# STATISTICS SEMINAR

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## Generalized exponential tilting

Suppose we are given a density and we ask for the density that is closest to it, but has a different expectation. If we express closeness using the Kullback-Leibler distance, we find that we have to add a linear function to the logarithm of the given density. This is equivalent to multiplication with an exponential function, leading to the name exponential tilting. We can go further and specify expected values of a set of functions. Then we find that we have to add a linear combination of these functions to the logarithm of the given density. The proper values of the coefficients can be computed efficiently with Newton-Raphson iterations. Suppose now that we are given a set of densities. We can ask the reverse question: can we find a "mother density" such that the observed densities are (approximately) the results of exponential tilting? The answer is affirmative, but it is of little value if we work with observed data. However, starting from histograms with narrow bins and applying penalized Poisson regression (to get a smooth estimate) we can obtain excellent results. We call this exploratory exponential tilting (EET). In EET it is assumed that the tilting functions are known. A more ambitious goal is to estimate them from the data in a semi-parametric way. As will be shown, this goal is attainable. It can lead to a parsimonious but accurate description of large sets of densities. Also the patterns in the tilting functions can teach us something about the underlying processes. We call this generalized exponential tilting (GET). Applications to real data show the usefulness of GET.

*This is joint work with Giancarlo Camarda (Institut Nationale d'Études Démographiques, Paris) and Jutta Gampe (Max Planck Institute for Demographic Research, Rostock).*

Friday, March 6, 2015 - 14h00 - Trifac 3 (Building B33)
Boulevard du Rectorat 3, 4000 Liège (Parking P15-16)