Department of Experimental Statistics

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A multi-armed trial based on ordinal outcomes is proposed that leverages a flexible non-proportional odds cumulative logit model and numerical utility scores for each outcome to determine treatment optimality. This trial design uses a Bayesian clustering prior on the treatment effects that encourages the pairwise null hypothesis of no differences between treatments. A group sequential design is proposed to determine which treatments are clinically different with an adaptive decision boundary that becomes more aggressive as the sample size or clinical significance grows, or the number of active treatments decreases. A simulation study is conducted for three and five treatment arms, which shows that the design has superior operating characteristics (family wise error rate, generalized power, average sample size) compared to utility designs that do not allow clustering, a frequentist proportional odds model, or a permutation test based on empirical mean utilities.

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