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Entanglement for quantum technologies

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I will first briefly introduce the concept of quantum entanglement, highlighting its differences with classical correlations. I'll therefore discuss the concept of Bell non-locality, which plays a central role in quantum cryptography and device independent certification, using a diagrammatic causal inference analysis. This approach will allow us to investigate the physical meaning of the free-will, realism, and locality assumptions used to derive the Bell inequalities. I'll conclude the course by introducing the concept of metrological entanglement, namely the class of entangled states that can provide sub shot-noise sensitivities in generic phase estimation problems. I'll demonstrate that this class of states is witnessed by the Fisher information.

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