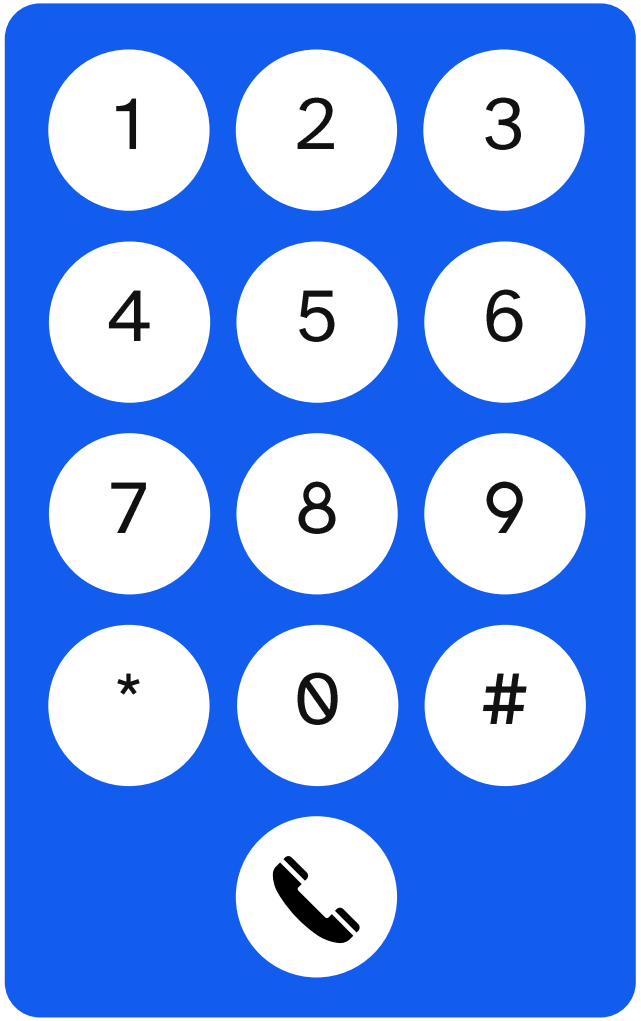
Introduction to Human-Computer Interaction

