

# PETER MCCULLAGH

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A Symposium Celebrating his 65<sup>th</sup> Birthday

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D-optimal Designs for Multinomial Logistic Models

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Stevanovich Center, MS 112

5727 S. University Avenue, Chicago, Illinois

## ABSTRACT

Design of experiment with categorical responses is becoming increasingly popular in a rich variety of scientific disciplines. When the response is binary, generalized linear models have been widely used (McCullagh and Nelder, 1989). For optimal designs with generalized linear models, the minimum number of distinct experimental settings required by a nondegenerate Fisher information matrix is equal to the number of parameters. It is also known that the experimental units should be uniformly allocated when a minimally supported design is adopted. When the response has three or more categories, the models used in the literature should rather be treated as a special case of the multivariate generalized linear model (McCullagh, 1980). Glonek and McCullagh (1995) further built a more general framework for multiple categorical responses, called multivariate logistic models. We show that the optimal designs for responses with three or more categories are different from the ones for binary responses in at least two aspects: (i) the minimum number of experimental settings required can be strictly less than the number of parameters; (ii) even for a minimally supported design, the uniform allocation, which has been used as a common practice, is not optimal anymore.