Personalisation for (Public) Media

INFOMPPM

Applied Data Science

Utrecht University

Block 3, 2020-2021

Labs

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Lecturers

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Class Schedule

The entire course has been scheduled to take place online. To participate it is important that you join the MS Teams course environment. If Covid-19 guidelines allow, we intend to supervise the group work from week 7 onwards on campus (with the option for those unable to join to attend virtually). Please note that the course begins on Thursday 11 February 2021 with a lecture.

Lecture: Thursday

All together: 11:00-12:45

Lab: Tuesday

Group 1: 11:15-15:00

Group 2: 15:15-19:00

Readings

The readings include articles available in open-access online or via the UU library and chapters from the required book for the class:

- Schrage, Michael. 2020. *Recommendation Engines*. The MIT Press. ISBN: 9780262539074.

Content

Personalizing content in order to cater to a wide variety of audience clusters is a key effort in the media industry. Referred to as "recommender systems", these systems have become an integral part of our daily media consumption. The recommender systems developed operate in specific contexts and reflect particular norms and values (both intentionally and unintentionally). This course combines the approaches value-sensitive design and algorithmic affordances and interfaces in the development of recommender systems for (public) media. More specifically, it explores the interplay between values, technologies and stakeholders.

Course goals

At the end of the course, the student will be able to:

- Understand and apply value-sensitive design in the design process of a recommender system
- Understand and apply recommender systems in a media context
- Develop metrics that are used for cluster analysis for audience analysis
- Develop models for personalization and content recommendation with regards to public values
- Consider ethical and cultural concerns of recommender systems

Assignments & Deadlines

All assignments should be submitted via Blackboard (with the exception of the video presentation which you e-mail the link to Erik Hekman)

	Weight	**Form**	**Deadline**
Assignment 1: Value-sensitive design	20%	individual	25 February 2021, 17:00
Assignment 2: Algorithmic affordances and interfaces	40%	individual	25 March 2021, 17:00
Final: Case Study Building a Recommender	40 %	group of 3	13 April 2021, 17:00

Please note that you need a minimum of 5.5 for the individual assignments to pass the course

Assignment 1: Value-sensitive Design (20%)

In this assignment you will use value-sensitive design as a method to contribute to the critical analysis of recommender systems and the values that have been—intentionally or unintentionally—embedded into them. You will map the individual stakeholders and the values associated with these stakeholders for the provided case study through *conceptual investigations, empirical investigations,* and *technical investigations*. Conceptual investigations aim at (theoretical) conceptualizing the various values and value tensions. Empirical investigations aim at understanding the users' attitudes, desires, opinions, and values. Technical investigations concern identifying value issues based on existing technical designs and translating these values into technical features. Analysis is not limited to only desk research but also includes other methods such as interviews and stakeholder analysis. For this assignment you will combine desk research with one other method.

Doing so will help to uncover the complex relationships among values, technology, and stakeholders of the provided case study.

You will write a research report consisting of a maximum of 2,000 words excluding references and citations. This should include an introduction, a brief theoretical framework (reflecting on the relationship between values and technology), methods section (concise explanation of Value-Sensitive Design methodology), results of desk research and interviews/stakeholder analysis (= this should be the longest section) and a concise conclusion/reflection.

The assessment of the research report will be based on the following criteria:

- level of research: able to identify stakeholders, values and existing technologies;
- level of reflection: able to reflect on the tensions of these values between the stakeholders;
- formal elements: includes all three elements of the tripartite methodology - conceptual, empirical and technical (with primary emphasis on the conceptual e.g. identifying values at stake), academically sound

Assignment 2: Algorithmic affordances and interfaces (40%)

In this assignment you develop a recommender system based on a provided dataset. Besides creating a prototype for a working recommender system you will also propose an interface that provides control over the recommender system. Which implicit and explicit feedback mechanisms provide the algorithm with the necessary data? For this assignment you will start by exploring the dataset and develop audience metrics. From there, you use content-based and collaborative-based filtering to give recommendations to the user. Parallel to this, you design an interface that translates the audience metrics and provides the interface with the necessary data in order to support user autonomy over values.

The assessment of the assignment will be based on:

- Short video presentation (20%) (of maximum 10 minutes) in which you demonstrate a mid-fidelity prototype (interface) and briefly reflect on one or two central values and stakeholders affected by certain design decisions. in which you elaborate and critically reflect on the connection between the mid-fidelity prototype, metrics, the values addressed, and the stakeholders affected by the design decisions. Please submit via SurfDrive, WeTransfer, Dropbox or other file sharing service via e-mail to Erik Hekman.
- Technical report (20%): a maximum of 1,500 words where you describe and motivate the system you have built and how it connects to the designed interface from a usability and technical perspective.

You should submit the code and screen designs of your recommender system as an appendix to the document.

