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Integrable deformations of sigma models

Integrability is a key property of certain field theories, typically characterized by an infinite number of conserved currents. It is a remarkable feature, since it allows us to explicitly compute exact solutions and observables. In general, integrability is a phenomenon that is confined to one or two-dimensional models. An example is the class of the 2D integrable sigma models. These are amongst a small class of interacting field theories that can potentially be solved exactly both classically and at the quantum level.

The canonical example is the Principal Chiral Model (PCM) defined on a group G. In a PCM, the fields are maps from a two-dimensional space Σ to a group G. One can also add a topological term to the PCM in order to construct another type of integrable sigma model, called Wess-Zumino-Witten (WZW). The integrability of the PCM and the WZW model is immediate, as in these cases one can follow a general procedure to construct an object called Lax connection, which can be used for constructing an infinite set of conserved charges.

It turns out that new integrable models can be derived by deforming the PCM and the WZW model in a systematic manner. These deformations allow us to investigate different portions of the space of integrable models.

In this presentation, I will provide an overview of integrable deformations of sigma models, with a particular focus on a specific class of deformations known as Yang-Baxter deformations. These are deformations of the PCM and are characterized by the presence of a Drinfeld-Jimbo R-matrix. The R-matrix satisfies the Classical Yang-Baxter (CYB) equation, which ensures the classical integrability of the model.

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