AI–Quantum Hybrid Models for Organizational Risk Forecasting and Crisis Management

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***Abstract*—As organizations navigate increasingly complex operational environments, conventional risk management models often fail to capture the nonlinear, high-dimensional interactions that drive modern crises. The convergence of artificial intelligence (AI) and quantum computing offers a transformative framework for predictive risk assessment and adaptive crisis response. This study explores the design and application of AI–quantum hybrid models that integrate quantum-enhanced computation with machine learning to improve the accuracy, speed, and scalability of organizational risk forecasting systems. The proposed framework employs quantum machine learning (QML) algorithms—such as the Quantum Support Vector Machine (QSVM) and Quantum Neural Networks (QNNs)—in conjunction with classical deep learning methods for multi-layered risk prediction and decision optimization. By leveraging quantum superposition and entanglement, the system enhances the exploration of correlated variables in financial, operational, and reputational risk domains. Empirical simulations demonstrate that hybrid AI–quantum approaches outperform purely classical models in identifying latent crisis patterns, managing uncertainty propagation, and optimizing mitigation strategies under dynamic constraints. The study underscores the strategic importance of quantum-ready organizational resilience frameworks, emphasizing interpretability, data security, and ethical governance in hybrid model deployment. By merging predictive analytics with quantum optimization, this research establishes a pathway toward proactive, intelligent, and resilient organizational crisis management in an era of exponential technological change.**

In today's volatile global landscape, organizations face a convergence of financial, operational, cybersecurity, and environmental risks that evolve faster than traditional management systems can analyze or respond. The increasing interdependence of digital infrastructures and supply chains has made crisis prediction and mitigation both more urgent and more computationally demanding [7]. Traditional risk forecasting methods—rooted in statistical modeling and rule-based inference—often struggle to handle the complexity, scale, and uncertainty of multi-variable crises. The rise of artificial intelligence (AI) has partially bridged this gap by enabling pattern recognition and predictive analytics, yet even the most advanced machine learning systems remain constrained by the computational limits of classical architectures [2].

Quantum computing offers a new computational paradigm capable of processing and correlating vast, nonlinear datasets through principles of superposition, entanglement, and quantum interference [1]. These

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