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Euler-Mellin-Feynman Integrals and Intersection Theory

Thursday, 12 September 2024 09:30 (30 minutes)

I elaborate on the vector space structures of Euler-Mellin-Feynman Integrals, emerging from the application of Intersection Theory of (twisted) De Rahm Co-homology, and discuss the crucial role of the intersection numbers as fundamental mathematical quantities, ruling linear relations (integration-by-parts identities or contiguity relations, differential and difference equations), as well as quadratic relations (Riemann bilinear relations), and higher order relations obeyed by those integrals.
I comment on the correspondence between the vector space of integrals and the D-module structure of the differential operators acting on them.
I report on the methods we introduced for evaluating intersection numbers of differential n-forms, and their application to the direct decomposition of integrals in terms of master integrals, to be considered as the generators of the vector space.
I conclude on the applicability of these novel techniques and ideas in various areas of modern Physics and Mathematics.

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