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Optimal Control Theory and Quantum Information Systems

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Building a working quantum information processing system requires extremely precise control over the strongly coupled dynamics of suitable quantum systems. Ultracold molecular interactions represent a promising candidate for scalable quantum information processing in the AMO field. Quantum optimal control theory, developed in the context of laser-assisted molecular reactions, has already been shown to yield improvements for quantum devices that can take performance beyond the otherwise unattainable fault-tolerance threshold. The talk will introduce various schemes to attain this, and discuss several open questions concerning the robustness of the approach in the presence of noise, dissipation, imprecise control and other imperfections.