STROOPWAFEL: an adaptive sampling algorithm to unravel the origin of gravitational-wave sources

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Gravitational-wave observations of binary black hole mergers are rapidly providing new insights into the physics of massive stars and the evolution of binary systems. Making the most of expected near-future observations for understanding stellar physics will rely on comparisons with binary population synthesis models. However, binary black hole mergers are a rare outcome of stellar binary evolution, which makes simulating a statistically significant theoretical population computationally challenging. In this talk I will present our adaptive importance sampling algorithm, STROOPWAFEL, that we designed to improve the computational sampling efficiency of population studies of rare events. I will discuss the similarities of the code with playing the board game Battleship, and present its performance compared to traditional Monte Carlo sampling from birth distributions. I will also discuss the statistical challenges that we are currently facing in this field and mention further efforts to overcome these.