# Modelling features for forensic speaker comparison

*Vincent Hughes*[1], *Erica Gold*[1], *Paul Foulkes*[1], *Peter French*[1,2], *Philip Harrison*[1,2], *Louisa Stevens*[1,2], *Colin Aitken*[3] *and Tereza Neocleous*[4]

[1]*Department of Language and Linguistic Science, University of York.*
{erica.gold|vh503|paul.foulkes}@york.ac.uk
[2]*J P French Associates, York.*
{ jpf|pth|lcc }@jpfrench.com
[3]*School of Mathematics, University of Edinburgh.*
c.g.g.aitken@ed.ac.uk
[4]*School of Mathematics and Statistics, University of Glasgow.*
tereza.neocleous@glasgow.ac.uk

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Speech is an exceptionally complex form of forensic comparison evidence. In linguistic-phonetic forensic speaker comparison (FSC) experts typically analyse a range of segmental, suprasegmental, syntactic, lexical and linguistic features (Gold and French 2011). Such features can be continuous, discrete or even both (e.g. vowels can be analysed continuously using formant frequencies or discretely by considering the realisation of different allophones). Linguistic data can be normally and non-normally distributed, and features vary systematically within- and between-speakers according to a wide range of social, stylistic and phonological factors. Further, given that the speaker-space (Nolan 1991) is so highly multidimensional, there is considerable interrelatedness between features, some of which differ within- and between-speakers (see Gold and Hughes 2012). Such issues cause significant difficulty for the application of the numerical likelihood ratio (LR) framework to speech evidence since current formulae, which were never primarily designed to deal with linguistic-phonetic data, generally fail to account adequately for the complexity and interrelatedness of features.

To address these problems, a network has been established which brings together members of York's forensic speech science group with leading forensic statisticians. Building on Aitken and Gold (2013), the goals of the network are (i) to develop statistically appropriate models for analysing phonetic data of multiple types, and (ii) to explore the mathematical complexity of phonetic data. The collaboration will yield new statistical methodologies relevant to statisticians interested in multivariate data analysis, Bayesian modelling and Bayesian networks, as well as forensic speech scientists working on FSC research and casework.

In this paper, we will explore, in more detail, current issues with the application of the numerical LR to linguistic-phonetic FSC evidence and provide an overview of the aims of the network. We will also present preliminary results on two lines of work: (1) attempts to model and combine a subset of short vowels (KIT, DRESS, TRAP, LOT and STRUT) for 25 speakers from the DyViS corpus (Nolan et al. 2009); and (2) quantifying and modelling voice quality and vocal setting, based on multidimensional auditory vocal profile analyses (VPA; Laver 1991, 1994) of 100 DyViS speakers (Stevens, in progress).

## References


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