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Supergeometry in classical field theory

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Ordinary (bosonic) classical field theory consists of "field" bundle on a spacetime manifold, a variational PDE on the field sections, its space of solutions (the "phase space", an infinite dimensional manifold), and the algebra of smooth functions ("observables") on the phase space, with an induced Poisson bracket. Fermionic field theory is defined analogously, except that the fibers of the field bundle are allowed to be supermanifolds instead of ordinary manifolds. In the physics literature, fermionic field theories are usually treated in an essentially algebraic way, at the level of the super-Poisson algebra of observables, with its interpretation as the algebra of functions on a phase space supermanifold lost. I will discuss how a modern, functorial formulation of supergeometry allows us to describe the fermionic phase space as a geometric object and to apply tools from analysis and PDE theory to answer some questions about fermionic theories that were difficult to study or even formulate in the algebraic treatment.

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