PULMONARY FIBROSIS PROGNOSIS PREDICTION USING QUANTUM MACHINE LEARNING

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ABSTRACT

Pulmonary fibrosis is a progressive lung condition caused by damaged or scarred lung tissue obstructing the exchange of carbon dioxide and oxygen gasses in the alveoli Thereby, leaving the body deprived of the oxygen required for blood oxygenation and less lung volume. As per state-of-the-art medical practice, the deterioration/ scarring of the lung tissue is not entirely reversible or correctable, merely leaving patients with symptom management using therapy and clinical drug trials. An accurate judgment of the lung function decline is crucial for the management and trial treatment of the patient.

This research project endeavors to automate the process of prognosis prediction of pulmonary fibrosis using a hybrid-classical quantile regression hybrid model built using a variational quantum circuit. Although quantum computing is still in its formative years, research activities done in similar domains have proved to have immaculate success in both the correctness and speed of the results. The project explores the advantages one might gain by utilizing the developing quantum computing over the use of classical computational approaches, which will in return facilitate and encourage more optimization of machine learning using quantum computing.

The model has shown promising results so far, with a Laplace Log Likelihood matrix of -7.13, and a mean absolute error of just 212.31. For a regression model trained with a small dataset such as the OSIC dataset with just 700+ DICOM images with its metadata, the evaluations are noticeable and promising.

Keywords: Pulmonary Fibrosis, Prognosis Prediction, Quantum Machine Learning.

Subject Descriptors:

Computing methodologies → Machine learning → Machine learning approaches → Neural networks

Theory of computation → Models of computation → Quantum computation theory → Quantum complexity theory