Description for the general public

The task of classification consists in assigning a class label to an object to be identified, for example a person or an image, using a transformation of the known features of that object. The result of the operation of a single classifier is the indication of the class label where the set of all possible class labels defines the response space. The indirect result of the operation of the classifier is a support function vector that defines the support function space. The effects of the operation of a single base classifier include also the division of the features space into decision regions which are separated by decision boundaries. The decision boundaries define the geometric space.

Single classifiers are often unstable (small changes in input data may result in very different decision boundaries). This is one of the reasons why a set of classifiers, also called a classifier ensemble, is used in classification tasks. Integration of single (base) classifiers is one of the three stages distinguished in the process of creating a classifier ensemble. The integration module reflects the philosophy of the operation of the classifier ensemble which consists in combining multiple results obtained from individual classifiers in the ensemble into one decision with a class label.

In many practical applications, classifier ensembles use the classifier response space or support function space in the integration process. An observation that there is a lack of methods for integrating base classifiers with the use of the geometric space has prompted the authors to undertake the research problem, **the purpose of which is to develop methods for integrating base classifiers in the geometric space.** The research hypothesis to be tested during the implementation of the project is as follows: *Integration of base classifiers performed in the geometric space allows building a classifier ensemble more effective than a classifier ensemble built from the same base classifier, in which the integration takes place in the response space or support function space.*

As a part of the project, a number of problems concerning the creation of a classifier ensemble, in which the integration of base classifiers is performed in the geometric space, will be worked out. The three proposed research threads are as follows:

1. Integration of linear base classifiers forming a classifier ensemble created during the generation of learning sets with the use of boosting methods.
2. Integration of piecewise linear base classifiers that use decision tree algorithms in the learning process.
3. Integration of base classifiers preceded by the stage of selecting the classifiers, which takes place independently in each competence region defined by the base classifiers.

The planned studies will affect the development of a scientific discipline, which in this case is computer science, by defining a new trend of research concerning the process of integration of base classifier in classifier ensembles. The method of integrating base classifiers proposed in the project has not been presented yet in works associated with the creation of classifier committees.