ESR20: Why, what, fit in the network

Costas G. Papadopoulos

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WHY

Exploiting the physics potential of the LHC and future colliders requires the development of even more ingenious automated tools for precise calculations of more complicated multileg and/or multi-loop processes, including all those appearing on the experimentalists Les Houches NLO wish list as well as NNLO predictions for specific processes such as $pp \rightarrow H+$jet, $pp \rightarrow V+$jet, $pp \rightarrow t\bar{t}$, $pp \rightarrow VV$. In anticipation of the discovery of New Physics, tools for the NLO QCD predictions for supersymmetric (SUSY) particle production and decays will also be developed.

Extending the OPP at two loops
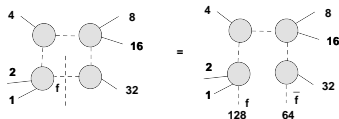
- Reduction at the integral level (Algebraic Geometry, cutting equations)

$$\frac{N\left(l_1, l_2; \{p_i\}\right)}{D_1 D_2 \ldots D_n} = \sum_{m=1}^{\min(n,8)} \sum_{S_{m;n}} \frac{\Delta_{i_1 i_2 \ldots i_m}\left(l_1, l_2; \{p_i\}\right)}{D_{i_1} D_{i_2} \ldots D_{i_m}}.$$

- Master Integrals via Simplified Differential Equation Approach

FIT IN THE NETWORK

- The development of novel methods for the evaluation of two-loop amplitudes will be beneficial for and will benefit from other projects like ESR3, ESR8, ESR14, ESR15, ESR16, ESR17, ESR21

- Secondments: Three months to ALU-FR and ETH-Zurich for training in two-loop reduction methods, three months to FOM for training in amplitude construction. Secondment to the private sector, Maplesoft and Wolfran Research will be organized.