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<https://scholar.google.com.au/citations?user=Ww5HkHUAAAAJ&hl=en>

**Title:**

### **Teaching an old dog new tricks: Joint selection in mixed models using regularized PQL**

**Abstract:**

Generalized linear mixed models (GLMMs), and extensions thereof, are a standard technique used in many areas of applied statistics when analyzing longitudinal data and data from multilevel designs. When GLMMs were first popularized, penalized quasi-likelihood (PQL) was very much the go-to method of estimation given its ease of implementation and speed. Today however, with increasingly powerful computation, PQL has largely been supplanted by more accurate and formal maximum likelihood methods, notably Laplace approximation and adaptive quadrature.

This talk focuses on how PQL remains an important method in modern statistics, by combining it with penalized likelihood methods for simultaneous selection of fixed and random effects in GLMMs. Since PQL treats the random effects coefficients as “fixed”, a penalty can be chosen which exploits their inherent group structure. Furthermore, a hybrid information criterion for selecting the tuning parameter is proposed, which combines differing model complexity penalties for the fixed and random effects. Both theoretical and computational aspects of regularized PQL are discussed, and simulations and an application to forest health monitoring presented to illustrate its strong performance.

This is joint work with Samuel Mueller (USYD) and Alan Welsh (ANU).