



# User Needs and Challenges in Digital Musicology

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# Our group

- Department of Information and Computing Sciences
  - division of Interaction Technology
    - Multimedia technology
      - **MUSIC**



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Jan Van Balen



Geert-Jan Giezeman



Remco Veltkamp



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Anna Aljanaki



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# What we do

- research at the intersection of computer science and music, connecting computer science methodology to state-of-the-art domain knowledge of music
- three areas
  - Music Information Retrieval
  - Computational / Digital Musicology
  - Music Technology for Games and Virtual Worlds
- past and current projects
  - WITCHCRAFT (folksong)
  - C-Minor (harmonic similarity)
  - MUSIVA (musical variation and similarity)
  - COGITCH (hooks in popular music)
  - Sensing Emotion in Music (induced emotion)



# Our 'big' data

- Dutch folk songs: Meertens Tune Collections
  - created by Meertens Institute
  - audio (c. 7000), symbolic (c. 5000), metadata, expert annotations
  - to be published soon at [www.meertens.knaw.nl/](http://www.meertens.knaw.nl/)
- Dutch popular songs from the 1930s (in progress)
  - being digitized by Sound and Vision
  - aim: c. 5000 78RPM records
- Hooked! data (in progress)
  - with University of Amsterdam
  - memorability of music from the Dutch Top-2000
  - crowdsourcing / game
  - currently c. 100,000 observations
  - <http://hookedgame.humanities.uva.nl/#About>

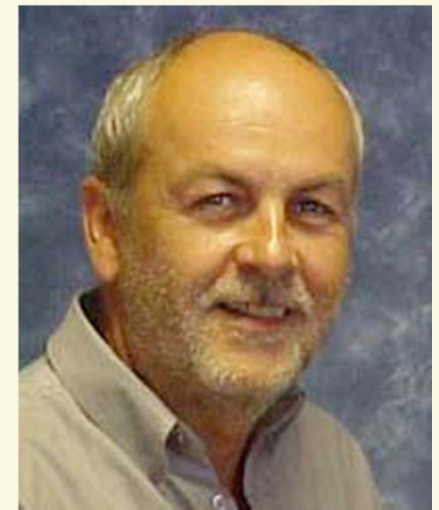
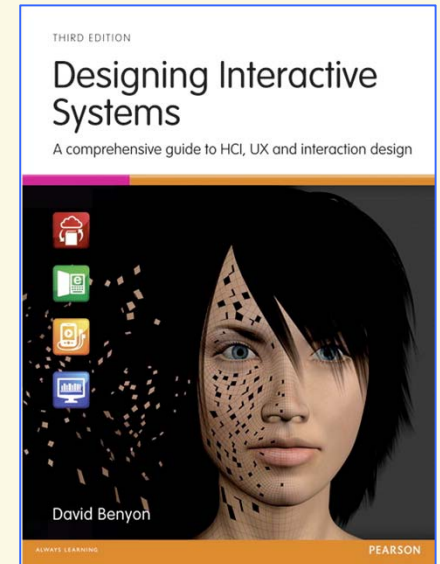


# My teaching includes

- *Design of Interactive Systems*
- ... is concerned with developing high quality interactive systems, products and services that fit with people and their ways of living (David Benyon)



- human-centred design
  - not just 'user-centred'
- people-technology system
  - seamless integration of human and tool
  - supports and enhances work practice





# Human-centred design for musicology

- not many successful people-technology systems around
- core issue: acceptability
  - what makes people want to use technology?
  - what prevents people from using it?
- understanding musicologists
  - what do musicologists do?
  - what do they value?
- how?
  - observation: anthropology
  - ask questions: survey



# Survey on Digital Musicology

- specifically about Music Information Retrieval research challenges coming from Digital Musicology
- preliminary analysis based on first 30 respondents

profession	number
musicologist	15
computational/digital musicologist	7
computational/digital musicologist and MIR researcher	3
MIR researcher	2
Music librarian	1
Music librarian, composer	1
Composer, information engineer	1

- see also <http://www.ppgia.pucpr.br/ismir2013/wp-content/uploads/2014/02/lbd4.pdf>



# Questions

1. What, in your opinion, is the most important open problem (technical or otherwise) in Digital Musicology?
2. What are other important open problems in Digital Musicology?
3. Specifically, what 'Grand Challenge' should Digital Musicology propose to the MIR community?





