

# Exploring Fundamental Physics with Quantum Information

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## Abstract

Quantum technologies provide new base capabilities which open up frontiers in sensing, networking, and computation. I will discuss the promise quantum systems have in fundamental physics research, from the creation of quantum memory via quantum error correction to exploring the ability of gravity to entangle objects.

My talk will explore both the opportunities for realizing novel systems in the pursuit of these efforts, from levitated diamonds [1] and torsion pendula [2] to spin qubits in semiconductors [3], but also consider the practical challenges of realizing these complex experiments 'by hand'. Of particular interest is the role of artificial intelligence systems to enable and improve the capabilities of experimental systems to better achieve the limits provided by quantum mechanics. [4,5]

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## References

- [1] arXiv:2603.16487
- [2] arXiv:2510.12787
- [3] arXiv:2112.09362
- [4] arXiv:2510.12787
- [5] arXiv:2511.01080