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LEARNING WITH WHICH LOCAL DECISION EXPERT TO CONSULT NEXT CASE STUDY: ARRHYTHMIA DIAGNOSIS

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Abstract. *The proposed approach is based on the classical model of Mixture-of-Experts and tries to concurrently learn two tightly coupled issues. As the main goal, it learns the optimal classification and at the same time, it learns the best sequence of council with previously designed local decision experts to reach the former optimal classification strategy. Local experts are in fact local classifiers who have learned the sub-optimal decision making based on just a portion of the whole feature space. The methodology is that in the first stage we generate different feature spaces by binning the features according to their potential relevance and then randomly selecting from the bins. At the second stage, we train a classifier for each of the resulting feature subsets. Finally, we use a continuous Q-learning variant for learning a combiner for the predictions of these classifiers which is the key contribution of the paper. Actually, the meta-learner in the last stage learns to combine different global models, each induced from a different feature subset. The domain of medical diagnosis (specifically Arrhythmia recognition) by using UCI datasets is opted as the benchmark. The acquired classification rate certifies that the proposed approach is quite comparable with the results have been reported so far. Moreover, this recognition is achieved by as few consultations as possible which is another key different merit for our approach.*

Keywords: Sequential decision making, Continuous Q-learning, Degree of support, Arrhythmia diagnosis, UCI ML repository

1. **Introduction.** Counseling and consulting with a field expert and, sometimes, using a combination of opinions of several professionals is a rather much used way in real-life situations: consulting with a multitude of skilled lawyers for legal cases, reference to a family advisor in familial problems and visiting a physician are some common everyday instances of this strategy. Consultation can enhance the level of confidence to the decision and facilitate looking at a single problem from different perspectives. However, there is a downside that counseling with an expert (or a number of experts) is an expensive and time-consuming procedure. Now, let's transfer the consultation problem into the domain of machine learning. Now, in this context, the stated problem gets even more crucial when the types of information provided by the experts are heterogeneous which requires spending considerable time and resources to prepare and deal with such a training database.

This makes an important consideration in the field of medical diagnosis, where the diagnosis procedure requires numerous sometimes-expensive and even harmful tests. The