SELECTION OF ARTIFICIAL NEURAL NETWORK MODELS FOR SURVIVAL DATA

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In clinical studies, the main end-point is the time to failure of a treatment. A deeper investigation concerns the causes of failure. From a statistical viewpoint this imply the study of the cause specific hazard functions of possibly censored survival data. A flexible approach could be considered for hazard regression as an alternative to the use of traditional models based on distributional or proportional hazard assumptions. In the context of discrete time models, a multilayer perceptron (MLP) has been proposed as an extension of generalized linear models with binomial (PLANN) or multinomial (PLANNCR, for competing risk analysis) errors using a non linear predictor. According to standard practice, model selection is based on weight-decay. Three statistical approaches for choosing the size of the weight decay term, based on the estimate of the expected test error, were compared: the Network Information Criterion (NIC, Murata et al. 1994), the ICOMP criterion (Bozdogan 1987) and Non Linear Cross Validation (NLCV, Moody 1994). PLANNCR models, with the three model selection approaches, were applied to a case series of 1793 women with primary breast cancer without axillary lymph node involvement, submitted to surgery and without adjuvant treatment. NIC and NLCV led to consistent model choice although the error estimate based on NLCV appears greater than that obtained with NIC. The ICOMP criterion appears reliable also for small weight decay values in contrast with NIC.