



VRIJE
UNIVERSITEIT
BRUSSEL

Next Generation User Interfaces

Course Review

Prof. Beat Signer

Department of Computer Science
Vrije Universiteit Brussel

beatsigner.com





Course Summary

1. Introduction

- history of human-computer interaction
 - analogue computers, direct manipulation, mouse, desktop metaphor, innovative forms of interaction
- interface types and natural user interfaces
- interaction design process (lifecycle model)
 - establish requirements, design alternatives, prototyping, evaluation
- types of requirements
 - functional requirements, data requirements, environmental requirements, ...
- user-centred design
- prototyping
 - different forms of low-fidelity prototyping
- evaluation
 - why, what, where and when?



Course Summary ...

2. Information Architectures

- personal information management
- memory types
- PIM systems
- RSL metamodel, cross-media PIM and MindXpres
- paper: *Towards Cross-Media Information Spaces and Architectures*

3. Multimodal Interaction

- human senses
- Bolt's "Put-that-there"
- multimodal fusion and fission
- ten myths of multimodal interaction
- CARE properties
- multimodal interaction frameworks



Course Summary ...

4. Pen-based Interaction

- history and affordances of pen and paper
- digital pen and paper solutions
- iPaper research
- innovative hardware and materials
 - printed electronics, AR headsets, ...

5. Interactive Tabletops and Surfaces

- multi-user tabletop interfaces
- enabling technologies and frameworks
 - resistive, surface capacitive and projected capacitive touch panels, SAW
- applications



Course Summary ...

6. Gesture-based Interaction

- gesture types
 - semiotic (symbolic, deictic, iconic and pantomimic), ergotic and epistemic
- gesture recognition devices
- gesture design guidelines
- gesture spotting and recognition solutions
- paper: *Gestural Interfaces: A Step Backward In Usability*

7. Tangible, Embedded and Embodied Interaction

- history of graspable and tangible user interfaces
- applications
- tangible bits and radical atoms
- tangible holograms (TangHo)
- paper: *Radical Atoms: Beyond Tangible Bits, Toward Transformable Materials*



Course Summary ...

8. Virtual and Augmented Reality

- technologies
 - large screen, BOOM, CAVE, head-mounted display
- VR navigation and interaction techniques
- augmented reality techniques
 - magic lens, magic mirror, magic eyeglass, optical/video see-through HMDs
- applications

9. Data Physicalisation

- advantages
- enabling technologies
- examples
- research challenges
- dynamic data physicalisation framework



Course Summary ...

10. Implicit Human-Computer Interaction

- context
- intelligibility
- affective computing
- emotion classification models
- emotion recognition modalities

11. Human-AI Interaction

- challenges
- guidelines
- human-centred artificial intelligence (HCAI)
- HCAI framework
- prometheus design principles



Course Summary ...

12. Case Studies and Future Research

- applications
- role of visions in HCI research
- future of work and workers
- human-AI collaboration



Exam



- Exams will take place on *June 11/12, 2026*
- Oral exam in English (20 mins slot)
 - covers content of lectures and exercises
 - counts for 40% of the overall grade
 - 5 mins questions about the assignment
 - 15 mins questions about the course content (no preparation time)
- You will have to register for a specific examination slot
- Overall grade = oral exam (40%) + assignment (60%)
 - students have some flexibility in distributing the grades for the assignment (± 2 points)
 - by default all team members get the same grade for the assignment
 - send us an email *before June 1, 2026* if you want to change the distribution



Exam ...



- Submission of the assignment report, source code and video via Canvas
 - *deadline: May 24, 24:00 (UTC+1)*
- The exam will cover *all the content presented in the lectures* as well as *any additional information from the exercise sessions*
 - *includes the videos* shown in some of the lectures
- Make sure that you *understand the basic concepts*
 - however, we might ask questions at any level of detail to evaluate your knowledge
- Make sure that you can report about any aspects of the assignment



