Chapter VIII
Handling Local Patterns in Collaborative Structuring

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ABSTRACT

Media collections on the Internet have become a commercial success, and the structuring of large media collections has thus become an issue. Personal media collections are locally structured in very different ways by different users. The level of detail, the chosen categories, and the extensions can differ completely from user to user. Can machine learning be of help also for structuring personal collections? Since users do not want to have their hand-made structures overwritten, one could deny the benefit of automatic structuring. We argue that what seems to exclude machine learning, actually poses a new learning task. We propose a notation which allows us to describe machine learning tasks in a uniform manner. Keeping the demands of structuring private collections in mind, we define the new learning task of localized alternative cluster ensembles. An algorithm solving the new task is presented together with its application to distributed media management.

INTRODUCTION

Today, large collections of music are available on the Internet. Commercial sites, such as iTunes or Yahoo!, structure their collections based on metadata about the songs like artist, publication date, album, and genre. Individual media collections are organized in very different ways by different persons. A user study reports several organization principles found in physical music collections (Jones, Cunningham, & Jones, 2004), among them the time of day or the situations in which the music is best listened to, the year in which a song has been the favorite, and the room in which to play it (e.g., kitchen, living room, car). In a student project, we found categories of mood, time of day, instruments, occasions (e.g., "when working" or "when chatting"), memories (e.g., "holiday songs from 2005" or "songs heard with Sabine"), and favorites. The same applies for other media collections as, for example, texts or videos. The *level of detail* depends on the interests of the collector. Where some students structure instruments into electronic and unplugged, others carefully distinguish between string quartet, chamber orchestra, symphony orchestra, requiem, and opera. A specialist of jazz designs a hierarchical clustering of several levels, each with several nodes, where a lay person considers jazz just one category.

Where the most detailed structure could become a general taxonomy, from which less finely grained, local structures can easily be computed, categories under headings like "occasions" and "memories" cannot become a general structure for all users. Such categories depend on the personal attitude and life of a user, only. They are truly *local* to the user's collection. Moreover, the classification into a structure is far from being standardized. This is easily seen when thinking of a node "favorite songs". Several users' structures show completely different songs under this label, because different users have different favorites. The same is true for the other categories. We found that even the general genre categories can *extensionally vary* among users, the same song being classified, for example, as "rock'n roll" in one collection and "blues" in another one. Hence, even if (part of) the collections' structure looks the same, their extensions can differ considerably. In summary, structures for personal collections differ in:

- The level of detail.
- The chosen categories.
- The extensions for even the same labels.

This diversity gave rise to new applications under the Web 2.0 paradigm. Systems as *flikr* or *del.icio.us* allow users to annotate objects with arbitrary tags. Such tags complement global properties like artist, album, genre, and so forth, for music collections. In contrast to the global properties, the additional user-assigned tags are *local*; that is, they represent the personal views of a certain user not aiming at a global structure or semantic. These approaches do not include any machine learning support for users. They obey the rule to not destroy hand-made, carefully designed personal structures.

While users like to classify some songs into their own structure, they would appreciate it if a learning system would clean up their collection "accordingly". This means to sort-in songs into the given structure. In addition, users often need to refine their structure since a node in their hierarchy or a class of objects has become too large. Hand-made well-designed structures are often superior to learned ones. Therefore, collaborative approaches are welcome, which allow users to share preferences and knowledge without requiring common semantic or explicit coordination. A structure of another user might serve as a blueprint for refining or enhancing another's structure. The success of collaborative filtering (as in Amazon) shows that users also like to receive personalized recommendations in order to enlarge their collection. Hence, there is some need of support, but it should not force users into a general scheme. An approach which fits the characteristics of users' collections should:

- Not overwrite hand-made structures.
- Not aim at a global model, but enhance a local one.
- Add structure where a category's extension has become too large.

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