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Genetic Algorithm-Based Optimization of Strangeness Production

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In heavy-ion collisions, strange particles are not present before the collision, as they are absent in normal matter. Consequently, strange particles must be produced during or shortly after the collision. Therefore, the production of strange quarks serves as an important probe for the underlying physics of heavy-ion collisions.

In this project, we will investigate strangeness production with the SMASH (Simulating Many Accelerated Strongly-interacting Hadrons) model. At lower collision energies, SMASH incorporates short-lived particles, termed resonances, to describe the production of strange quarks through resonance decay.
The properties of resonance particles are constrained by experimental measurements with unfortunately large uncertainties. Consequently, simulating low-energy observables with SMASH, which are sensitive to strangeness production, inherits these uncertainties.

To address this challenge, we implement a genetic algorithm to simultaneously fit numerous resonance parameters to experimental data, which comprise exclusive elementary cross-sections.

With the best set of resonance parameters, we will investigate pion-nucleus collisions as the second most complicated system before moving on to heavy ions.

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