

Abstract

It has been argued that a new algebraic structure, the three-algebras, are relevant to the 3d $N=8$ superconformal field theory and to the theory of multi M2-branes. Based on the realization of three-algebras in terms of algebra of matrices and four-brackets [arXiv:0807.1570] we present an “extended” notion of the three-algebra for which the Bagger-Lambert theory takes the form of the $N=8$ $su(n) \times su(n)$ supersymmetric Chern-Simons theory. The dynamical fields of this theory are eight complex valued bosonic and fermionic fields in the bi-fundamental representation of the $su(n) \times su(n)$. This theory, after gauging the 3d parity which renders the fields to be real valued, is proposed to be the (low energy effective) theory of n M2-branes. We discuss that our three-algebra structure suggests a picture of open M2-brane stretched between any two pairs of M2-branes. We comment on the relation between our model and that of ABJM [arXiv:0806.1218]