SMART Radio: Personalized News Radio

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ABSTRACT

In this demonstration paper we describe the SMART Radio app for BNR Nieuwsradio.[1] The SMART Radio app is an extension to the current BNR app, which offers users a more personalized news radio experience. It does so by automatically fragmenting shows to offer our users more targeted and focused fragments of audio, not full shows. We employ audio segmentation and audio topic-tagging techniques to achieve this, which we describe in this paper. In its present form, users can subscribe to tags to get appropriate suggestions of relevant radio fragments. In the future we would like to improve the app's personalization, by using information of the user's interaction with the app.

CCS CONCEPTS

• **Information systems → Personalization**; **Recommender systems**;

KEYWORDS

personalization, news, radio

1 INTRODUCTION

FD Mediagroep (FDMG[2]) is the leading information provider in the financial economic domain in the Netherlands. FDMG operates "Het Financieele Dagblad," (FD) a daily financial newspaper, similar to the Financial Times. In addition, FDMG operates the daily all-news radio station "Business News Radio" (BNR). FDMG is investing in personalizing the news experience, both in news articles and news radio [3], since we believe this will help to serve our users better, and help in unlocking long tail content from FDMG's rich archives.

[1] http://www.bnr.nl
[2] http://fdmediagroup.com
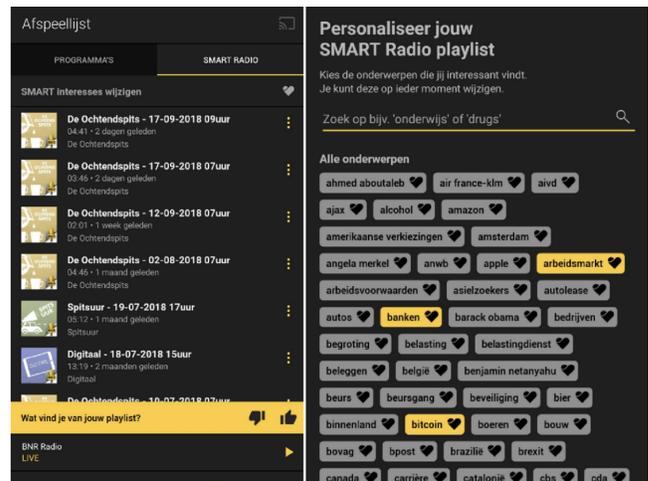
Figure 1: Screenshot of SMART Radio in the BNR app

Recently FDMG has launched a new version of the SMART Radio app[3] where users can create a personalized playlist, based on their interests, see also Figure 1. BNR SMART Radio offers a non-linear radio experience with short radio fragments that match the listener's interests. For this purpose, FDMG employs automatic audio segmentation, and topic-tagging techniques, which we describe in this paper.

2 AUDIO SEGMENTATION

On a daily basis BNR broadcasts live radio shows from 6AM to 7PM. Next to that, BNR also produces podcasts in a wide range of topics. Currently, users can tune-in live to BNR, or listen to historic radio broadcasts, which are offered in their full length on BNR's website, through the BNR mobile app, and through its channels on Spotify and iTunes. Although BNR's archive provides short description of shows, in shows where many different topics are discussed, our users cannot easily tune-in to the parts or sections that are of specific interest to them. Particularly when a user has limited time available, but wants to remain up-to-date on specific topics, this is undesirable. For this purpose with BNR SMART Radio we aim to segment full-length radio shows into shorter coherent

[3] https://bit.ly/2QLsvQG

pieces of audio. This way, these shorter fragments can be retrieved by users, or served to them through, e.g., personalized playlists.

Segmenting audio in topically coherent segments is a non-trivial problem. That is why it is more common to provide an interface to search for keywords in an audio stream or some other visualization of topics in the stream [1, 2]. This would, however, be too limited for coherent pieces of radio that can make up a personalized radio show. Since BNR radio is created in-house, we have additional metadata available about the radio shows that we can leverage to inform segmentation of the audio. The most important information that we currently use is the occurrence of jingles that indicate the start and end of segments.

