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Optimal time-dependent classification for diagnostic testing

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Optimal time-dependent classification for diagnostic testing

Antibody tests can identify past infection by quantifying the immune response of an infected individual, thereby providing guidance for decisions about public health measures. The relative antibody measurements change with time due to the variation in an individual's antibody levels and prevalence in the population as the pandemic progresses. We use optimal decision theory to develop a time-dependent, probabilistic classification scheme which takes both the personal and the population-level effects into account. These classification domains change with time and suggest a natural adaptive scheme for estimation of prevalence, taking into account the progression of the pandemic through the use of publicly available data. We demonstrate the results by using a combination of SARS-CoV-2 and synthetic data sets, and detail the type of data needed to execute this scheme in real-world settings.