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The Quantum Technology ecosystem: A data-driven analysis of policy trajectories and the labor market

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As quantum technologies advance from foundational science to commercial deployment, a robust understanding of their surrounding ecosystem—spanning policy, workforce, and industrial dynamics—is critical. In this work, we demonstrate how AI and machine learning methods can illuminate the structure and evolution of the quantum technology (QT) ecosystem. Drawing on two large-scale datasets—(1) 62 national quantum strategy documents across 20 countries, a corpus of 12,786 paragraphs, and (2) over 3,600 global job postings related to QT—we apply natural language processing and GPT-classification techniques to extract thematic, temporal, and geographical insights.

Using BERTopic and K-means clustering on dataset (1) of strategy documents, we identify 13 key policy themes, track their evolution over two decades, and reveal a strategic shift from foundational quantum science toward commercialization, workforce development, and national program coordination. In parallel, through LLM-enhanced classification of job posts (dataset 2), we analyze regional hiring trends, degree and skill requirements, and the demand for specific quantum roles across academia and industry. Taken together, we are able to build a data-driven picture of the QT landscape, identifying policy foci and the corresponding state of the labor market. Our approach supports strategic decision-making at the interface of science, industry, and governance—crucial for guiding the global transition into the second quantum revolution.

Broad physics domain

Quantum Science

AI/ML technique(s) to be presented

NLP (Topic modelling) and GPT-classification

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