# Open problems

Category	Open problems		
	main	other	total
<b>Institutional / organisational issues</b>			
1. access to online resources	5	1	6
2. institutional orphanhood		2	2
3. awareness of digital publication and IP	1	1	2
4. sustainability and funding	2	1	3
<b>Methodology</b>			
5. musicological goals and collaboration	4	1	5
6. relating tools and research questions	1	6	7
7. interfaces, usability and training	4	6	10
<b>Resources</b>			
8. data creation	7	8	15
9. quality of resources		3	3
10. music encoding standards	5	3	8
11. findability	1	1	2
12. usage and circulation		1	1
<b>Processing</b>			
13. automatic analysis tools	3	2	5
14. joint handling of scores and recordings	4	2	6
<b>Total</b>	<b>37</b>	<b>38</b>	<b>75</b>



# Open problems, sorted

Category	Open problems		
	main	other	total
8. data creation	7	8	15
7. interfaces, usability and training	4	6	10
10. music encoding standards	5	3	8
6. relating tools and research questions	1	6	7
1. access to online resources	5	1	6
14. joint handling of scores and recordings	4	2	6
5. musicological goals and collaboration	4	1	5
13. automatic analysis tools	3	2	5
4. sustainability and funding	2	1	3
9. quality of resources		3	3
2. institutional orphanhood		2	2
3. awareness of digital publication and IP	1	1	2
11. findability	1	1	2
12. usage and circulation		1	1
<b>Total</b>	<b>37</b>	<b>38</b>	<b>75</b>



# Collaboration

A lack of understanding of MIR researchers like myself on the challenges... in musicology itself (36)

a clearer understanding of what "the digital" means in a traditional musicologists working life (32)

An active 'dialogue' between musicologists and researchers (42)

The relation between musicological research questions ... and abstract models and datastructures... has not yet begun to be explored systematically (2)

Let's start by asking good questions, then build tools to answer them. (31)



# Power

A major problem in my opinion is an appropriate funding of research projects (21)

Sustainability. Things get funded for project A and then the funding runs out (30)

lack of 'political' and 'organisational' power to further Digital Musicology (46)

...the need to communicate to musicologists who work on critical editions to stop "giving away" their work to publishers... [otherwise] digital musicology for the next 100 years will be stuck with inferior (public-domain) editions...(7)



# Data

The biggest problem for my research is the lack of a comprehensive corpus of music represented in symbolic form (8)

Copyright access to digital media for analysis (47)

More sophisticated tools in O[ptical] M[usic] R[ecognition] (10)

Developing non-proprietary musical codes that can be used universally for all our needs (29)

Greater dissemination of knowledge about and implementation of M[usic] E[ncoding] I[nitiative] (5)





# Usability

For me, the biggest problem, hands down, is time to learn the available tools (15)

the difficulty for musicians to handle with software like music21 (4)

I guess we need to work on both ends. That is training musicologist to use the tools, but also encouraging technology people to develop tool as user friendly as possible (40)



# Processing

The joint handling of scores and recordings in terms of search, annotation and information extraction (1)

'Musical scene analysis', the musical version of Bregman's famous 'auditory scene analysis'... being able to select a melodic phrase in a representation of the score and to be delivered the audio which extracts the right time segment and, even more difficult, the right audio components... (24)

We have to make important discoveries if we are to gain the attention and respect of our musicology colleagues. (7)



# Challenges for MIR

Category	MIR challenges
<b>Institutional / organisational issues</b>	
1. access to online resources	3
2. institutional orphanhood	
3. awareness of digital publication and IP	
4. sustainability and funding	
<b>Methodology</b>	
5. musicological goals and collaboration	1
6. relating tools and research questions	1
7. interfaces, usability and training	2
<b>Resources</b>	
8. data creation	7
9. quality of resources	1
10. music encoding standards	1
11. findability	
12. usage and circulation	
<b>Processing</b>	
13. automatic analysis tools	4
14. joint handling of scores and recordings	7
<b>Total</b>	<b>27</b>



# Querying musical data

Solve the Optical Music Recognition problem, and use OMR to create a huge database of musical scores available for research (8)

Digitizing manuscript sources, old journals, recordings and creating a database of primary musicology sources (26)

Explore the nature of a musical 'query' in the digital domain... [beyond] music as a searchable string. We need some vision of other types of queries that are central to musical study (in polyphonic contexts, for instance) (44)



# Intelligent systems

Incorporate richer and more funded knowledge about music into music information systems (2)

The connexion (mapping) between audio and symbolic descriptors with “musical meaning” (39)

Make the same search interface / technology available for searches across scores, across recordings and within one recording. Make the interface simple and intuitive as well as powerful as possible. Integrate as much music as possible... (1)

a music player which has an intelligent pause button. Hitting play would cause the music to restart playing not at the precise instant when the pause button was hit but at the beginning of the phrase (24)





# Music history

move into the 'historical realm' of musicology →  
how to encode, mine, analyse the existing  
corpora of historical data regarding music? (46)

Bring us fully searchable scores for all notated  
repertories of Western music (31)

How about: Build a program that estimates  
the date of composition for any arbitrary  
score of Western art music (7)

Resuscitate the study of structure in Western art music by  
developing tools for (1) accurate and efficient encoding of  
complex scores and (2) extracting structure of various types  
from these encodings and (3) visualising and sonifying the  
results of these analyses (35)



# Future work

- analyse all responses
  - new topics include interactivity and ontologies
- survey musicologists
  - through International Musicological Society?
  - other national and international societies?
- observe work practices
  - anthropological track in e.g. *Transforming Musicology?*

