ON A GENERAL CONCEPT OF THE INDUCTIVE LEARNING PROCESS

by

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ABSTRACT

We propose to modify the original definition of the inductive learning process proposed by one of us to include two modes of operation of the evolving transformation system (ETS), supervised and unsupervised, which we will call external and internal.

Keywords: inductive learning , evolving transformation system, supervised and unsupervised pattern recognition.

This short note is motivated by the need to clarify the relationship between supervised and unsupervised forms of pattern classifications as they are currently known in pattern recognition. The need has become apparent in light of the recent development of the Evolving Transformation System (ETS) model.

The standard definitions of the supervised and unsupervised classifications refer to the two forms in which the input data is given, in a labeled form (i.e., training set) and, the unlabelled form, i.e., the class membership of each given object is unknown.

In light of the development of ETS the relationship between the above two modes of classification is becoming clearer. Therefore in this note we propose to modify the definition of the inductive learning process proposed in [1] in the following manner:

> Inductive learning process can operate in two modes: *external and internal.* By the external mode we mean the supervised form of the inductive learning process (see definition in [1], p. 535), where the training set is labeled by "supervisor", while by the internal mode of the process we mean the unsupervised form of inductive learning process.

It is important to note that in the supervised mode the role of the supervisor could be taken by various feedback processes from environment, direct or indirect, active or passive. For example, the environment may respond differently to various outputs generated by the agent, which the agent can then use to label the generated output, i.e., to produce the labeled data set.

The unsupervised mode involves the classification of some set of objects collected by the agent using the *current* set of operations possessed by the agent *at present time.*

Moreover, the unsupervised mode may include discovery, during the process of optimization of g (see [2], p. 603), of new operations and therefore of the new families of distance functions. Hence a more exact definition of the unsupervised mode differs from the supervised mode due to the fact that the unlabeled training set (C+, C-) is collected by the agent where no supervision is necessary.

To summarize, the inductive learning process can operate in two modes, depending on the needs of the agent which are controlled by the nature of interaction of the agent and the environment.

References

[1] L. Goldfarb and S.Nigam (1994). The unified learning paradigm: A foundation for AI, In *Artificial Intelligence and Neural Networks: Steps toward Principled Integration*, eds. V.Honavar and L.Uhr, Academic Press, Boston, 1994

[2] L. Goldfarb (1990). On the foundation of intelligent processes - I : An evolving model for pattern learning, *Pattern Recognition* 23, 596-616.