The assessment of the research report will be based on the following criteria:

- Level of research: able to connect design decisions to metrics, values, and the stakeholders
- Practical implementation of algorithmic affordances: level of technical sophistication, logic of design choices, feasibility
- Level of reflection: academic discussion of the central values, motivation for technical choices made in the implementation of values, critical of own role in design process (potential blind spots)

Final: Case Study Building a Public Recommender (40%)

Public service media (PSM) play a vital role in safeguarding media diversity by offering a broad array of program genres reflecting society's diversity. The diversity in content is paramount for a pluriform and diverse society and gives voice to a plurality of competing views and values from a myriad of generations, cultures, religions, majorities as well as minorities. A large part of this content is available through the video-on-demand service. Currently, many PSM VOD services have a functioning recommender system but are limited in scope by giving recommendations based on content-based filtering. But how can values such as pluriformity and diversity be incorporated into an algorithm? How would you translate these values into audience metrics? Which data is needed? Which implicit and explicit feedback mechanism are needed? How would the user interact with the recommender system? For the final assignment you will develop a recommender system for a public broadcaster.

This assignment combines the academic knowledge and practical skills from assignment 1 and 2. The final paper (approximately 5,000 words) should include:

- Develop, design and model a recommender system that includes personalization and values
- Discussion and reflection on the value-sensitive design method and process and how those values were implemented in the recommender system prototype
- In the appendix you are required to include a reflection of the group process. Who was responsible for what? How should the final grade be distributed between group members?

The assessment of the research report will be based on the following criteria:

- Level of research: explanation, implementation and discussion of VSD method (strengths and pitfalls), academic research on values central to the design
- Practical implementation of values in model: level of technical sophistication, logic of design choices, feasibility

- Level of reflection: academic discussion of the central values, motivation for choices made in the implementation of values, critical of own role in design process (potential blind spots)
- Formal elements

Course Schedule

Week 1: Value-sensitive design (Karin and Koen)

Designers of recommender systems instill human values throughout the design process shaping them intentionally and unintentionally. However, the design process, the solutions they create, and the algorithms they use are neither neutral nor value-free. One approach for designers to ensure and safeguard human values throughout the design process of recommender systems is value-sensitive design (VSD). You will use this iterative tripartite design process (Friedman et al. 2006) to uncover the complex relationships among values, technology, and stakeholders.

Readings:

- Friedman, B., Khan, PH, & Borning, A. (2003). Value Sensitive Design: Theory and Methods. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.58.6046&rep=rep1&type=pdf
- Verbeek, PP. (2015). Beyond Interaction: A Short Introduction to Mediation Theory. *Interaction.AC.ORG*, 26-31. https://core.ac.uk/download/pdf/31151236.pdf
- Kheirandish, S., Funk, M., Wensveen, S., Verkerk, M., & Rauterberg, M. (2019). HuValue: a tool to support design students in considering human values in their design. *International Journal of Technology and Design Education*, 1-27. https://link-springer-com.proxy.library.uu.nl/article/10.1007/s10798-019-09527-3
- Smits, A., Nguyen, D., Hekman, E., & van Turnhout, K. (2020). Data-driven UX Design. In *Proceedings of the 22nd International Conference on Engineering and Product Design Education (E&PDE 2020), Herning, Denmark*. https://www.researchgate.net/publication/343182061_Data-driven_UX_Design

Recommendation

- Simon, J., Wong, P. H., & Rieder, G. (2020). Algorithmic bias and the Value Sensitive Design approach. *Internet Policy Review 9(4).* https://policyreview.info/concepts/algorithmic-bias

Week 2: What are recommender systems? (Aletta)

A *recommender system* calculates and provides relevant content to the user based on knowledge of the user, content, and interactions between the user and the item. Algorithms that employ usage data are called collaborative filtering. Algorithms that use content metadata and user profiles to calculate recommendations are called content-based filtering. During this course, you will explore both while working with recommender algorithms. Besides getting practical and hands-on experience with these algorithms you will explore which user behavior is necessary and how to collect this data. During the lab you will build your first content-based recommender system.

Readings:

- Fayyaz, Z., Ebrahimian, M., Nawara, D., Ibrahim, A., & Kashef, R. (2020). *Recommendation Systems: Algorithms, Challenges, Metrics, and Business Opportunities.* Applied Sciences, 10(21), 7748. https://www.mdpi.com/2076-3417/10/21/7748/pdf
- Schrage, M. (2020). *Recommendation Engines.* MIT Press. *Chapter 1, 2 and 4 (pp. 1-63, 109-148)*

Week 3: Algorithmic affordances and interfaces (Koen)

Recent studies have shifted the perspective from the accuracy of the algorithm towards the human factors that affect user satisfaction, trust, transparency and sense of control (He, Parra, and Verbert, 2016). With the user interface as an essential aspect of the recommender system (Cosley et al., 2003; Konstan and Riedl, 2012), the current generation of those systems do little to give users control over the actual recommendations. There is still too little focus on the possibilities for users to control and tune algorithms (Ribeiro, Singh and Guestrin, 2016) and an ongoing critical reflection between users, practitioners, and researchers is lacking.

