MACHINE LEARNING BASED ASSESSMENT OF CORROSION RELATED DAMAGES IN REINFORCED CONCRETE LOW-RISE BUILDINGS

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DECLARATION

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

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ABSTRACT

A machine learning-based approach for evaluating corrosion-related damages in low-rise RC buildings is presented in this study. Traditional assessment methods often rely on visual inspections, which can be subjective and inefficient. To address this limitation, the research integrates empirical data from field investigations and advanced computational techniques to establish a data-driven framework for evaluating structural degradation due to corrosion. Quantitative assessments of key parameters named concrete quality, carbonation depth, compressive strength, concrete cover thickness, and corrosion risk were conducted, using non-destructive tests named ultrasonic pulse velocity test, carbonation test, rebound hammer test, cover meter test, and half-cell potential test during field investigations in RC buildings. A systematic categorization of corrosion-related damages and their causative factors was developed, providing a structured understanding of deterioration mechanisms. Based on empirical data, including the measured key parameters, a Damage Index (DI) equation and a corresponding Damage Assessment Framework were formulated to quantify degradation levels of structural components in RC buildings affected by corrosion. The DI equation and Damage Assessment Framework were validated using machine learning-based regression techniques to enhance predictive accuracy. The findings confirm that the machine learning model developed in this research can effectively identify patterns and predict structural degradation levels, offering valuable insights into corrosion progression. This research underscores the importance of proactive maintenance and data-driven decision-making in structural health monitoring. By integrating machine learning into corrosion assessment, the study advances predictive maintenance strategies, ensuring the long-term durability and resilience of RC structures.

Keywords: Reinforcement Corrosion, RC Buildings, Damage Index, Damage Assessment Framework, Machine Learning, Structural Integrity.

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LIST OF ABBREVIATIONS

Abbreviation	Description
RC	Reinforced Concrete
NDE	Non-Destructive Evaluation
NDT	Non-Destructive Testing
UPV	Ultrasonic Pulse Velocity
HCP	Half-Cell Potential
NBRO	National Building Research Organization
ML	Machine Learning
DI	Damage Index