A Survey on Interactive Video Retrieval Using Active Learning Approach

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Abstract—Active learning is a machine learning technique which chooses the most informative models for labelling and uses them as training data. It has been extensively explored in multimedia research area for reducing human annotation effort. In this article, efforts of active learning in multimedia annotation and retrieval have been surveyed. The application domains such as image or video annotation, Relevance feedback and content-based image retrieval are mainly focussed. The principle of active learning has been briefly discussed and then sample selection criteria were analyzed. Classification models used in active learning-based multimedia annotation and retrieval, including semi-supervised learning, Support vector machine has been discussed. In particular, large-scale interactive multimedia annotation and analysis of human annotation with several strategies were briefly discussed.

I. INTRODUCTION

In the development of multimedia technologies, a wide range of information for a broad range of applications has been provided. Digitized videos made available through various information systems or World Wide Web. The digitalization of multiple video results in a considerable increase in querying for video retrieval and demands for video resources which is becoming more prevalent in day to day information seeking. In the following literature, the authors summarized “Multimedia information retrieval which has considerably evolved over recent years with WWW and the development of many digital libraries and thus allowing browsing and retrieval of multimedia content efficiently.”

Due to the advancements in the creation and distribution of video data Video analysis, storage and retrieval has become an important research area. Feedback techniques have been explored in the retrieval of textual data. Interactive schemes which are mainly based on the concept of relevance feedback, have been developed and examined. However, these approaches have not been applied in the video retrieval domain.

In this following survey, Various methods have been investigated with the use of advanced interactive retrieval schemes for the retrieval of video data. For better understanding the role of various features in the video retrieval, various retrieval strategies has been experimentally proved. The role of visual features and the textual features plays a major role for interactive video retrieval strategies. This method can be further explored by categorizing queries into various classes the retrieval effectiveness of various features and their combination can be investigated.

Based on these results, a retrieval scheme for video retrieval has been developed. Several retrieval models are being developed based on this concept. The following surveyed methods have been dealt by combining these methods with Active learning approach. Active learning is unique cases of semi-supervised machine learning approach in which a learning strategy can be interactively queried the user or some other source of information to obtain the desired output at new data points. It is often said to be an optimal experimental design in the statistics literature.

II. ACTIVE LEARNING

A. Active Support Vector Learning

In [1] this work, an active support vector learning algorithm has been described. This method is a probabilistic generalization of purely margin based methods. The methodology is encouraged by the representation of learning from statistical queries. These queries captures the natural notion of learning algorithms which make a hypothesis based on statistical properties of large. This method involves estimating the likelihood in which a new example fit into the actual support vector set and picking a set of p new points according to the likelihood. Again these likelihoods are then used along with the SVs to obtain the Active SVs.

B. Relevance Feedback using ASVM

In this [2] Active learning SVM has been discussed for Image retrieval using Relevance feedback mechanism. Relevance feedback mechanism is a significant component while designing image databases. When designing these databases it is more difficult to denote queries directly. These mechanisms dynamically determine both query concepts by asking the user whether certain proposed images are relevant or not and user's desired output. Be relevant. It must take hold of a user's query concept quickly and accurately. For conducting effective relevance feedback for image retrieval...
support vector machine active learning algorithm can be used. The algorithm chooses the most instructive images to query a user and then promptly learns a boundary which separates the images that satisfy the user's query concept from the remaining dataset.

C. Multimedia retrieval

In [3] Retrieval of Interactive multimedia content like image, audio etc., have been discussed which is becoming stronger in the media consumption paradigms. The leading technology to provide a way for this interactive retrieval is active learning. Through user interaction the changes can be alleviated for challenging multimedia information retrieval for active learning strategy. This work describes in which way active learning is preferably suited for the multimedia information retrieval problem. Finally, growing field can be in sighted and how it matches into the larger context of multimedia information retrieval.

D. Query-Point Refinement-Based Strategies

1) Diversity Analysis: In this [3] Diversity analysis using active learning algorithms has been described. This closely related to query-point refinement with traditional relevance feedback. The optimal transformation of the feature space continues to change when more unlabeled data is labeled in the relevance feedback process. This allows for the enhancement of the initial query point with respect to the original feature space. Two ideas can be used for active learning research. They are 1. readily available of unlabeled data and 2. Learner is not strictly passive. Active learning in Semi-supervised is used to classify the unlabeled data. Training set contains predicted tables with confident unlabeled instances.

2) Reinforcement Learning: Query point refinement can be done with reinforcement learning has been discussed. The learner interacts with the world through “actions,” and then tries to evaluate an optimal technique of behavior with respect to “rewards” which it receives from the environment. In a reinforcement setting, the machine actually works against real or simulated opponents or negative is discussed in [4].

E. Content Based Information Retrieval

In this [5] work, a general approach to make hidden annotation with active learning for information retrieval has been discussed. Natural attribute tree structure for the annotation has been considered. By making annotation on this, A Knowledge gain on the system can be determined. Knowledge gain as the uncertainty measurement and product of the probability density function has been described. In order to evaluate the uncertainty of an object, a list of attribute probabilities for each object can be computed based on its neighboring annotated objects. This can be done through kernel regression. By knowing the explicit function for the probabilities of these objects, The uncertainty measure can be obtained. This method outperforms the random sampling algorithm in all the experiments This shows the hidden annotation with active learning which is a very powerful tool for improving the performance of content-based information retrieval. The relationship between hidden annotation and is worth discussing in [5]. Hidden annotation through active learning has shown its effectiveness on improving database query results. However, with only a little annotated structure, there are less number of training sets in the system for each attribute. There is a possibility of over-fitting for a small number of training data. This shows that the improvement of the performance is not significant for an outsider query of the database in the experiment. In this case relevance feedback is necessary in a retrieval system Relevance feedback can fit to the query easily and quickly and thus designed to work specifically for each query.

F. DUAL Strategy

In [6] static strategies for sampling unlabeled point through Active Learning methods has been discussed. These strategies range from density estimation and uncertainty sampling of multi-factor methods. Dynamic approach called DUAL has been discussed in [6] which the selection parameter strategy are adaptively updated by depend upon estimated future residual error reduction. The motive of duality is to outperform static strategies over a huge operating range which is from very few to many labeled points. Experimental results over six datasets has been demonstrated in which DUAL outperforms several state-of-the-art methods on several datasets.

G. Ontology-based Video Search

In [7] Ontology based method for searching video has been discussed. Depending on the modalities of search queries such as text or visual, there exist several ways to present mapping from queries to concepts. For text queries, the approaches are conducted on mapping by the concept similarity measures metrics. In addition to ontology reasoning, some approaches expand queries with the related terms and also explore the mapping by comparing queries against the text descriptions linked with concepts. The expanded conditions as well as their weights are learnt from external information such as the Internet or training samples. For queries with video or image samples, the mapping is frequently done by selecting the concept detectors. This produces high output confidence to query samples by indicating the likelihood of equivalent concepts obtained in the queries. The weight of a detector is normally assigned based on the detection score of the detector to video or image samples when more than one detector is selected.
III. CONCLUSION

Active learning is a developing research area in machine learning approach, in which the data in reality are easily increasing and inexpensive to obtain. Several methods were discussed for interactive video retrieval which includes multimedia retrieval concepts such as image, video etc in the above surveyed methods. Based on this method an efficient and interactive video can be retrieved. Each method which is discussed in the literature gives a better result in one category and convincing result in another category. The classification accuracy can be done by applying Support vector Machine with Active Learning approach that gives benchmark result in the research.

REFERENCES