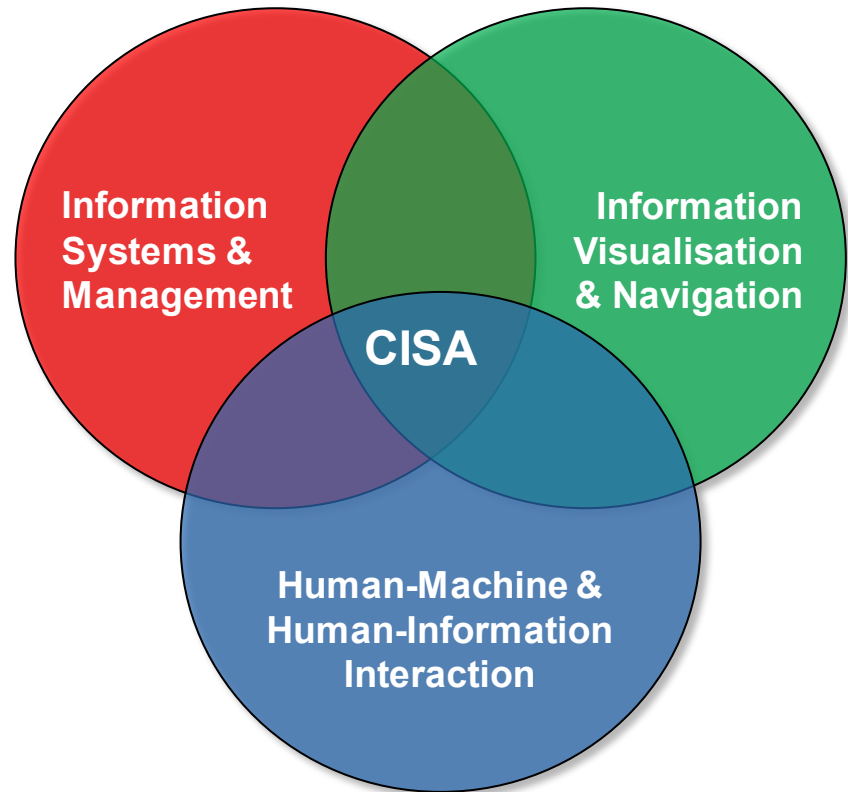
Exam ...



- Remember to *read the following three papers* as they form part of the course material
 - B. Signer, *Towards Cross-Media Information Spaces and Architectures*, Proceedings of the 13th International Conference on Research Challenges in Information Science (RCIS 2019), Brussels, Belgium, May 2019
 - <https://beatsigner.com/publications/towards-cross-media-information-spaces-and-architectures.pdf>
 - D.A. Norman and J. Nielsen, *Gestural Interfaces: A Step Backward In Usability*, interactions, 17(5), September 2010
 - <https://doi.org/10.1145/1836216.1836228>
 - H. Ishii, D. Lakatos, L. Bonanni and J.-B. Labrune, *Radical Atoms: Beyond Tangible Bits, Toward Transformable Materials*, interactions, 19(1), January 2012
 - <https://doi.org/10.1145/2065327.2065337>



CROSS-MEDIA INFORMATION SPACES
AND ARCHITECTURES (**CISA**)



Prof. Dr. Beat Signer
Cross-Media Technology, Interac-
tive Paper, Data Physicalisation



