


# Chapter 13


## Quantum–Enhanced Smart Computing Framework for Sustainable Credit Risk Decision Communication

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## ABSTRACT

*Recent advancements in smart computing and intelligent decision communication systems have enabled new possibilities for sustainable financial technologies. This chapter introduces a hybrid quantum classical model for credit risk prediction that leverages superposition and entanglement to enhance complex financial data processing. Unlike traditional machine learning models that struggle with class imbalance, nonlinear relationships and high dimensional dependencies, the system combines advanced preprocessing, feature selection and quantum kernel computation within a scalable support vector framework. Trained on 33,000 loan records across 12 borrower attributes, it achieves 94.53% accuracy, outperforming logistic regression, random forests, decision trees and CNNs. By improving decision accuracy and reducing default risk, the approach contributes to economic sustainability and responsible lending. The same quantum communication architecture can extend to healthcare, logistics and cybersecurity, aligning with the wider vision of smart technology for a sustainable future.*

## INTRODUCTION

Credit prediction forms a critical component of financial decision-making in the contemporary world that enables the lenders to determine the creditworthiness of borrowers and reduce the risks associated with loan defaults. With the growth of digital finance, the credit risk assessment today is performed on massive data volumes, i.e. the character of various borrowers is present: demographics, financial well-being, and behavioral portrait. In this study we consider a data containing approximately 33,000 loan records that are described on 12 significant parameters, including age, loan status, length of credit history, interest rate, loan grade, annual income, loan-income ratio, default history, tenure of employment, ownership of a home, loan purpose, and the loan amount. These variables provide a holistic base of creating prognostic models that will have the capacity to cater to the individual creditors and to large financial institutions.

Despite the importance of credit prediction, the functionality of the standard machine learning (ML) models faces certain barriers. First of all, financial data is usually imbalanced in terms of the number of classes: non-default loans significantly exceed the number of defaults. This asymmetry favours models to predict the majority group thus lowering their capacity to predict actual defaults. Second, financial data is not linear and might contain many variables that depend on each other: its complexity and nonlinearity pose a challenge to traditional non-linear algorithms like logistic regression or decision trees to detect subtle effects. Third,

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