PHYSIKALISCHES KOLLOQUIUM

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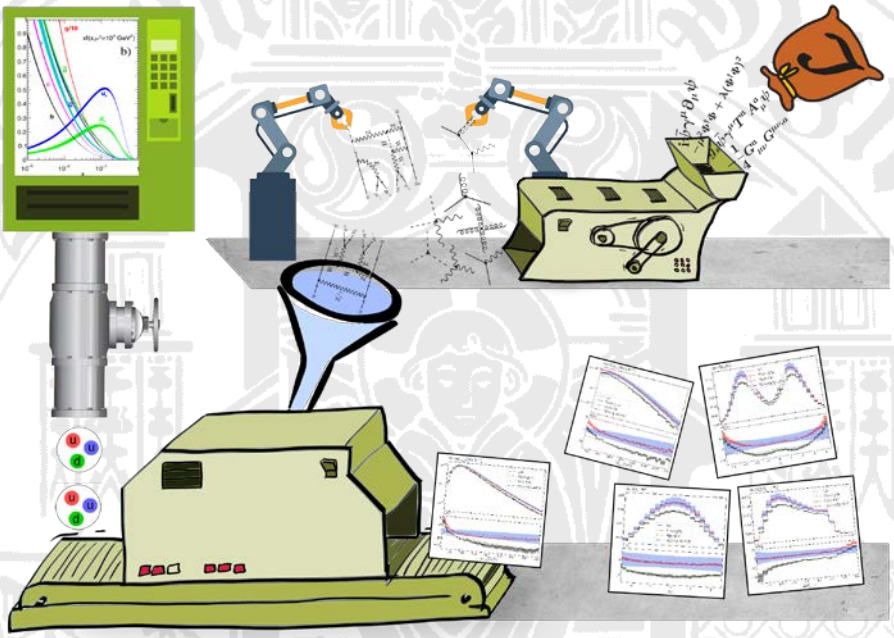
IM GROßEN HÖRSAAL



MODERN APPROACHES TO PRECISION PHENOMENOLOGY AT PARTICLE COLLIDERS

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The Large Hadron Collider is exploring the properties and interactions of fundamental particles with unprecedentedly high energy. With the Higgs boson the only newly discovered particle, precision phenomenology is the key to searches for signs of new physics. To reach the required precision of theoretical predictions, higher orders in the perturbative expansion of scattering amplitudes must be calculated. Due to the high energy of the particle collisions, the scattering reactions tend to involve a large number of particles, leading not only to high complexity of individual processes, but also to a large number of partonic channels to be considered. In this presentation, I will review the developments in the last decade that lead from laborious calculations for individual processes to automated tools for the large-scale production of next-to-leading order (NLO) simulations. These developments were triggered by the introduction of recursive numerical algorithms that largely replaced traditional analytic methods. With NLO corrections in the full Standard Model available, the higher-order frontier moved to next-to-next-to-leading order quantum chromodynamics corrections, posing new challenges in various respects.