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Perturbative solutions of Einstein's equations: recursive techniques and multipole expansions

Thursday 28 August 2025 16:00 (30 minutes)

Perturbative approaches to gravity, particularly within the post-Minkowskian (PM) expansion, provide a powerful framework for studying gravitational interactions beyond the weak-field limit. In this talk, I will highlight the role of off-shell recursion relations—formulated through the Perturbiner expansion—in systematically organizing gravitational perturbations. These recursive structures naturally generate all orders in Newton's constant, offering new insight into both conservative dynamics and dissipative effects.

Compared to conventional Feynman diagram methods, the Perturbiner approach offers a far more efficient, computer-friendly framework for perturbative gravity, acting as a generating functional for off-shell currents in both gauge and gravity theories. By combining recursive structures with iterative loop integrals, this method transforms the overwhelming complexity of perturbative gravity into a systematic and tractable procedure.

This talk will be of interest to researchers in perturbative gravity, self-force dynamics, scattering amplitudes, quantum field theory, and mathematical physics, as well as those interested in computational methods for high-energy theory.

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