SENSITIVITY BASED GENERALIZATION ERROR FOR SUPERVISED LEARNING PROBLEM WITH APPLICATIONS IN MODEL SELECTION AND FEATURE SELECTION

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Abstract: Generalization error model provides a theoretical support for a classifier's performance in terms of prediction accuracy. However, existing models give very loose error bounds. This explains why classification systems generally rely on experimental validation for their claims on prediction accuracy. In this talk we will revisit this problem and explore the idea of developing a new generalization error model based on the assumption that only prediction accuracy on unseen points in a neighbourhood of a training point will be considered, since it will be unreasonable to require a classifier to accurately predict unseen points "far away" from training samples. The new error model makes use of the concept of sensitivity measure for an ensemble of multiplayer feedforward neural networks (Multilayer Perceptrons or Radial Basis Function Neural Networks). Two important applications will be demonstrated, model selection and feature reduction for RBFNN classifiers. A number of experimental results using datasets such as the UCI, the 99 KDD Cup, and text categorization, will be presented.

BRIEF BIOGRAPHY

Daniel S. Yeung (Ph.D., M.Sc., M.B.A., M.S., M.A., B.A.) is the President of the IEEE Systems, Man and Cybernetics (SMC) Society, a Fellow of the IEEE and an IEEE Distinguished Lecturer. He received the Ph.D. degree in applied mathematics from Case Western Reserve University. In the past, he has worked as an Assistant Professor of Mathematics and Computer Science at Rochester Institute of Technology, as a Research Scientist in the General Electric Corporate Research Center, and as a System Integration Engineer at TRW, all in the United States. He was the chairman of the department of Computing, The Hong Kong Polytechnic University, Hong Kong, and a Chair Professor from 1999 to 2006. Currently he is a Chair Professor in the School of Computer Science and Engineering, South China University of Technology, Guangzhou, China. His current research interests include neural-network sensitivity analysis, data mining, Chinese computing, and fuzzy systems. He was the Chairman of IEEE Hong Kong Computer Chapter (91and 92), an associate editor for both IEEE Transactions on Neural Networks and IEEE Transactions on SMC (Part B), and for the International Journal on Wavelet and Multiresolution Processing. He has served as a member of the Board of Governors, Vice President for Technical Activities, and Vice President for Long Range Planning and Finance for the IEEE SMC Society. He co-founded and served as a General Co-Chair since 2002 for the International Conference on Machine Learning and Cybernetics held annually in China. He also serves as a General Co-Chair (Technical Program) of the 2006 International Conference on Pattern Recognition. He is also the founding Chairman of the IEEE SMC Hong Kong Chapter.

His past teaching and academic administrative positions include a Chair Professor and Head at Department of Computing, The Hong Kong Polytechnic University, the Head of the Management Information Unit at the Hong Kong Polytechnic University, Associate Head/Principal Lecturer at the Department of Computer Science, City Polytechnic of Hong Kong, a tenured Assistant Professor at the School of Computer Science and Technology and an Assistant Professor at the Department of Mathematics, both at Rochester Institute of Technology, Rochester, New York.

He also held industrial and business positions as a Technical Specialist/Application Software Group Leader at the Computer Consoles, Inc., Rochester, New York, an Information Resource Sub-manager/Staff Engineer at the Military and Avionics Division, TRW Inc., San Diego, California, and an Information Scientist of the Information System Operation Lab, General Electric Corporate Research and Development Centre, Schenectady, New York.