# PREFACE

This thesis presents a comprehensive study on the development of a CNN-based system for precision farming, specifically aimed at the classification of crops and weeds and the analysis of their density. Traditional farming practices often rely on manual methods for managing resources such as pesticides and fertilizers, leading to inefficiencies and environmental harm. The increasing global population and the emergence of herbicide-resistant weeds necessitate innovative solutions for sustainable agriculture.

Utilizing advancements in machine learning and computer vision, particularly Convolutional Neural Networks (CNNs), this research introduces an automated system capable of accurately identifying crop and weed species from image data. The system facilitates data-driven decisions for optimal fertilizer and pesticide application, thereby enhancing resource efficiency and reducing environmental impact.

The methodology involves data collection from various sources, preprocessing, and the development of multiple CNN models. The performance of these models is evaluated based on accuracy, precision, recall, and F1 score. The study's findings demonstrate the effectiveness of the proposed system in improving agricultural productivity and sustainability.

This research contributes to the field by providing a robust framework for precision farming, highlighting the practical implications of integrating advanced technologies in agriculture. Future research directions and potential improvements to the system are also discussed, aiming to further enhance the accuracy and applicability of the proposed approach.