Section 1

Introduction and Overview

5/28/2025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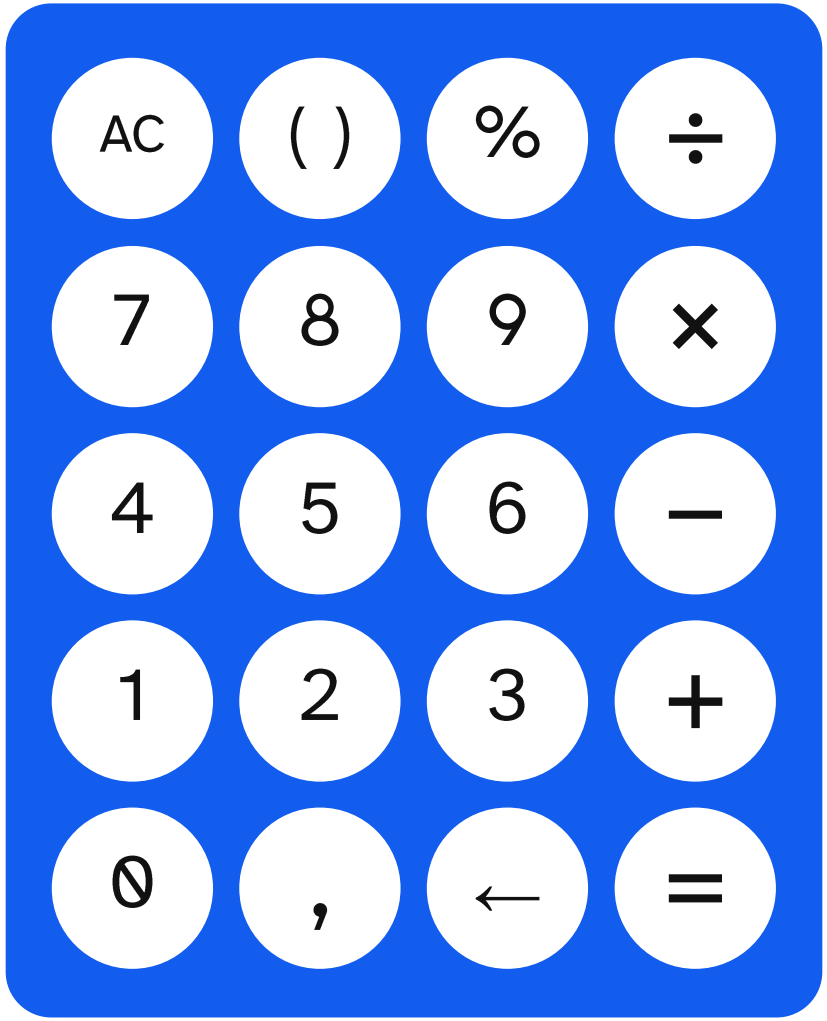
