# What do Monte-Carlo tools do

Need to know amplitude for the process and be able to compute it fast

$$\sigma_{LO} = \int d(\mathrm{PS})_2 |\mathcal{M}_{LO}|^2$$

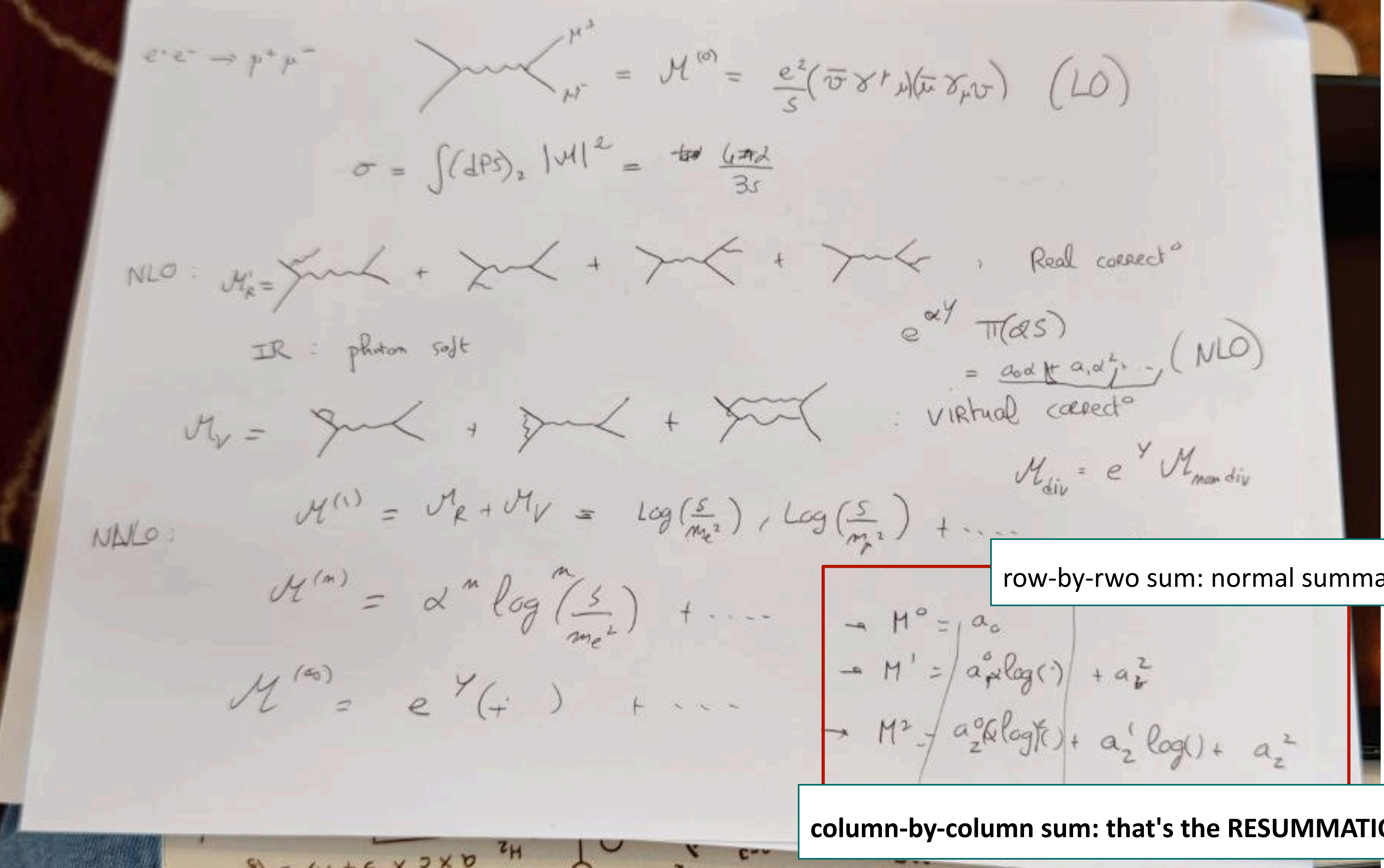
Numerical integration

Phase-space algorithm

Beyond LO, need to cancel IR singularities with a scheme, but principle is the same

NLO is automated for most processes (sometimes NNLO)

What about effects that are important but arise at NN…NLO?




row-by-rwo sum: normal summation ☹️

**column-by-column sum: that's the RESUMMATION!** 🙂

# One clever trick: resummation

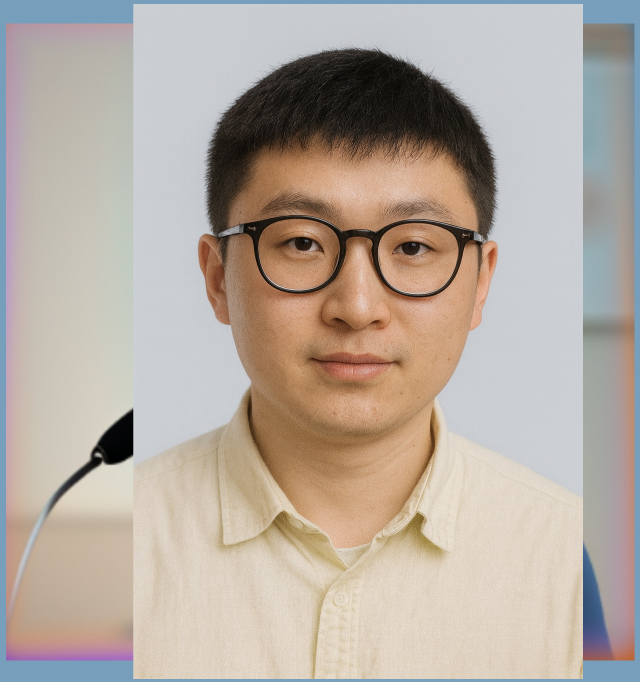
$$d\sigma = \sum_{n_\gamma=0}^{\infty} \frac{e^{2\alpha(B+\tilde{B}(\Omega))}}{n_\gamma!} d\Phi_Q \left[ \prod_{i=1}^{n_\gamma} d\Phi_i^\gamma \tilde{S}(k_i)\Theta(k_i,\Omega) \right] \left( \tilde{\beta}_0 + \sum_{j=1}^{n_\gamma} \frac{\beta_1(k_j)}{\tilde{S}(k_j)} + \cdots \right)$$

Form Factor

Phase-Space Integration

IR safe amplitude

# Thank you



**Any questions?**