Predicting local order parameter from disorder distribution

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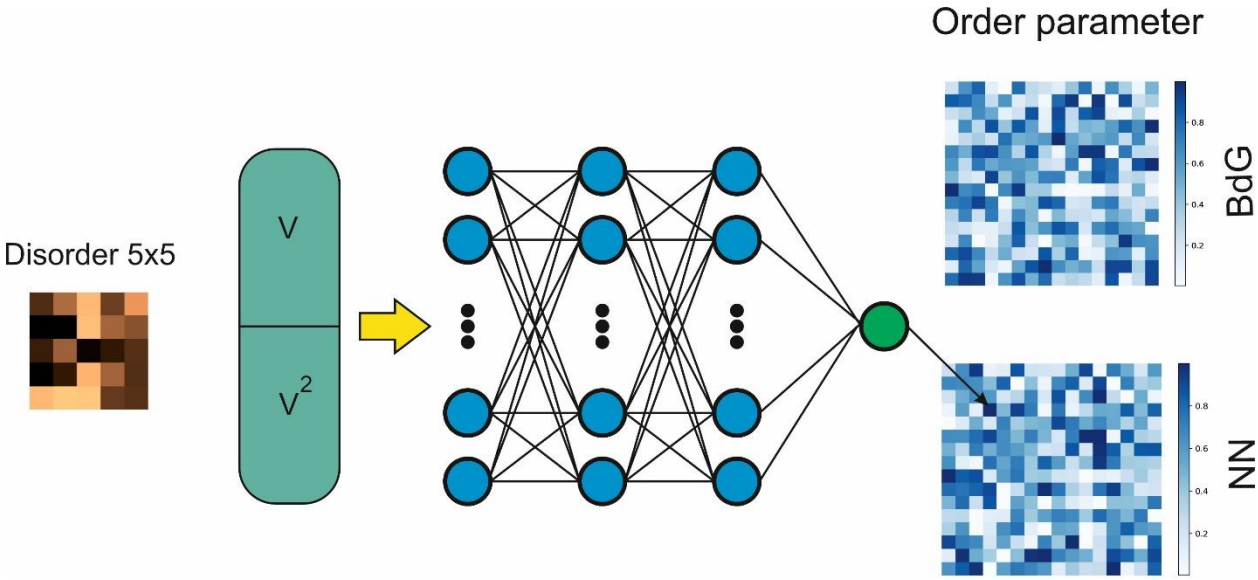
Machine Learning (ML) is making significant advancements across various scientific disciplines, transforming research methodologies and data analysis techniques. Since its appearance, ML has evolved into a robust instrument capable of handling vast quantities of data, uncovering patterns, and forecasting outcomes, thereby expediting scientific advancements.

For example, ML techniques have been effectively utilized to replicate the results of Density Functional Theory (DFT) [1]. The deep learning model developed in this context successfully circumvents the direct solution of the Kohn-Sham equations, achieving a speed enhancement by an order of magnitude.

In our research, we designed a machine learning algorithm that predicts the distribution of local order parameter in a superconductor based on a correlated disorder. This ML model aims to enhance both the efficiency and precision of solving the Bogoliubov-de Gennes (BdG) equations, which are an extremely powerful tool for analyzing the local electronic structure in inhomogeneous superconductors including those in an external magnetic field. [2,3].



Pic. 1. Disorder distribution (V) used for training the neural network to predict the distribution of the local order parameter.

Bibliography

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