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Poisson algebra bundles over configuration spaces and covariant multilocal observables (Part 1)

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In relativistic field theory, fields are sections of a vector bundle over spacetime and observables are functionals of the fields generated by distributional sections of the bundle. Observables form a well-known Poisson algebra (induced by a given Lagrangian), which is then quantized by deformation. The algebra structure breaks the covariant dependence on the bundle, because there is no nice bundle description of (symmetric) multilocal observables defined on many spacetime points (products of local observables).
In an joint work of A. Frabetti, O. Kravchenko and L. Ryvkin, we restore the covariance of multilocal observables by considering bundles over the space of unordered configurations of points as a base manifold and Poisson algebra bundles with respect to two suitable tensor products of bundles (the usual one, called Hadamard, and a new one similar to the external tensor product, called Cauchy). This Poisson bundle induces the known deformation quantization by Laplace pairing in QFT [Brouder, Fauser, Frabetti, Oekl 2004, Herscovich 2017], fits both covariant and multisymplectic approaches to field theory, and is an example of the 2-monoidal category setting developed on species [Aguiar, Mahajan 2009].
This talk is divided in two parts: in Part I we explain the algebraic background (Poisson algebra bundles on configuration spaces) and in Part II the applications in field theory.
The content of Part I is available at https://arxiv.org/abs/2407.15287, Part II is coming soon.

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