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StochasticAD.jl: Derivatives of discrete randomness

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Automatic differentiation (AD), a technique for constructing new programs which compute the derivative of an original program, has become ubiquitous in science due to the improved performance afforded by gradient-based optimization. However, a lot of scientific simulations, e.g. in particle physics, are discrete random. This motivates extending AD to handle discrete stochastic behaviors governed by distribution parameters, such as flipping a coin with probability p of being heads. These pose a challenge because the connection between the result (heads vs tails) and the parameters (p) is fundamentally discrete. This talk introduces StochasticAD.jl, a Julia AD system for handling discrete stochastic behaviours, and its application to discrete stochastic simulations in the sciences.

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