**Online Multi-Modal Distance Metric Learning with Application to Image Retrieval**

**ABSTRACT:**

Distance metric learning (DML) is an important technique to improve similarity search in content-based image retrieval. Despite being studied extensively, most existing DML approaches typically adopt a single-modal learning framework that learns the distance metric on either a single feature type or a combined feature space where multiple types of features are simply concatenated. Such single-modal DML methods suffer from some critical limitations: (i) some type of features may significantly dominate the others in the DML task due to diverse feature representations; and (ii) learning a distance metric on the combined high-dimensional feature space can be extremely time-consuming using the naive feature concatenation approach. To address these limitations, in this paper, we investigate a novel scheme of online multi-modal distance metric learning (OMDML), which explores a unified two-level online learning scheme: (i) it learns to optimize a distance metric on each individual feature space; and (ii) then it learns to find the optimal combination of diverse types of features. To further reduce the expensive cost of DML on high-dimensional feature space, we propose a low-rank OMDML algorithm which not only significantly reduces the computational cost but also retains highly competing or even better learning accuracy. We conduct extensive experiments to evaluate the performance of the proposed algorithms for multi-modal image retrieval, in which encouraging results validate the effectiveness of the proposed technique.

**EXISTING SYSTEM:**

* In recent years, one promising direction to address this challenge is to explore distance metric learning (DML) by applying machine learning techniques to optimize distance metrics from training data or side information, such as historical logs of user relevance feedback in content-based image retrieval (CBIR) systems.
* As a classical well-known online learning technique, the Perceptron algorithm simply updates the model by adding an incoming instance with a constant weight whenever it is misclassified.
* Recent years have witnessed a variety of algorithms proposed to improve Perceptron, which usually follow the principle of maximum margin learning in order to maximize the margin of the classifier.
* Among them, one of the most notable approaches is the family of Passive-Aggressive learning algorithms, which updates the model whenever the classifier fails to produce a large margin on the incoming instance.

**DISADVANTAGES OF EXISTING SYSTEM:**

* Although various DML algorithms have been proposed in literature, most existing DML methods in general belong to single-modal DML in that they learn a distance metric either on a single type of feature or on a combined feature space by simply concatenating multiple types of diverse features together.
* In a real-world application, such approaches may suffer from some practical limitations:
* Some types of features may significantly dominate the others in the DML task, weakening the ability to exploit the potential of all features; and
* The naïve concatenation approach may result in a combined high dimensional feature space, making the subsequent DML task computationally intensive.

**PROPOSED SYSTEM:**

* This paper investigates a novel framework of Online Multi-modal Distance Metric Learning (OMDML), which learns distance metrics from multi-modal data or multiple types of features via an efficient and scalable online learning scheme.
* The key ideas of OMDML are twofold:
* It learns to optimize a separate distance metric for each individual modality (i.e., each type of feature space), and
* It learns to find an optimal combination of diverse distance metrics on multiple modalities.
* We present a novel framework of Online Multimodal Distance Metric Learning, which simultaneously learns optimal metrics on each individual modality and the optimal combination of the metrics from multiple modalities via efficient and scalable online learning
* We further propose a low-rank OMDML algorithm which by significantly reducing computational costs for high-dimensional data without PSD projection.
* We offer theoretical analysis of the OMDML method
* We conduct an extensive set of experiments to evaluate the performance of the proposed techniques for CBIR tasks using multiple types of features.

**ADVANTAGES OF PROPOSED SYSTEM:**

* OMDML takes advantages of online learning techniques for high efficiency and scalability towards large-scale learning tasks.
* To further reduce the computational cost, we also propose a Low-rank Online Multi-modal DML (LOMDML) algorithm, which avoids the need of doing intensive positive semi-definite (PSD) projections and thus saves a significant amount of computational cost for DML on high-dimensional data.

**SYSTEM ARCHITECTURE:**



**SYSTEM REQUIREMENTS:**

**HARDWARE REQUIREMENTS:**

* System : Pentium Dual Core.
* Hard Disk : 120 GB.
* Monitor : 15’’ LED
* Input Devices : Keyboard, Mouse
* Ram : 1GB.

**SOFTWARE REQUIREMENTS:**

* Operating system : Windows 7.
* Coding Language : JAVA/J2EE
* Tool : My Eclipse
* Database : MYSQL