The Cohesiveness of Particle Collisions: Markovian Analysis of Proton Collision Patterns in Particle Physics

Cohen, Raiya (School: iPrep Academy North)

This research aimed to explore the behavior of particles in high-energy proton collisions through a Markovian model to identify cohesive patterns and predict particle behavior. One fundamental concept in particle physics is measuring the probability that a specific process will occur when a particle scatters with another particle or a nucleus. By examining high-energy proton collisions, this study aimed to create a model that reflects the probability of different particle interactions. Understanding these interactions could provide insights into fundamental forces at work in particle physics and, by extension, offer clues about the conditions present nanoseconds after the Big Bang. To carry out this study, I collected and analyzed collision images from CERN, recorded the color sequences within these images, and organized them into squared Markov transition matrices. Each transition represented the influence of a specific fundamental force: Transition 1 modeled the strong nuclear force, Transition 2 the weak electromagnetic force, and Transition 3 the steady-state matrix dominated by gravity. The data analysis showed that particles demonstrated stable, cohesive transition patterns, supporting the hypothesis that a Markov model could serve as a reliable tool for analyzing and predicting particle interactions. The Markov models were able to effectively represent the patterns observed in proton collision images and accurately predict subsequent states based on initial conditions. This method could serve as a new resource for physicists, advancing our understanding of particle physics while enhancing predictive accuracy and providing deeper insights into early-universe conditions.

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