While some interfaces offer limited interaction in the form of clicking the ‘like’ or ‘dislike’ buttons, the parameters of the algorithm and how the data is interpreted remain hidden. From a user’s perspective, recommender systems are often autonomous black boxes (Pasquale, 2015). During this week you will explore the importance of the user interface and take a first step at designing explicit feedback mechanisms for the hidden affordances of a recommender system.

Readings:

- Djajadiningrat, T., Wensveen, S., Frens, J., & Overbeeke, K. (2004). Tangible products: redressing the balance between appearance and action. *Personal and Ubiquitous Computing*, *8*(5), 294-309. https://link-springer-com.proxy.library.uu.nl/article/10.1007/s00779-004-0293-8
- He, C., Parra, D., & Verbert, K. (2016). Interactive recommender systems: A survey of the state of the art and future research challenges and opportunities. *Expert Systems with Applications, 56*, 9-27. https://www-sciencedirect-com.proxy.library.uu.nl/science/article/pii/S0957417416300367
- Schrage, M. (2020). *Recommendation Engines*. MIT Press. Chapter 5 (pp. 149-176)

Week 4: Metrics and user behavior (Aletta)

Recommender systems, and especially those based on collaborative filtering, need user data in order to function properly (i.e. provide the user with personalized recommendations based on behavior). How can you quantify the user behaviour and how does this affect the recommender system? During this week you will look at the various metrics and user behavior associated with recommender systems. You will measure similarities between sets and can be used to calculate similarity between users where the data is transactional, such as a buy or a like data rating.

You will also start working on your first collaborative recommender system.

Readings:

- Pu, P., Chen, L., & Hu, R. (2011) A user-centric evaluation framework for recommender systems, *RecSys '11: Proceedings of the fifth ACM conference on Recommender systems* (Oct 2011), 157–164.https://doi.org/10.1145/2043932.2043962https://dl.acm.org/doi/abs/10.1145/2043932.2043962
- Helberger, N., Karppinen, K., & D'acunto, L. (2018). Exposure diversity as a design principle for recommender systems. *Information, Communication & Society, 21*(2), 191-207. https://www-tandfonline-com.proxy.library.uu.nl/doi/full/10.1080/1369118X.2016.1271900

Week 5: Guest lecture Andreas Grün (Head of Technology New Media | Data Scientist at ZDF)

In the previous week you started working on a collaborative recommender system. During this week you will continue working on collaborative recommender systems.

Readings:

- Chandrashekar, A., Amat, F., Basilico, J., & Jebara, T. (2017). Artwork Personalization at Netflix.. https://netflixtechblog.com/artwork-personalization-c589f074ad76
- Fields, B., Jones, J., & Cowlishaw, T. (2018). The Case for Public Service Recommender Algorithms. https://piret.gitlab.io/fatrec2018/program/fatrec2018-fields.pdf
- van Es, Karin. 2017. "An Impending Crisis of Imagination: Data-Driven Personalization in Public Service Broadcasters." Media@LSE Working Paper Series (Available in our Teams, General -> Files -> Class Materials)

Recommended

Still struggling a bit with the relationship between values and code, we can highly recommend reading:

- Lessig, L. (2000). Code is Law: On Liberty in Cyberspace. *Harvard Magazine*. https://harvardmagazine.com/2000/01/code-is-law-html

Week 6: Putting the user in the driver's seat (Koen and Erik)

With a better understanding of the inner-workings of recommender systems it is time to revisit the user interface. In this week you will continue designing explicit feedback mechanisms for the hidden affordances of a recommender system. By putting the user in the driver's seat, i.e., giving the user control over the parameters and data of the algorithm also creates new challenges and dilemmas. Would improving the autonomy of the user undermine the authority of the algorithm? Would it help users escape the funnel of their preferences, viewpoints and beliefs or lock them into new ones?

Readings:

- Amershi, S., Weld, D., Vorvoreanu, M., Fourney, A., Nushi, B., Collisson, P., ... & Horvitz, E. (2019, May). Guidelines for Human-AI Interaction. In *Proceedings of the 2019 CHI conference on human factors in computing systems* (pp. 1-13).

https://www.microsoft.com/en-us/research/uploads/prod/2019/01/Guidelines-for-Human-AI-Interaction-camera-ready.pdf

- Eslami, M., Karahalios, K., Sandvig, C., Vaccaro, K., Rickman, A., Hamilton, K., & Kirlik, A. (2016, May). First I" like" it, then I hide it: Folk Theories of Social Feeds. In *Proceedings Of The 2016 CHI Conference On Human Factors In Computing Systems* (pp. 2371-2382). https://dl-acm-org.proxy.library.uu.nl/doi/10.1145/2858036.2858494

Week 7 - 10: Final project implementing values in recommender systems

In the final four weeks you will work on the final assignment in a group of max three students. Here you are expected to find and read your own literature related to the values you seek to implement. You will have weekly meetings of 20 minutes with Erik Hekman to discuss group progress. In consultation with the societal partner we intend to organize final presentations/pitches of relevant projects. This will be announced in week 7.