

Meta-analysis of paired-comparison studies of diagnostic test data: a Bayesian modeling approach

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Abstract

Diagnostic paired-comparison studies arise when two diagnostic tests are applied to the same group of patients. The main problem in meta-analysis of this type of data is the lack of published information to make direct comparison between tests and to account for intra-study correlation of accuracy characteristics (e.g. sensitivities and specificities). The common statistical practice is to ignore these issues and proceed with simple meta-analytical techniques. In this work we proposed a new Bayesian hierarchical model to make meta-analysis of diagnostic paired-comparison studies. The observed diagnostic rates are modeled as the marginal results of unobserved rates which allow direct comparison between tests. Variability between studies is modeled by extending a Bayesian hierarchical model for meta-analysis of diagnostic test (Verde, 2010). We propose new techniques of model diagnostics based on posterior predictive simulations and visualization techniques. Statistical methods are illustrated with two systematic reviews: The first one investigates the diagnostic accuracy of doctors aided with decision tools (e.g. neural networks) compared with unaided doctors in patients with acute abdominal pain (Liu et al. 2006). The second one compares the diagnostic accuracy of positron emission tomography with computer tomography in the detection of lung cancer (Birim et al. 2005).

Keywords: multivariate meta-analysis, diagnostic test, generalized evidence synthesis, MCMC, ecological inference.

References:

[1] Verde, P. E. (2010) Meta-Analysis of Diagnostic Test Data: a Bivariate Bayesian Modeling Approach. *Statistics in Medicine* (in press).

[2] Liu J.L.Y., Wyatt J.C., Deeks J.J., Clamp S., Keen J., Verde P.E., Ohmann C., Wellwood J., Dawes M., Altman D.G. (2006). Systematic reviews of clinical decision tools for acute abdominal pain. *Health Technol Assess.* Nov;10(47):1-167, iii-iv. Review.

[3] Meta-analysis of positron emission tomographic and computer tomographic imaging in detecting mediastinal lymph node metastases in nonsmall cell lung cancer. *Ann Thorac Surg* 79(1):375-82

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