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William L. He*, WilliamHe@u.northwestern.edu, and **Christopher M. Lee** and **Alexandria Volkening**. *Mathematical Modeling to Forecast U.S. Elections*.

Forecasting the outcomes of U.S. elections is a pertinent and complex task that has been approached in many ways, most commonly incorporating statistical methods. We take a differential equations approach to forecasting elections by adapting a compartmental model commonly employed in epidemiology. We model the evolution of Democrat or Republican political affiliation across states. We use R to fit our parameters based on polling data and MATLAB to run simulations with the model. Through thousands of simulations of our stochastic differential equations with correlated noise, we forecast a range of election outcomes at the state level, specifically focused on swing states. Our model's final forecasts for past presidential, senatorial, and gubernatorial elections have been comparable to those of popular forecasting sites like FiveThirtyEight. We have examined the accuracy of our model's forecasts of past presidential elections in detail, as well as applied the model to create forecasts for the 2020 U.S. elections. Our work demonstrates the effectiveness of data-driven forecasting from a mathematical-modeling perspective and suggests additional research in this field. (Received August 31, 2020)