Séminaire commun

The R-mAtrIx Net

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Résumé

We provide a novel Neural Network architecture that can : i) output R-matrix for a given quantum integrable spin chain, ii) search for an integrable Hamiltonian and the corresponding R-matrix under assumptions of certain symmetries or other restrictions, iii) explore the space of Hamiltonians around already learned models and reconstruct the family of integrable spin chains which they belong to. The neural network training is done by minimizing loss functions encoding Yang-Baxter equation, regularity and other model-specific restrictions such as hermiticity. Holomorphy is implemented via the choice of activation functions. We demonstrate the work of our Neural Network on the two-dimensional spin chains of difference form. In particular, we reconstruct the R-matrices for all 14 classes. We also demonstrate its utility as an Explorer, scanning a certain subspace of Hamiltonians and identifying integrable classes after clusterisation. The last strategy can be used in future to carve out the map of integrable spin chains in higher dimensions and in more general settings where no analytical methods are available. Particularly, at the end of my talk, I will present the first results regarding the exploration of new integrable three-dimensional spin chains.