



# Mixed Effects Models with Censored Response

Florin Vaida

(University of California, San Diego)

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Department of Statistics, Ludwigstr. 33, Seminar Room 144

and online via Zoom ([Link](#))

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## In Memoriam of Victor DeGruttola

This talk is an overview of our previous work on the inference for linear and non-linear mixed effects models with censored response. These models have an immediate application in the analysis of longitudinal biomarkers such as HIV viral load, that are subject to censoring below the limit of detection.

In a parametric framework, the computation of the maximum and restricted maximum likelihood for linear and non-linear mixed effects models with censored response is frustrated by the double integral in the likelihood over the random effects and over the censored response. Several approaches are available, including multiple imputation of the censored values (Fitzgerald, Vaida, and DeGruttola, 2002), and exact calculation of the maximum likelihood estimator using the EM algorithm. For the latter, we discuss two approaches: a Monte Carlo EM algorithm (Vaida, Fitzgerald and DeGruttola, 2007), and a closed-form EM (Vaida and Liu, 2009), that relies on formulas involving the mean and variance of the truncated multinormal distribution. A wide class of mixed effects models is considered, including the Laird-Ware model, and extensions to different structures for the variance components, heteroscedastic and autocorrelated errors, and multilevel models. We apply the methodology to two case studies from our own biostatistical practice, involving the analysis of longitudinal HIV viral load in two HIV studies.

## About the Speaker:

Florin Vaida is a Professor at the Herbert Wertheim School of Public Health & Human Longevity Science, UC San Diego. He holds a PhD in Statistics from the University of Chicago and between 1998 and 2004 he was a Biostatistics faculty at Harvard School of Public Health. His research interests are in mixed-effects models, proportional hazards mixed-effects models, model selection, and clinical trials. Prof. Vaida has published over 150 papers in peer-reviewed journals and several book chapters, and he has extensive experience in the areas of HIV and NeuroAIDS.

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### References:

Fitzgerald, A. P., DeGruttola, V. G., & Vaida, F. (2002). Modelling HIV viral rebound using non-linear mixed effects models. *Statistics in Medicine*, 21(14), 2093-2108.

Vaida, F., Fitzgerald, A. P., & DeGruttola, V. (2007). Efficient hybrid EM for linear and nonlinear mixed effects models with censored response. *Computational Statistics & Data Analysis*, 51(12), 5718-5730.

Vaida, F., & Liu, L. (2009). Fast implementation for normal mixed effects models with censored response. *Journal of Computational and Graphical Statistics*, 18(4), 797-817.

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