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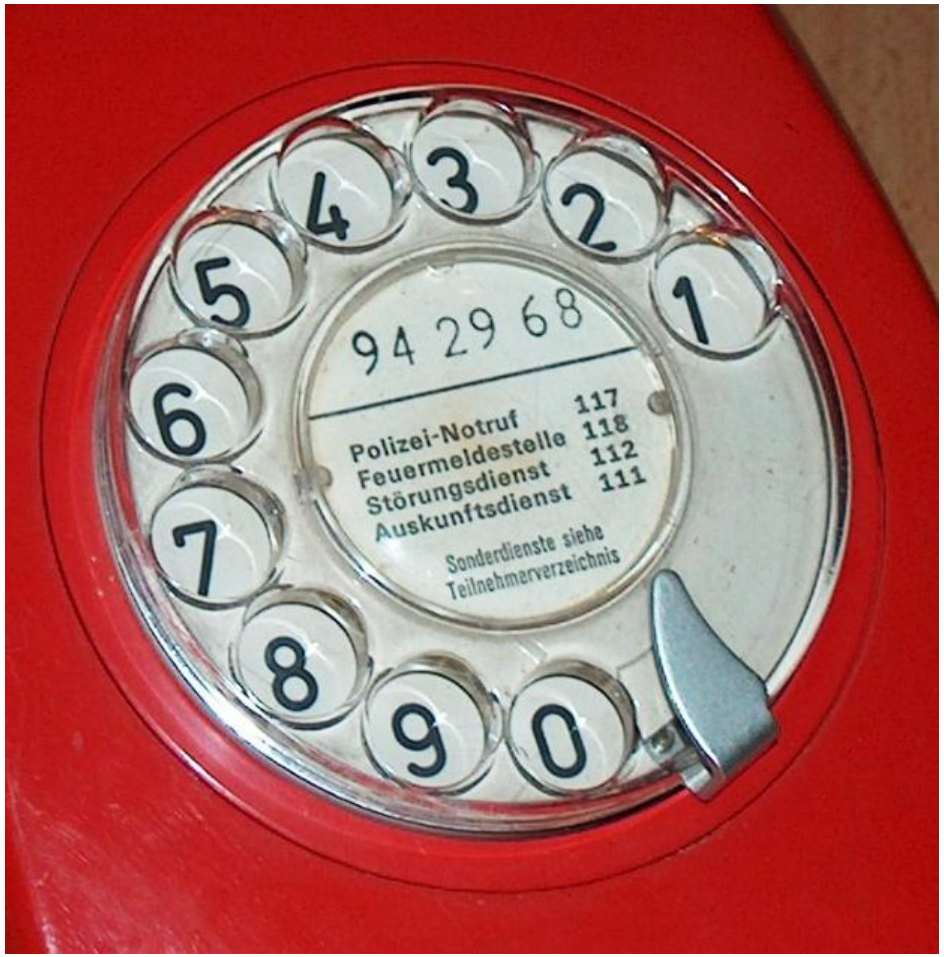
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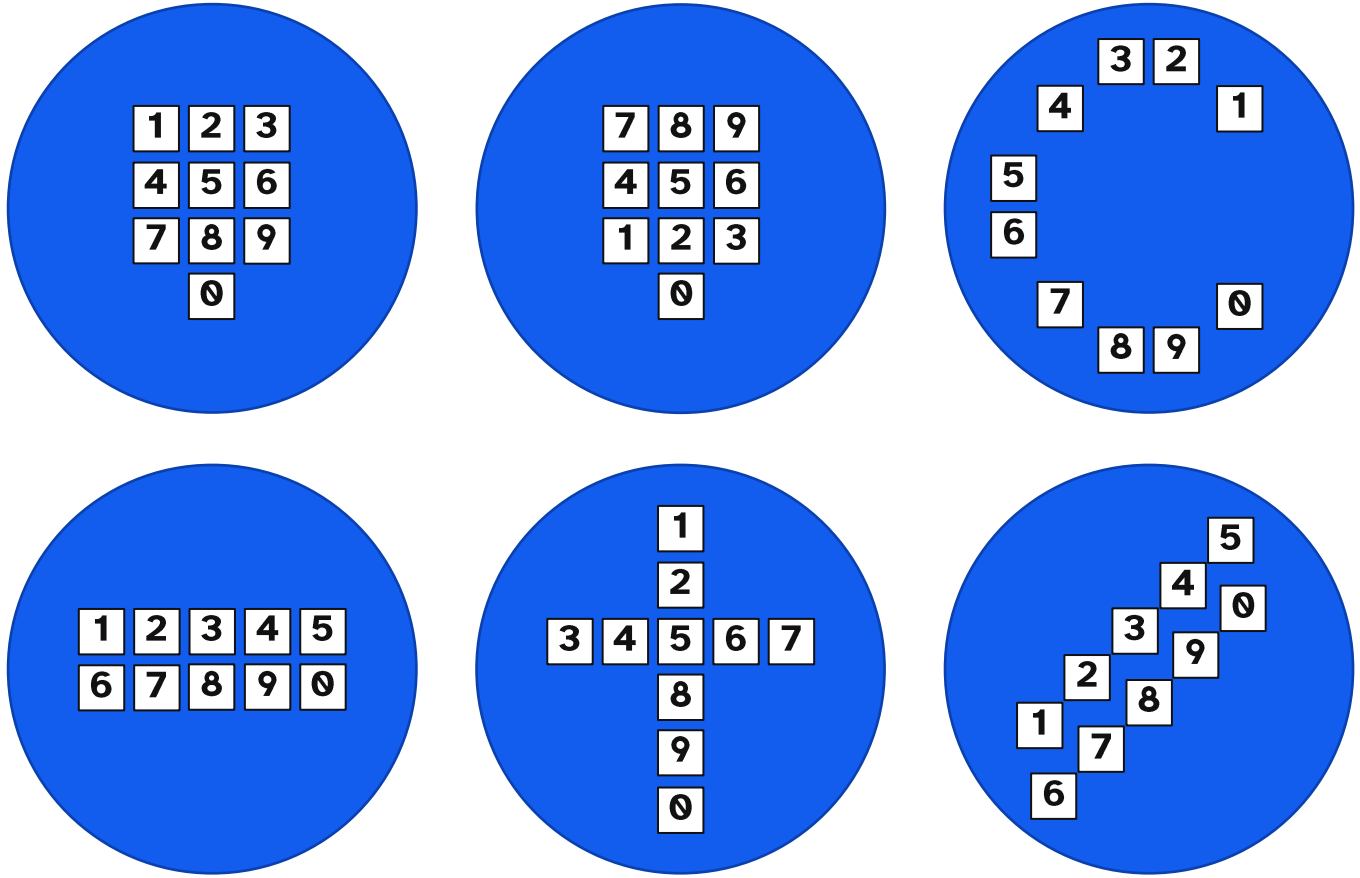


