Chapter 6
A Review on Quantum Deep Machine Learning Model for Predicting Rice Husk Ash Compressive Strength

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ABSTRACT

Concrete formulation for qualities is difficult with advances in concrete science. Using rice husk ash as a partial substitute of cement is a strategy to lower the environmental impact worldwide. Compressive strength of concrete made with rice husk ash has not been reliably predicted; diverse quantum events in condensed matter and atomic physics may be traced back, however, their underlying mechanisms and their dynamical management remain elusive to researchers, while machine learning's task-solving abilities have shown potentials in the burgeoning computational machine learning for concrete mixture design. Reducing cement used in concrete can lessen the industry's environmental impact and boost efficiency. The expanding data volumes provide openings for cutting-edge machine learning data analysis methods. This study reviews prediction models for compressive strength of cement replacement concrete with rice husk ash using quantum deep machine learning algorithm models for experimental data on concrete's compressive and flexural strengths.

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INTRODUCTION

When it comes to global carbon dioxide emissions, cement is a huge example. Throughout the world, advancements are being made at a dizzying rate. Every industry sees the daily introduction of new technology and developments. These developments have changed the way human history unfolds. The development of modern society is in large part due to improvements in infrastructure. Mankind has progressed from living in caves to constructing homes that are both functional and aesthetically beautiful. Infrastructure is still seen as the key to a country's development today (An et al., 2019). When it comes to building infrastructure, cement is by far the most widely utilized construction material in the world. Though cement has many uses and benefits, it does have some drawbacks as well. Some ten percent of the world's carbon dioxide emissions are attributed to cement production. Cement manufacture requires a high temperature because the addition of water causes a reaction that generates carbon dioxide (Madlool et al., 2011); (Ishak & Hashim, 2015); (Kinnon et al., 2018).

Cement's carbon footprint grows as a result of the burning of fossil fuels to reach such a high temperature. Several potentially catastrophic issues threaten our home planet. Some of these worrying problems include environmental damage and global warming. Because of this, producing greener concrete structures requires sustainable alternatives to traditional cement. Ash from rice husks has demonstrated several interesting properties that make it a viable alternative for further studies. These issues will drive Earth to the edge of extinction if they are not addressed in a timely manner. Emissions of carbon dioxide from various goods and processes are thought to be a substantial contributor to environmental deterioration and global warming. Cement accounts for a significant portion of global CO2 emissions, hence the significance of infrastructure cannot be overstated. It needs to be swapped out for something that can provide the same or better functionality as cement but with a less carbon footprint (Perera, 2017).

Secondary cementitious materials are those that can be used as a substitute for Portland cement but still achieve the same results. Lower rates of carbon dioxide emission are one of their characteristics. To put it simply, secondary cementitious materials are industrial leftovers and waste products from other sectors. If not disposed of or used correctly, these materials can contribute to many forms of pollution. Different amounts and combinations of secondary cementitious materials can be employed to achieve the same results. Fly ash, maize cob ash, sugarcane bagasse ash, rice husk ash, and powdered granulated blast furnace slag are all examples of secondary cementitious materials. When the rice husks are burned, the ash is one of the secondary cementitious elements that can be salvaged from the agricultural byproduct. Paddy is boiled in rice mills using fuel made from the rice husks (RH) that cover the rice grains. By burning rice husks, it can be obtained. With a silica content of about 90%, it works well as a supplementary cementitious ingredient in concrete production. Shown above is an illustration of the chemical make-up of Rice Husk Ash (Raghav et al., 2021).

Synergy between quantum computing and AI has the potential to completely alter the technological landscape of the future. A major AI theory group uses generative models. In this paper, we present a universal quantum algorithm for machine learning that makes use of a quantum generative model. Predicting the qualities of concrete with rice husk ash using machine learning is effective because the experimental work necessary to analyze its properties is both time demanding and difficult (Tian et al., 2022); (Gao et al., 2018); (Xu et al., 2021).

Ash from rice husks has demonstrated several interesting properties that make it a viable alternative for further studies. Machine learning can accurately predict the qualities of concrete using rice husk ash,