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A comparison of Gaussian Process Classification to classical statistical methods in sensitivity tests[1] ALEX CASEY, NICK CUMMOCK, ILIAS BILIONIS, STEVEN SON, Purdue University — The input at which there is 50% probability of a 'go' in a binary outcome test – also known as the L50 – is a commonly used safety metric when evaluating the sensitivity of energetic materials to impact and shock. The L50 of a given material is typically determined using the Neyer Sensitivity Test or the Bruceton Test. These tests can provide a framework for a sequential design of experiments in order to choose the subsequent input given the observed data. In the present work, Gaussian Process Classification (GPC) is similarly applied to sensitivity test data to estimate a material's L50 and design sequential experiments. The GPC model defines a probability distribution over function space which provides a rich representation of the underpinning function. The function space can be constrained to those with a physically-based rationale. Additionally, the GPC model is easily extensible to experiments with multivariate inputs. A comparison of the Neyer and GPC statistical methods is presented alongside their implementation on a multivariate input gap-test experiment involving PBX 9501 pellets of varying porosities.

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