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Sinopsis

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This book is an introduction to two higher-categorical topics in algebraic topology and algebraic geometry relying on simplicial methods.

Moerdijk's lectures offer a detailed introduction to dendroidal sets, which were introduced by himself and Weiss as a foundation for the homotopy theory of operads. The theory of dendroidal sets is based on trees instead of linear orders and has many features analogous to the theory of simplicial sets, but it also reveals new phenomena. For example, dendroidal sets admit a closed symmetric monoidal structure related to the Boardman-Vogt tensor product of operads. The lecture notes start with the combinatorics of trees and culminate with a suitable model structure on the category of dendroidal sets. Important concepts are illustrated with pictures and examples.

The lecture series by Toën presents derived algebraic geometry. While classical algebraic geometry studies functors from the category of commutative rings to the category of sets, derived algebraic geometry is concerned with functors from simplicial commutative rings (to allow derived tensor products) to simplicial sets (to allow derived quotients). The central objects are derived (higher) stacks, which are functors satisfying a certain up-to-homotopy descent condition. These lectures provide a concise and focused introduction to this vast subject, glossing over many of the technicalities that make the subject's research literature so overwhelming.

Both sets of lectures assume a working knowledge of model categories in the sense of Quillen. For Toën's lectures, some background in algebraic geometry is also necessary.