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A Tree Based Model for Thyroid Cancer Prognostication

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Thyroid cancer is becoming an increasingly common cancer and yet little is known about the prognostic factors associated with survival. Controversy also exists over appropriate treatment for thyroid cancer. Prognostic models are needed to determine correlates of overall survival and identify subgroups of patients with poor prognosis who may benefit from earlier therapeutic intervention. In this talk we present a tree-based model for thyroid cancer prognostication using data from the US National Cancer Database. Trees are conceptually simple yet powerful, and are being increasingly used in biomedical studies for analyzing censored survival data where the primary goal is prognostication of patients. To gain accuracy in prediction and address instability in a single tree, an ensemble of trees is typically grown and the predictions are averaged across the trees in the ensemble. In this talk, we present a methodology for identifying the most representative tree from the ensemble based on several tree distance metrics. Out of bag error based on the cumulative hazard estimate is computed for the representative tree. For the thyroid cancer data, the representative tree from the ensemble was able to identify four distinct prognostic groups, defined by age, gender, lymph node involvement, tumor size, and metastasis status. Five year survival rates in these groups ranged between 64% and 99%. The prognostic groups derived can provide guidance for patient management, clinical trial design, and future treatment policy. The representative tree itself can be used as a decision making tool in the clinical setting.

Biography

Mousumi Banerjee is Research Professor in the Department of Biostatistics and Director of Biostatistics at the Center for Healthcare Outcomes and Policy (CHOP). She is also a member of the University of Michigan Comprehensive Cancer Center. Dr. Banerjee received her BStat and MStat degrees in Statistics from the Indian Statistical Institute in Calcutta, India and her PhD in Statistics from the University of Wisconsin-Madison. Before joining the University of Michigan, she held faculty appointments at the State University of New York in Buffalo, and at Wayne State University in Detroit. Dr. Banerjee also held visiting faculty appointments at the University of Pretoria in South Africa and the University of Calcutta in India. Her methodological research focuses on tree-structured regression and ensemble methods, multilevel models, longitudinal analyses, survival analyses, and competing risks; with applications to cancer epidemiology and health services research. Dr. Banerjee has served as Principal Investigator of methodology as well as applied grants from the National Science Foundation, National Institutes of Health, and the Department of Defense.

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