Higher Segal Spaces

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I will outline some aspects of the theory of higher Segal spaces which is a joint project with M. Kapranov. This work centers around the new concept of a d-Segal space which for d=1 coincides with Rezk's notion of a Segal space. A central example of a 2-Segal space is given by Waldhausen's S-construction which turns out to capture higher associativity in the context of Hall algebras. We will see how other examples of 2-Segal spaces relate to Hecke algebras. Finally, I will sketch how cyclic 2-Segal spaces can be "integrated" over oriented closed punctured surfaces, leading to space-valued representations of mapping class groups.