Terrain Recognition using Deep Learning

A PROJECT REPORT

Submitted by,

SAHANA R	**-20211CSD0108**
AKASH KARTHIK RAO	**-20201CSD0130**
PRATHIKSHA M	**-20211CSD0019**
SRINIDHI S	**-20211CSD0114**
AMPANA J	**-20211CSD0110**

Under the guidance of,

Dr. Marimuthu K

in complete fulfilment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

At

PRESIDENCY UNIVERSITY
BENGALURU

MAY 2025

PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

CERTIFICATE

This is to certify that the Project report **"Terrain Recognition using Deep Learning"** being submitted by **"SAHANA R, AKASH KARTHIK RAO, PRATHIKSHA M, SRINIDHI S, AMPANA J"** bearing roll number(s) "**20211CSD0108, 20201CSD0130, 20211CSD0019, 20211CSD0114, 20211CSD0110**" in partial fulfilment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a Bonafide work carried out under my supervision.

Dr. Marimuthu K
Professor
School of CSE
Presidency University

Dr. Saira Banu Atham
Professor & HoD
School of CSE & IS
Presidency University

Dr. MYDHILI NAIR
Associate Dean
School of CSE
Presidency University

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

PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **Terrain Recognition using Deep Learning** in partial fulfilment 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 **Dr. Marimuthu K, Professor, School of Computer Science, Presidency University, Bengaluru.**

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

Student Name(s)	Roll No(s)	Signature(s)
SAHANA R	20211CSD0108	
AKASH KARTHIK RAO	20201CSD0130	
PRATHIKSHA M	20211CSD0019	
SRINIDHI S	20211CSD0114	
AMPANA J	20211CSD0110	

ABSTRACT

Accurate terrain recognition is fundamental for autonomous systems operating in diverse environments. Traditional sensor-based methods like LiDAR and IMUs are expensive, prone to drift, and affected by environmental conditions. Vision-based deep learning approaches, particularly Convolutional Neural Networks (CNNs), offer a promising alternative by analyzing RGB images from standard cameras, reducing hardware costs while maintaining high accuracy. This project focuses on developing a CNN-based model for terrain classification (sandy, rocky, grass, marshy) and predicting implicit properties like roughness and slipperiness. The proposed system uses data collection, preprocessing, model selection, training (including a multi-task learning approach with a secondary regression network), and evaluation. The methodology involves using existing datasets, annotating images with property values, applying preprocessing techniques, and fine-tuning a pretrained CNN model. The final system aims to achieve high accuracy in classification and robust prediction of physical properties, enhancing environmental perception for applications like autonomous vehicles and planetary rovers. The project demonstrates the practical application of deep learning to improve the safety and efficiency of autonomous navigation in challenging environments