R. L. Deininger et al., 1960: [Human factors engineering studies of the design and use of pushbutton telephone sets](), The Bell System Technical Journal, vol. 39, no. 4

Introduction: Julian Fietkau

2007–2015: University of Hamburg

Computer science (B.Sc. & M.Sc.)

Specializing in human-computer interaction

2015–2016: Bauhaus University, Weimar

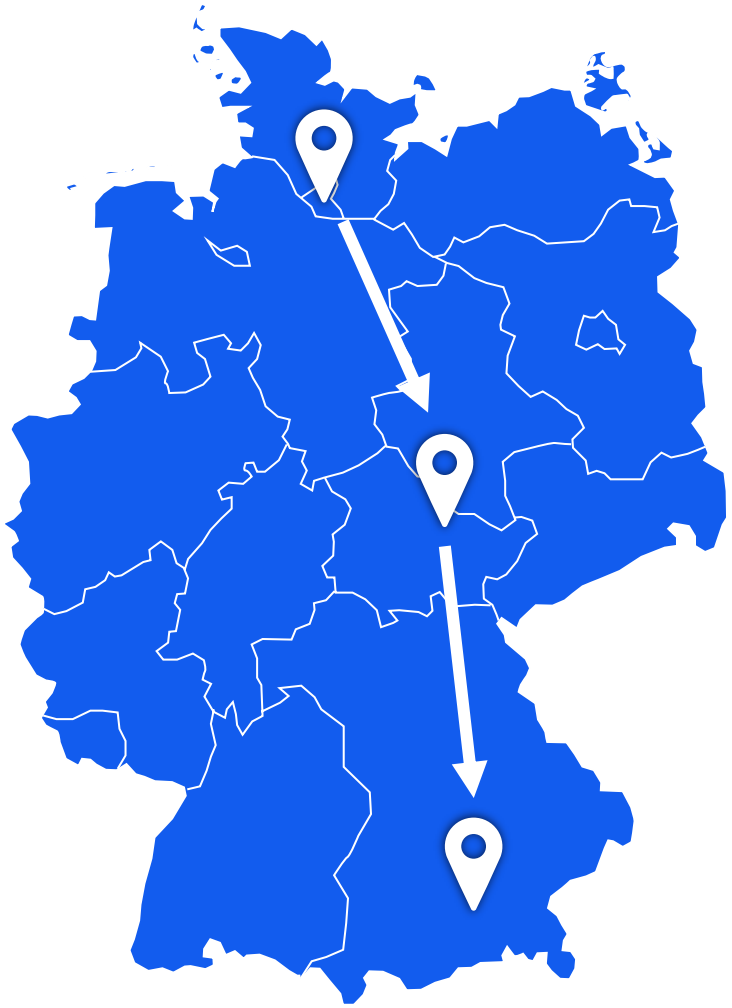
Research associate at the chair for human-computer interaction

2016–now: University of the Bundeswehr Munich

Research associate at the chair for human-computer interaction

Doctorate (Dr. rer. nat.) in computer science, 2023

Researching: usage and usability of public or semi-public interactive technology (especially large touch displays) for different target audiences

