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Robust multiple-instance learning ensembles using random subspace instance selection

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Many real-world pattern recognition problems can be modeled using multiple-instance learning (MIL), where instances are grouped into bags, and each bag is assigned a label. State-of-the-art MIL methods provide a high level of performance when strong assumptions are made regarding the underlying data distributions, and the proportion of positive to negative instances in positive bags. In this paper, a new method called Random Subspace Instance Selection (RSIS) is proposed for the robust design of MIL ensembles without any prior assumptions on the data structure and the proportion of instances in bags. First, instance selection probabilities are computed based on training data clustered in random subspaces. A pool of classifiers is then generated using the training subsets created with these selection probabilities. By using RSIS, MIL ensembles are more robust to many data distributions and noise, and are not adversely affected by the proportion of positive instances in positive bags because training instances are repeatedly selected in a probabilistic manner. Moreover, RSIS also allows the identification of positive instances on an individual basis, as required in many practical applications. Results obtained with several real-world and synthetic databases show the robustness of MIL ensembles designed with the proposed RSIS method over a range of witness rates, noisy features and data distributions compared to reference methods in the literature.

Biography

Ghyslaine Gagnon received his PhD degree in Electrical Engineering from Carleton University, Canada in 2008. He is now an Associate Professor at École de technologie supérieure, Montreal, Canada. He is an executive committee member of ReSMiQ and Director of research laboratory LACIME, a group of 10 Professors and nearly 100 highly-dedicated students and researchers in microelectronics, digital signal processing and wireless communications. He is highly inclined towards research partnerships with industry. His research aims at digital signal processing and machine learning with various applications, from media art to building energy management.

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