

## Advances in computational methods for Quantum Field Theory calculations

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## Stellingen

behorende bij het proefschrift Advances in computational methods for Quantum Field Theory calculations door Ben Ruijl

- 1. Contrary to expectations, a simple Stochastic Hill Climbing performs better for expression simplification than the complex MCTS algorithm (Ch.2).
- 2. Parametrically solving IBP systems is superior to the commonly used Laporta method, since the growth of the rational coefficients can be controlled better (Ch.3).
- 3. The applicability of the  $R^*$ -operation is greatly enhanced by allowing it to work on Feynman diagrams with arbitrary numerator structure (Ch.5).
- 4. There is no need to compute the six-loop QCD beta function, since this correction will be too small to measure (Ch.6).
- 5. There should be a standard description format for Feynman integrals and their analytic and numeric results.
- 6. More interaction between computer scientists and theoretical physicists is required to solve hard computational issues in physics.
- 7. Algorithmic details should be published in papers just like formulas, for the benefit of reproducibility and to allow others to improve the algorithms.
- 8. The free computer algebra system FORM (or a similar system) should be financially supported by the community that greatly benefits from it.
- 9. In many research fields, students have to handle large amounts of data, or have to perform complicated algebraic manipulations. Currently, the students are ill-prepared for such tasks. Therefore, more emphasis should be placed on data science, e.g., in physics education.
- 10. Professors should spend more time on research than on teaching. Specifically, teaching bachelor courses (where no expert knowledge is required) should be done by dedicated teachers.

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