the academic year **2023-24**. The Project has been approved as it satisfies the academic requirements in respect to the Project work.

Place: Tumakuru
Date:

Student Name & Signature

SHRAVAN KUMAR T	**[1SV20CS045]**	.....
VENKATESH DALAWAI	**[1SV20CS056]**	.....
SHARIBA FIRDOSE	**[1SV20CS042]**	.....
SUSHIMTHA K	**[1SV20CS050]**	.....

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
Sira Road, Tumkur - 572 106, Karnataka, India.
Phone: 0816 - 2212629 | Principal: 0816 - 2212627, 9686114899 | Telefax: 0816 - 2212628
Email: info@shrideviengineering.org, principal@shrideviengineering.org | Website: www.shridevienggineering.org
(Approved by AICTE, New Delhi, Recognised by Govt. of Karnataka and Affiliated to Visvesvaraya Technological University, Belagavi)

BONAFIDE CERTIFICATE

This is to certify that the project work Phase II entitled "DETECTION OF TUBERCULOSIS USING DEEP LEARNING CONCEPT" is a bonafide in the work of, SHRAVAN KUMAR T [1SV20CS045],VENKATESH DALAWAI [1SV20CS056],SHARIBA FIRDOSE[1SV20CS042], SUSHMITHA K[1SV20CS050] of VIII semester of **B.E** in Computer Science and Engineering carried out at Shridevi Institute of Engineering and Technology in partial fulfillment of requirements for the award of **Bachelor of Engineering in Computer Science and Engineering of the Visvesvaraya Technological University, Belagavi** under my supervision and guidance. Certified to the best of my knowledge the work reported here is not a part of any other thesis on the basis of which degree or award was conferred on earlier occasion to these or any other candidates.

Guide:

Dr. Basavesha D B.E.,M.Tech.,PhD

Associate Professor & HOD

Dept of CSE, SIET, Tumakuru

ACKNOWLEDGEMENT

This Project will be incomplete without thanking the personalities responsible for this venture, which otherwise would not have become a reality.

We express our profound gratitude to **Dr. Narendra Viswanath,** Principal, S.I.E.T, for his moral support towards completing our Project work.

We would like to thank Head of Department and our guide **Dr. Basavesha D** Head, Department of CSE, SIET for providing all the support and facility.

We would like to thank my Project Coordinator **Dr. Girish L** Associate Professor, Head, Department of AI & DS and **Mrs. Rashmi N** Assistant Professor, Department of Computer Science and Engineering, SIET for providing all the support and faculty.

We would like to express our sincere gratitude to all teaching and non-teaching faculty of the department of CSE for guiding us of this project by giving valuable suggestion and encouragement.

By,

SHRAVAN KUMAR T [1SV20CS045]

VENKATESH DALAWAI [1SV20CS056]

SHARIBA FIRDOSE [1SV20CS042]

SUSHIMTHA K [1SV20CS050]

ABSTRACT

Accurate diagnosis of tuberculosis (TB) from chest X-ray images is crucial for timely intervention and reducing TB-related mortality rates. Despite the widespread use of chest X-rays, manual interpretation can be time-consuming and prone to errors. In this study, we propose a machine learning approach for automated TB detection from chest X-ray images, aiming to streamline the diagnostic process.

We employ a multi-step approach consisting of preprocessing, segmentation, feature extraction, and classification procedures. Initially, preprocessing techniques are applied to enhance image quality and remove noise. Subsequently, the lung region is segmented to focus on relevant areas for TB detection. Feature extraction is performed to capture discriminative patterns indicative of TB presence. Finally, a classification model is trained to differentiate between TB-infected and healthy lung images.

To leverage the power of deep learning, we fine-tune five pre-trained models from the EfficientNets family, ranging from EfficientNetB0 to EfficientNetB4. This transfer learning-based approach initializes the models with weights from a large-scale dataset, such as ImageNet, and adapts them to the task of TB detection. Additional layers, including top layers and a fully connected layer, are added to enable classification.

Our experiments evaluate the performance of the fine-tuned EfficientNets against other pre-trained models. We conduct comprehensive tests to assess the robustness and efficacy of our approach. To gain insights into the model's decision-making process, we employ Grad-CAM visualization to highlight regions of interest indicative of TB presence within chest X-ray images.

Results demonstrate the effectiveness of using EfficientNetB2 as the underlying framework, yielding significant performance improvements. The proposed model achieves an overall test accuracy of 99.06%, with precision, recall, and F1-score reaching 98.73%, 99.13%, and 98.79%, respectively. This study underscores the potential of deep learning techniques in enhancing TB diagnosis from chest X-ray images, paving the way for improved healthcare outcomes in TB management.