3 AUDIO TAGGING

In order to serve segments from the audio segmentation to the right users, each segment needs to be tagged with one or more topics. We automatically transcribe BNR shows using a transcription-service by Zoom Media.[4] We assign tags to segments using a proprietary multilabel text classifier, trained on our own domain-specific dataset, which follows a hand-created taxonomy of tags.

Our current model has a precision of 0.64 and a recall of 0.36. On average the classifier assigns 2.6 tags to each audio segment, with a minimum of 0 and a maximum of 8. Although there is room for improvement, users of the beta version of the BNR SMART Radio app have responded positively to the provided fragments and how it fits their interests, which suggests that the tagging works well in practice.

4 SERVERLESS ARCHITECTURE

Managing servers and infrastructure is a time-consuming job and requires special personnel to maintain the system hence costs lots of money, time and headache. By simply leaving the server management to the service provider, we can focus on our building and expanding features. Our goal is to build a system that is reliable, scalable, maintainable and cost-effective.

We achieve this by consuming multiple managed services from Amazon Web Services, e.g., Step Functions and Lambda functions. Step functions are orchestration layer for our functionality in order to transcode, transcribe, and split audio files. These services enable us the visibility of the ongoing operations and scales upon needs effortlessly. See Figure 2 for a more detailed overview of our serverless architecture

5 FUTURE WORK

This version of the SMART radio app is only the beginning. It is apparent from the first responses of our testers that creating a personalized list of fragments is appreciated. Therefore we have several ideas to improve the app further.

One area for improvement is the audio tagging. We are aware of limitations of our dataset, for example the size of the sample of tags we used to train our classifier. It might be interesting to look at leveraging a hierarchical structure among the tags. This would have the additional advantage that it would help users browse the taxonomy of tags.
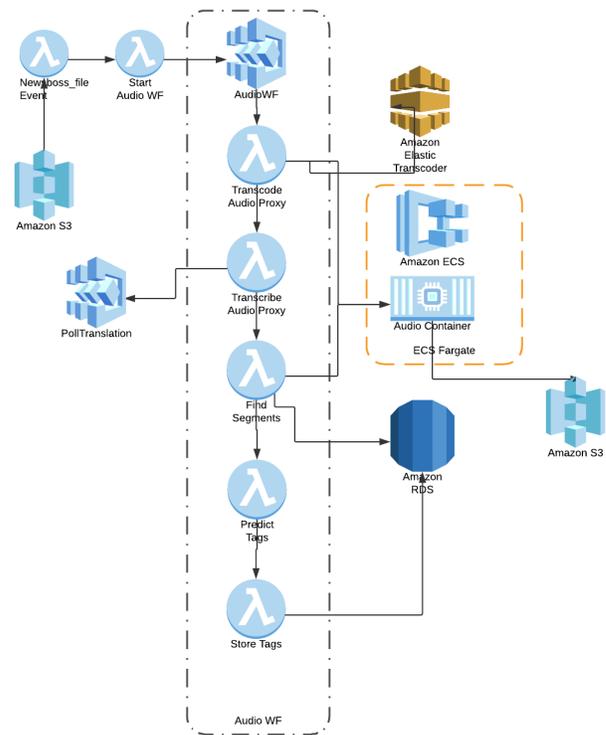
Figure 2: Audio flow

Next, there is space for improvement in the recommendation strategies. The app currently requires users to manually search and select tags they are interested in. In the future we could help users by providing tags suggestions based on their listening behavior, additional user interactions that we have, or relations between tags. Finally, including contextual information such as time, location or device is another direction for improving the recommendations of the app.

Finally, we would like to connect different types of content. Radio shows may provide background or context to news articles, cross-linking FD's news articles with BNR's audio could provide users a more complete news experience, where they can find information from different sources and perspectives more easily.

6 ACKNOWLEDGEMENTS

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[3] Maya Sappelli, Dung Manh Chu, Bahadir Cambel, David Graus, and Philippe Bressers. 2018. SMART Journalism: Personalizing, Summarizing, and Recommending Financial Economic News. In *The Algorithmic Personalization and News (APEN18) Workshop at ICWSM '18.*

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[4]https://www.zoommedia.ai/

[5]https://newsinitiative.withgoogle.com/dnifund/