

# Shuffle operads and their applications

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## **Abstract**

Some problems for symmetric operads are difficult to solve because there are not enough symmetric operads: when for associative algebras one can say "let us consider a simpler degenerate algebra obtained from this one", for symmetric operads this would not work, mainly because symmetries get in the way. Shuffle operads fix this problem, putting symmetric operads inside a wider universe of shuffle operads (which are not really operads, since they do not act on any algebras). To choose a very flattering analogy, one can say that shuffle operads are the same to symmetric operads as complex numbers are to real numbers: we throw in some objects that do not really exist but are nevertheless useful in some intermediate steps of solving existing problems. In this mini-course, I shall define shuffle operads and outline many different situations where they can be used.