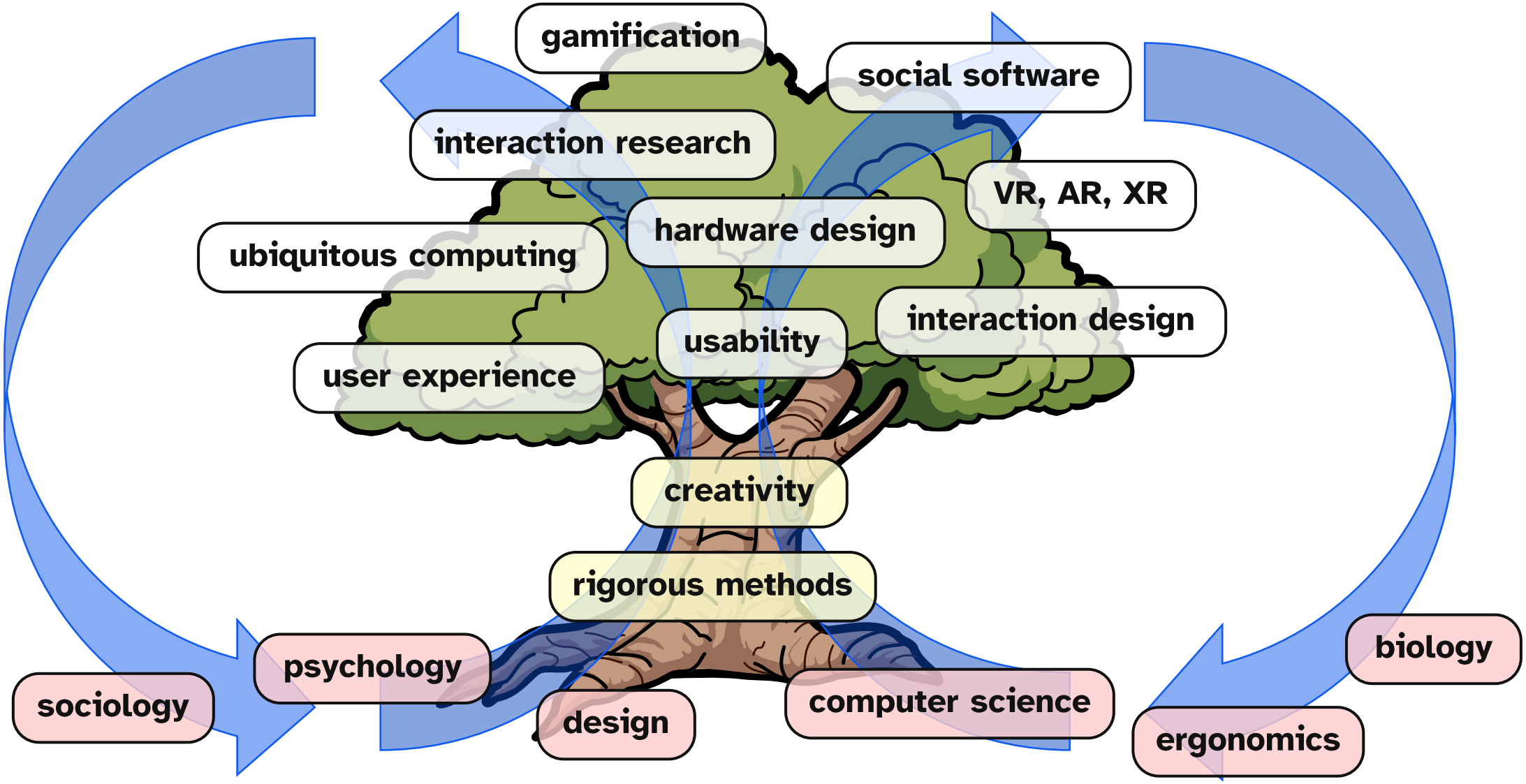


https://fietkau.me https://fietkau.social/@julian

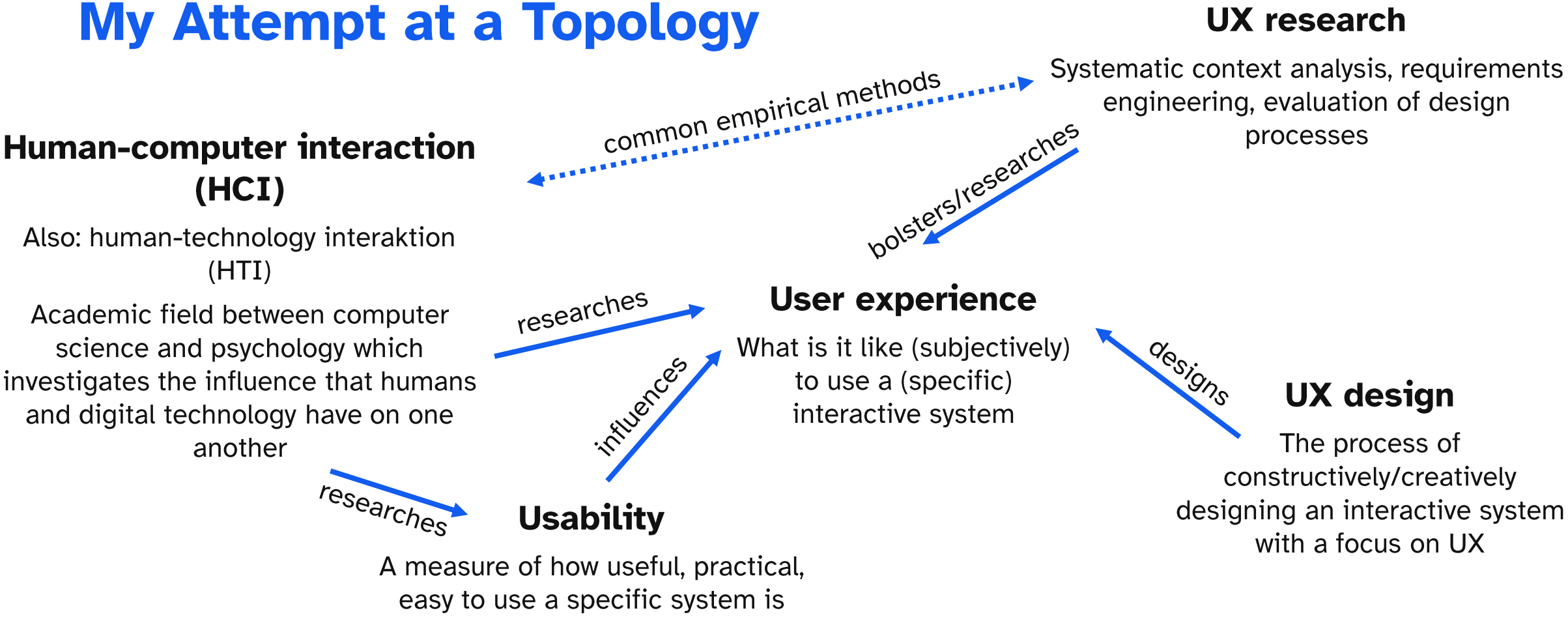
Round of Introductions

1. Name, major / degree / job / company
2. Your understanding of the word “human-computer interaction”
3. