Some Advancements in Grate Theory

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The "grate" work discussed in this presentation and the inescapable pun therein was originally inspired by the process of recording student grades on a traditional grade sheet. In the original problem, we defined an (n, k)-grate to be a binary n-tuple containing k ones such that there are never two adjacent zeroes. We considered the process of flipping the bits (0's turning into 1's) of a sequence of n zeroes until a grate is created (these "grate" expectations were first presented at the 2024 SEICCGTC!). This work has since inspired students and colleagues alike to investigate "grate" problems in higher dimensions. Recently, we have generalized our previous results to develop graph invariants which are derived from the expectation of acheiving independent vertex sets during some stochastic processes.

In this pun-filled talk, early work on "grate" problems and the connections between these and other famous mathematical results will be discussed to provide context for our current work. Recent advancements in "grate" theory will then be explored before providing some directions for future research. Finally, a discussion of how meaningful this project was for all involved will be given.