Augmenting the Metadata of Audiovisual Archives with NLP Techniques: Challenges and Solutions

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Abstract

In the last decade, following the push of mass digitization, audiovisual archives have also been digitized, both by cultural institutions and broadcasting companies. The Radio Télévision Suisse (RTS) has for instance assembled more than 200,000 hours in its archive. However, as outlined by both archival scholars (Fossati et al., 2012) and the GLAM sector (Winesmith & Anderson, 2020), once digitized, these large collections require new frameworks to facilitate their access for the larger public and improve their civic value (Edmondson & Edmonson, 2004). Actually working with such large datasets however presents several challenges, that this research sets to highlight and then address. In this paper, we tackle these challenges from the perspective of experimental museology (Kenderdine, 2021), with the goal of augmenting the metadata of the RTS Archives for supporting innovative modes of access through Natural Language Processing (NLP) techniques.

The main difficulty that arises is the potential lack of homogeneity in the archival process. This can result in overwhelming amounts of different tags and categories, unusable as is to actually cluster the items in the collection in a meaningful way. For instance, in the RTS Archives, we have 6528 topic tags, 3273 geographical tags and 8954 entity tags across 522103 videos. Figure 1 demonstrates that the distribution of the number of tags per video is heavily right-skewed, with 75% of the videos having a maximum of 4 tags.

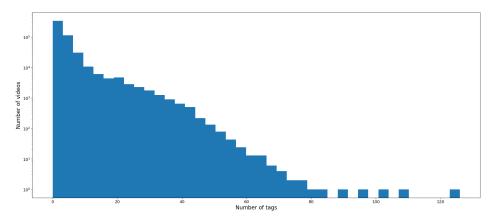


Figure 1: Distribution of the number of tags used per video in the RTS Archives (log scale).

Figure 2 displays a graph of tags co-occurrences, for the tags that have been used for at least 1000 videos. Unsurprisingly, Switzerland ("suisse") and important Swiss cities are the most common tags.

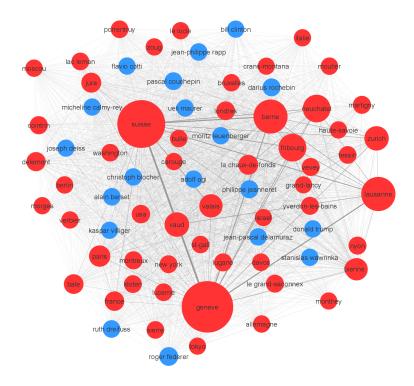


Figure 2: Graph of the co-occurrences of the most commonly used tags in the RTS Archives. Geographical tags are colored in red while entities are in blue. The node sizes indicate the number of videos using that tag while the widths of the edges represent co-occurrences.

The challenge is thus on how to infer a proper knowledge structure from this seemingly free and unconstrained text annotation, allowing for meaningful clustering of the videos and navigation of the archive. In parallel, the challenge of missing data can also highly influence the outcomes of visualizations attempts, as it can cause items to be isolated from the bulk of the collection, not because they actually are different but because they have not been properly tagged, as encountered by (Rodighiero et al., 2022). As the reader can see in figure 1, this is the case for many videos in the RTS Archives.

Our initial experiments used Bag-of-Words, TF-IDF, and word embeddings as video representations for clustering with the K-Means algorithm, using the elbow method to determine the optimal number of clusters. Unfortunately, a qualitative inspection of the clusters revealed that well-defined groups could not be extracted. Therefore, to augment the metadata available and facilitate exploration of the entire archive, we decided to link it to the Wikidata database. We focused on geographical and entity tags, linking 10,618 Wikidata entities to tags in the archive using a simplified entity linking approach that took the first candidate from the Wikidata API. Since these tags lacked context, we also used video descriptions as an alternative source for tagging videos. To perform entity extraction, disambiguation, and linking using the video descriptions and Wikidata, we developed an end-to-end pipeline using spaCy and the extend project (Barba et al., 2022). A small-scale experiment on 15,305 sports-related videos (filtered by content category) resulted in an additional 4,679 unique tags linked to Wikidata entities, thereby expanding the scope of our analysis beyond the original set of tags.

Once this first phase of extraction is completed, the collection of Wikidata entities collected enables numerous approaches to further complement the available metadata. Since all the tags are processed

and linked to a Wikidata entity, the RTS metadata automatically inherits the semantic and logical information from the Wiki knowledge graph. The audiovisual archive can thus be navigated through the Wikidata database. Properties of these entities can be queried in a simple manner, obtaining geographical coordinates for the location or citizenship of the persons for instance. The drawback of having a manual and arbitrary tagging system (often found missing tags, inconsistency in multi-lingual tags, etc.) is also solved by providing a holistic and connected higher structure to the tags.

In conclusion, this research shows how the metadata of an audiovisual archive tagged in an unconstrained manner can be augmented by linking it to a well-structured and large collection: the Wikidata database. Future work will explore how tags can be automatically extracted from the videos, transcribing the audio for instance, and thus potentially resulting in a much more granular tagging, on the scale of short clips rather than entire videos.

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