
DataTV 2019: 1st International Workshop on Data-Driven Personalisation of Television

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ABSTRACT

The first international workshop on Data-driven Personalisation of Television aims to highlight the significantly growing importance of data in the support of new television content consumption experiences. This includes automatic video summarization, dynamic insertion of content into media streams and object based media broadcasting, to serve the recommendation of TV content

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TVX '19, June 05-07, 2019, Salford (Manchester), United Kingdom

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ACM ISBN 978-1-4503-6017-3/19/06.

<https://doi.org/10.1145/3317697.3323349>

and personalization in media delivery. The workshop has two keynote talks alongside five paper presentations and several related demos.

CCS CONCEPTS

- Information systems~Data analytics
- Information systems~Multimedia content creation
- Applied computing~Publishing
- Applied computing~Service-oriented architectures

KEYWORDS

Data extraction and modelling, media value chain, media personalization, personalized TV, TV recommendations, video summarization, object based media

ACM Reference format:

Jeremy Foss, Lyndon J.B. Nixon, Ben Shirley, Basil Philipp, Benedita Malheiro, Vasileios Mezaris, Sara Kepplinger and Alexandre Ulisses. 2019. DataTV 2019: 1st International Workshop on Data-Driven Personalisation of Television. In *Proceedings of TVX '19: ACM International Conference on Interactive Experiences for TV and Online Video (TVX '19)*, June 05-07, 2019, Salford (Manchester), United Kingdom. ACM, New York, NY, USA, 9 pages. <https://doi.org/10.1145/3317697.3323349>

1 Workshop Aim and Topics

The aim of the DataTV 2019 workshop is to address the increasing importance and relevance of richly granular and semantically expressive data about TV content in the media value chain. Such data needs extraction, modelling and management before it can be meaningfully re-used in new, innovative services for TV content such as:

- Content Summarization (e.g. to provide highlights of a program according to a specific user, theme or channel)
- Recommendation and Scheduling across Content Publication Channels (Broadcast, Streaming, Social Networks)
- In Stream Personalisation of Content (both spatial and temporal modification of text, audio or video elements)

Topics for the workshop therefore include:

- Curation of TV data throughout the media value chain, e.g. use of the MPEG Value Chain Ontology
- Matching of TV data with user profiles for recommendation or personalisation (respecting data privacy and security)
- Tools and services for the composition of personalised TV, including object based media, making use of TV content data (e.g. creation of video summaries or alternative content)

- versions, recommendation of auxiliary assets for delivery alongside TV content, dynamic insertion or modification of media in streams).

The workshop reflects in its accepted papers and demos as well as invited keynotes the latest research and development in all areas of data creation and management for TV content and aims to support the growth of a community of researchers and practitioners interested in data value for personalised TV.

2 Keynotes: Object Based Media and Trans Vector Platform

The keynotes highlight two major threads of R&D into data-driven personalized TV.

The first keynote speaker, Matthew Brooks of BBC R&D, reports on latest developments in object based media broadcasting.

StoryFormer is a cloud-based tool for creating responsive stories, built by BBC Research & Development. Responsive storytelling uses an object-based media approach that allows the contents of a programme to change according to the requirements of each viewer. StoryFormer aims to enable anyone with an idea for a responsive story to be able to create it quickly and easily, without the need for coding. In this session, the participants will learn about the principles behind StoryFormer, and the potential it has to bring meaningful interactivity and personalisation to media experiences.

The second keynote speaker, Lyndon Nixon of MODUL Technology, reports on the latest outcomes of the ReTV project to provide new tools for personalized and recommended TV.

The ReTV project is building a platform that aggregates data about TV programming in order to give functionality to media organizations that optimises the reach of their future content publications. In this keynote, the potential for future TV ,when it is possible to offer dynamic adaptation of media streams to insert content personalized to the viewer, automatic recommendation of the most relevant programming in broadcaster archives or schedules as well as video summarization, is briefly considered, emphasizing the topics of most interest to the audience.

