METHOD OF COMPETENT AREA CONSTRUCTION FOR COLLECTIVE NEURAL NETWORK CLASSIFIER OF HETEROGENEOUS DATA

Dorogov A. Yu., Lesnykh V. Yu.
Saint Petersburg Electrotechnical University "LETI"

Forward-propagation neural networks give a good result in classification tasks when training data fits with homogeneous behavior of an object and data classes make compact areas in feature space. An idea of usage collective classifiers arose solving the problem of pattern classification. The most difficult phase of this approach is competent areas selection for local classifiers. The competent area is a feature space object subset where the incidence of local classifier with given subset of pattern recognition is specified. The main problem is that there is no any reliable homogeneity criterion for feature field of the competent area.

Empirical data is usually object-property table. It covers a set of single objects regarding as independent observations of a complex system. One raw in the table with a set of characteristics corresponds to one target. Data analysis usually represents to estimation of statistical dependences between feature space variables. Using typical solutions based on correlation measures connection graph may be constructed, where degree of interdependence is expressed in pair correlation coefficients. The data may be consisting of object subsets which define different system behaviors. Statistical approach removes this pair connection differences, but transforms them to a structural level, where they appears in ternary and n-ary relations between characteristics. The task is using structural information to determine characteristic subsets which are presenting homogeneous behavior areas (localities), to separate typical system statuses and verify them in data table. The result observation object subsets will specify competent areas for local classifiers.

There is a problem of structural localization of homogeneous areas. To solve the problem is suggested to use a clipping version of connection graph with connection degree equals to +1 or -1 (or 0 for no connection). Sociological system researches pioneered the use of the graph. In models based on sign graph the task is to detect sing imbalance and find the way of removal. A new approach to the problem is based on using sign graph model for reconstructive analysis of complex system. Within the bounds of new paradigm a problem of structural localization of homogeneous areas comes up to local balancing of sing graph. Primary system elements – separating structures (shares), which express logical principles of symmetry and two factor interaction, could be used as a selection tool.