Dr. Maxim Van de Wynckel
Interoperable Positioning
Systems, Implicit HCI



Ingela Rossing
Dynamic Data Physicalisation
Framework and Guidelines

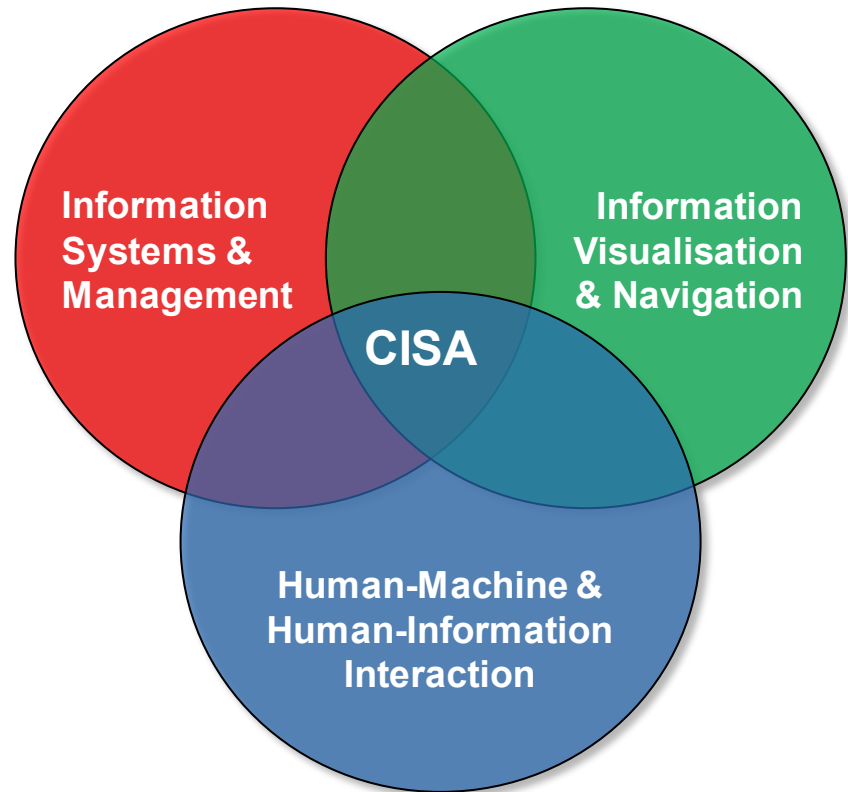


Jan Boonants
Mixed Reality Information Archi-
tectures, Generic IoT Interfaces



Wise WEB & INFORMATION SYSTEMS ENGINEERING

CROSS-MEDIA INFORMATION SPACES AND ARCHITECTURES (**CISA**)



Qi Xu
Next Generation Scholarly
Workflows, Cross-Media PIM



Isaac Valadez
Digital Twin User Interfaces,
Hybrid GUI-LLM Interfaces



Bingyan Lee
Next Generation User Interfaces
for Human-Information Interaction

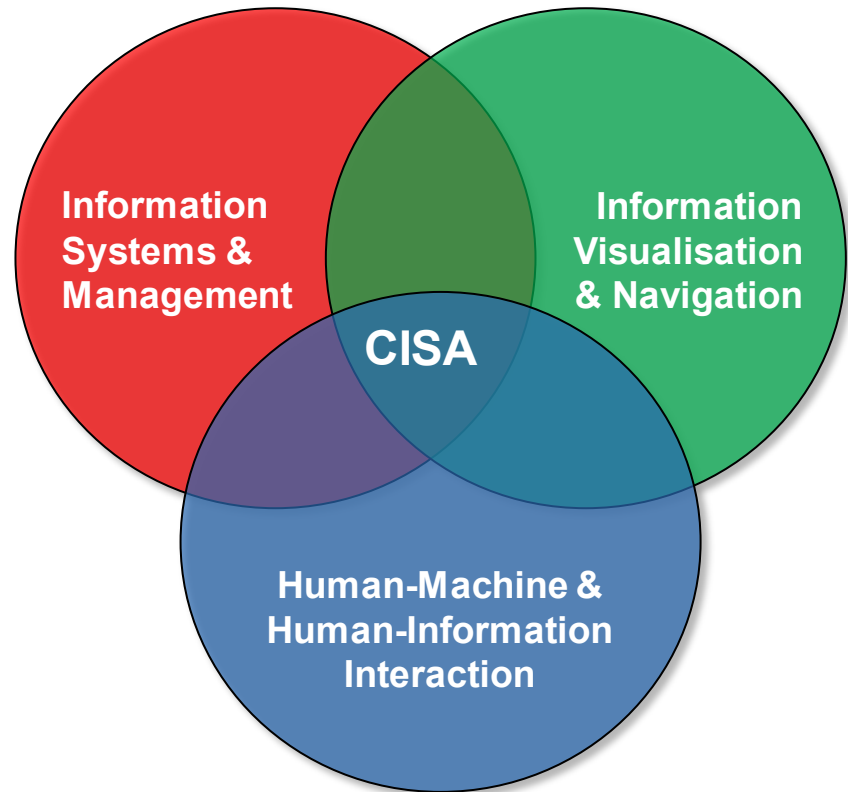


Yoshi Malaise
Technology-enhanced Learning,
Content-driven Presentations



Wise WEB & INFORMATION SYSTEMS ENGINEERING

CROSS-MEDIA INFORMATION SPACES AND ARCHITECTURES (**CISA**)