3 Papers: latest developments supporting data-driven personalization of TV

Five accepted papers around the topic of data-driven personalization of TV reflect the ongoing R&D directions that can feed into the topic. The first two papers are focused on addressing audio content (both for personalization and for handling intellectual property rights for personalized content) and this work needs to be continued to cover audio-visual content. The remaining three cover current R&D activities around personalization of the video streams, through system recommendation, live direction or cross-channel analytics. Together at this workshop, we capture the state of the art in using data about TV content to personalize viewing.

Personalization of Object-based Audio for Accessibility using Narrative Importance (Ben G. Shirley, Lauren Ward and Emmanouil T. Chourdakis)

An increasing incidence of hearing impairment and of reported problems with broadcast audio is leading to an increased demand for personalized audio services. Previous research has treated these issues as a 'speech in noise' problem; sounds are viewed as speech (good) or as competing masker (bad). This binary approach to accessible audio disregards the important role of some non-speech sounds in facilitating understanding of broadcast programme narrative. This work, as part of the S3A project, has taken a more holistic approach to audio personalization using categories of narrative importance to provide complex manipulations of broadcast audio based on narrative comprehension, instead of simply intelligibility. A simple, intuitive user-interface allows the user to adjust the complexity of audio scenes based on their personal hearing needs, metadata is generated at production using plugins to generate appropriate metadata and audio previews of user-narrative importance settings. This paper outlines the concept of narrative importance, the production tools and the end-user interface designed to deliver it. Response to these tools from target users and production staff are discussed as well as ongoing work.

MPEG Intellectual Property Rights Ontologies for Media Trading and Personalization (Panos Kudumakis, Thomas Wilmering, Mark Sandler and Jeremy Foss)

The Media Value Chain Ontology (MVCO, ISO/IEC 21000-19) facilitates rights tracking for fair and transparent royalties payment by capturing user roles and their permissible actions on a particular intellectual property (IP) asset. However, widespread adoption of interactive music services (remixing, karaoke and collaborative music creation) - thanks to Interactive Music Application Format (IM AF, ISO/IEC 23000-12) - raises the issue of rights monitoring when reuse of audio IP entities is involved, such as, tracks or even segments of them in new derivative works. The Audio Value Chain Ontology (AVCO, ISO/IEC 21000-19/AMD1) addresses this issue by extending MVCO functionality related to description of composite IP entities in the audio domain, whereby the components of a given IP entity can be located in time, and for the case of multi-track audio, associated with specific tracks. The introduction of an additional 'reuse' action enables querying and granting permissions for the reuse of existing IP entities in order to create new derivative composite IP entities. Furthermore, smart contracts for media assets are likely to be required to facilitate the lightweight trading and usage of those assets by facilitating machine readable deontic expressions for permissions, obligations and prohibitions, with respect to particular users and IP entities. The security of these transactions may be used in conjunction with distributed ledgers, e.g., blockchain, enabling both transparency and interoperability towards fair trade of audio and video assets. While the main focus of this paper is in the music domain and the description of the recently published AVCO standard, related developments (e.g., standards, formats and smart contracts) in the media domain are also discussed from the media trading and personalization point of view.

The Virtual Director Concept: Data-Driven Adaptation and Personalization for Live Video Streams (Rene Kaiser)

This workshop paper presents the Virtual Director concept and relates it to the theme of the workshop for discussion. A Virtual Director is a software component which seeks to automate the key decision making tasks of a TV broadcast director, i.e. which camera view to show, and when to switch to another view. A Virtual Director is capable of taking these decisions individually for each user, in personalized manner, taking personal preferences into account. To be able to take reasonable decisions, it must be continuously informed by real-time sensors which transmit data streams, such as real-time audio-visual content analysis components. From such low-level 'cues', the Virtual Director infers higher-level events, facts and states which in turn trigger its decision making processes.

The Trans-Vector Platform for optimised Re-purposing and Re-publication of TV Content (Lyndon Nixon, Miggi Zwicklbauer, Lizzy Komen and Basil Philipp)

This submission presents a first prototype for a new and innovative TV content analysis and publication system called the Trans-Vector Platform (TVP). The TVP derives its added value by the aggregation of TV data from different sources into a Metadata Repository. Its value for TV viewers and TV content publishers alike is reflected in a number of concept applications to be built on top of the TVP. The TVP and the associated applications will now be tested in the EU H2020 funded project ReTV (www.retv-project.eu) with end users to validate the added value of the TVP to TV viewers and the organizations that provide them with media content.

