

Computer tools in particle physics

- Lecture 3 : MadGraph -

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MadGraph

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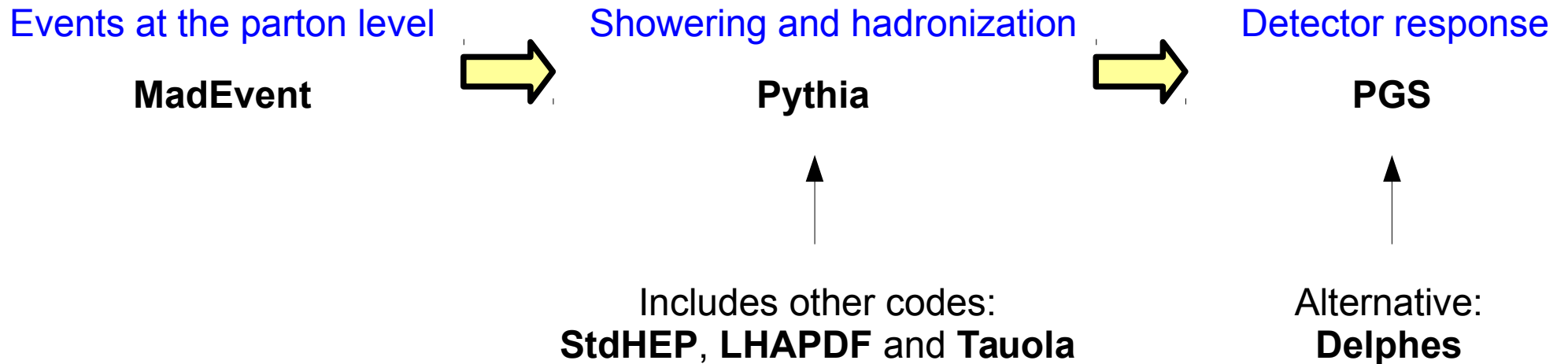
[The MadTeam]

- **Name of the tool:** MadGraph
- **Author:** *The MadTeam*, composed by Johan Alwall, Rikkert Frederix, Stefano Frixione, Michel Herquet, Valentin Hirschi, Fabio Maltoni, Olivier Mattelaer, Hua-Sheng Shao, Timothy J. Stelzer, Paolo Torrielli and Marco Zaro.
- **Type of code:** Python
- **Website:** <http://madgraph.hep.uiuc.edu/>

MadGraph

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Scotogenic: benchmark point

BS1 benchmark point

$$\lambda_1 = 0.25$$

$$\lambda_2 = 0.5$$

$$\lambda_3 = 0.5$$

$$\lambda_4 = -0.5$$

$$\lambda_5 = 8 \cdot 10^{-11}$$

$$m_\eta^2 = 1.85 \cdot 10^5 \text{ GeV}^2$$

$$M_N = \begin{pmatrix} 345 \text{ GeV} & 0 & 0 \\ 0 & 4800 \text{ GeV} & 0 \\ 0 & 0 & 6800 \text{ GeV} \end{pmatrix}$$

$$Y_N = \begin{pmatrix} 0.0172495 & 0.300325 & 0.558132 \\ -0.891595 & 1.00089 & 0.744033 \\ -1.39359 & 0.207173 & 0.253824 \end{pmatrix}$$

Scotogenic: Simulation 1

$$p p \rightarrow \eta_R \eta^+$$

Scotogenic: Simulation 2

$$\eta_R \rightarrow N_1 \nu$$

$$\eta^+ \rightarrow N_1 \mu^+$$

$$p p \rightarrow N_1 N_1 \mu^+ \nu$$

Only mechanism?