**Highlights**

* Novel primal L1-SVM formulation for optimizing over bags rather than instances
* Dual derivation along with KKT necessary and sufficient conditions for optimality
* Unique bag-representative selector method that maintains the standard MI assumption
* The formulations use bag-level information to find an optimal hyperplane among bags
* Results indicate the better performance of bag-level classifiers over other methods

**Highlights**

* Novel bag-level representative multi-instance learning SVM framework is proposed
* Primal and dual L1-SVM formulations and KKT conditions are devised and derived
* Unique positive and negative bag-representative selector method is designed
* The formulations use bag-level information to find an optimal hyperplane among bags
* Results are competitive and outperform current state-of-the-art methods