Stream Recommendation using Individual Hyper-Parameters (Bruno Veloso, Benedita Malheiro and Jerry Foss)

This contribution reports on a new technique for stream recommendation. Due to the accumulated volume and pace of incoming information in data streams, there is the need to adopt stream mining algorithms to build and maintain models of the viewer preferences as well as to make timely personalised recommendations. This paper reports on the adoption of optimal individual hyper-parameters to build more accurate dynamic viewer models. The proposed method, first, implements a grid search algorithm to identify the optimal individual hyper-parameters (IHP) and, then, uses these hyper-parameters to update incrementally the user model. This technique is based on an incremental learning algorithm designed for stream data. The results show that this new method outperforms previous approaches, reducing substantially the prediction errors and, thus, increasing the accuracy of the recommendations.

4 Discussion and Workshop Outcomes

The workshop is outward looking and provides feedback to stakeholders in the industry (viz. operators, broadcasters, manufacturers) and also to end users. The workshop's objective is to become a focus for the broadcast personalization services of the near future, in terms of development and deployment. To enable this, the workshop will close with round table discussions on salient issues and disseminate findings to relevant bodies. This includes:

- issues of commercialization of software or services for data driven TV personalization, in order to move from reliance on R&D funding to self-funding via licensing and sales;
- media value chain and asset management in broadcasters' future IT systems, including media component contracts (e.g. smart contracts) and security of transactions, for example on blockchain platforms;
- items of best practice; standards; data management, ethics, user privacy; user interfaces and practices for production staff; user interfaces for viewers for service navigation; overall user experience (UX).

While this workshop is the first of its kind, it does not exist in isolation. A series of workshops on Future Television were held at the EuroITV conference (the forerunner to TVX) in 2010-2013, considering how the TV experience could be integrated with the Semantic Web, social networks, interactive media and services, and multiscreen applications. In all these cases, the role of data in informing software to make autonomous choices has been present and significant (e.g. the recommendation or selection of TV or Web content, its adaptation to device and user, personalization of the delivered content to the current context and user choices). The emergence of this topic of data-driven TV can be tied to two developments of this decade: R&D investment into exploring and developing data-driven TV solutions (also by the EU in projects such as NoTube (notube.tv, 2009-2012), LinkedTV (linkedtv.eu, 2011-2015) and ReTV (retv-project.eu, 2018-2020)) in parallel to the TV industry observing the data-driven solutions being delivered in other domains.

A similar workshop to DataTV was held at the TVX2017 conference – IPP4B (In-Programme Personalisation for Broadcast). At that workshop, issues raised included:

- selection and sequencing of programme sections which are dynamically adapted at time of playout
- the requirement to allow production personnel to focus on creation potential and the technologies supporting storytelling.
- the wide gulf between the technology capabilities identified in the workshop and what the creatives see as the potential of personalisation.
- the need to facilitate tools and capabilities to allow experimentation, including non-professional producers, including interaction with social networks
- metadata, workflow and production tools and associated technologies for media object compositing
- data collection remains an increasingly hot topic: user profiling issues, including “cold start” profiles (for new users without a profile history) and group profiling
- network technologies for delivering personalised content via adaptive bit rate streaming and cloud platforms.

- neural networks and AI for scene assessment and placement of content for personalization.

It was suggested that milestones are planned as a development towards demonstrators, i.e., boot-strap activities which demonstrate personalisation. It was also noted that real world data sets are required from initial activities to provide meaningful further studies in personalised media performance.

As a conclusion, DataTV2019 facilitates new opportunities two years on to pick up and continue the discussions around these issues, chart progress, identify remaining gaps and take action. The ultimate aim is to communicate the state of the art in data-driven TV personalisation to relevant bodies in the media industry as well as drive further R&D in the remaining technology gaps, so that the necessary data specifications and standards are established alongside the necessary software and services using that data.

ACKNOWLEDGMENTS

This workshop is co-funded by the EU Horizon 2020 research and innovation programme under grant agreement H2020-780656 ReTV.