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Neutrino Quantum Kinetics in Supernovae

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Neutrino interactions with matter will set the neutrino luminosity, spectra, and duration of the neutrino signal from the next galactic core-collapse supernovae. Flavor oscillations will mix the signals from different neutrino species. The exciting prospect of fast flavor instabilities deep inside the supernova shock suggest that these processes occur at the same time and location, influencing each other in a nonlinear manner. I will discuss the importance of modeling these effects simultaneously and self-consistently, demonstrate current capabilities with simplified isotropic simulations, and outline the path forward to global simulations of the full explosion.

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