Holomorphic blocks for supersymmetric gauge theories in various dimensions

Fabrizio Nieri

Abstract

In recent years, due to the method of supersymmetric localization, many exact results have been achieved in the study of supersymmetric gauge theories on compact spaces of various dimension and topology, discovering surprising structures. For example, it is becoming clear that partition functions of a large variety of such theories can be described in terms of fundamental "holomorphic blocks" and gluing rules. In this talk, I will introduce the subject by reviewing one of the best understood example, namely 3d N=2 theories defined on manifolds admitting a Heegaard decomposition in solid tori, where partition functions can be built by fusing 3d holomorphic blocks by elements in $SL(2,\mathbb{Z})$. This was originally checked for $S^2 \times S^1$ and S^3, and recently for any lens space $L(r,1)$. Moreover, this picture can be lifted to 4d N=1 theories defined on $L(r,1) \times S^1$. Holomorphic blocks have been also proposed for 5d N=1 theories, and I will discuss how partition functions on S4xS1 and any toric Sasaki-Einstein manifold can be built out of them.