Xuyao Zhang
Extensible Platform for Dynamic
Data Physicalisation



Ekene Attah
IoT Middleware, Context-aware
Computing, Implicit HCI



Piet Van Der Paelt
Julia-based Framework for
Simulation and Optimisation



Patrick Sello
Digital Twins for Healthcare,
Federated Learning

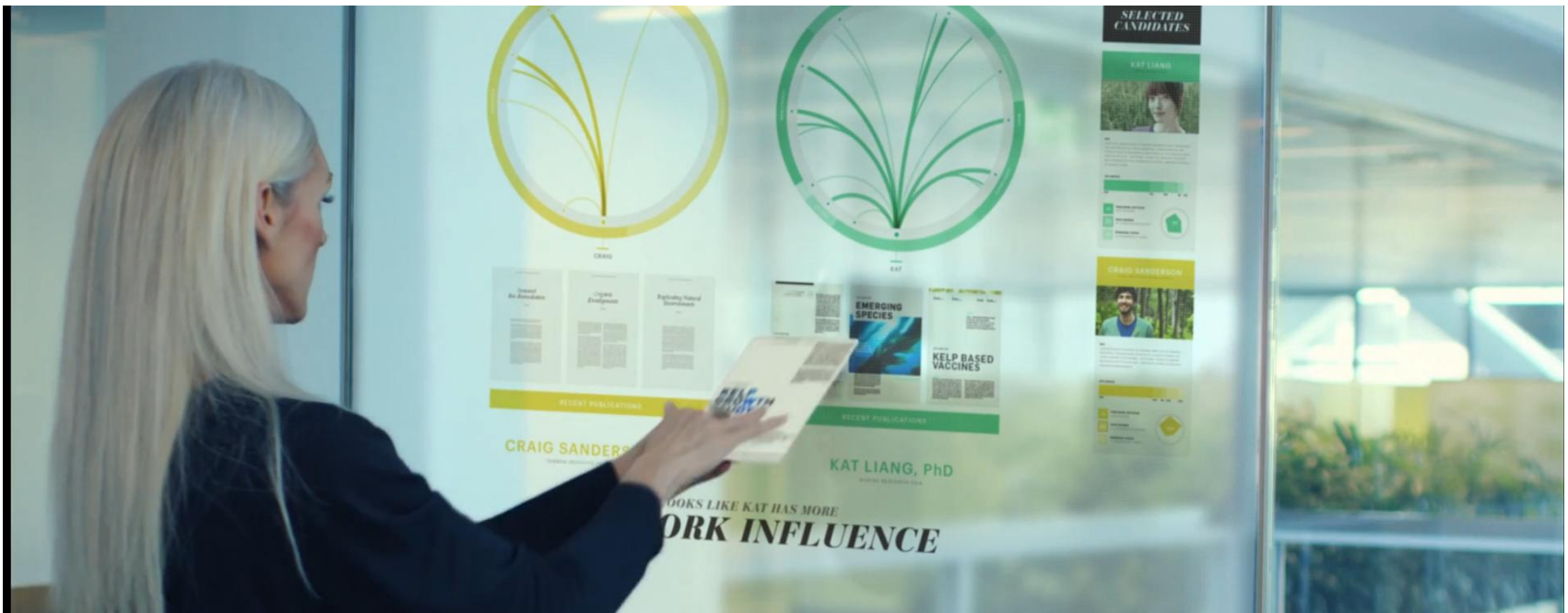


Are You Interested in a Thesis?

- Various possibilities for *MA and PhD theses*
 - Data Perceptualisation
 - extensible dynamic data perceptualisation platform and framework
 - Personal Information Management (PIM)
 - Technology-enhanced Learning
 - Next Generation Scholarly Workflows
 - Innovative Mixed Reality Interfaces and Interaction Paradigms
 - AR-based human-information interaction, AR-IoT, interactive paper, ...
 - Next Generation Presentation Solutions (e.g. MindXpres)
 - Human-AI Interaction and Digital Twin Solutions
 - Smart Environments and Cross-Domain Internet of Things (IoT)
 - ...
 - *Do you have your own ideas? Come along to discuss them ...*
 - <https://wise.vub.ac.be/thesis-proposals>



Video: Microsoft Productivity Vision (2015)





References

- Microsoft Productivity Future Vision (2015)
 - <https://www.youtube.com/watch?v=w-tFdreZB94>





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The End

Good Luck with the Exam!

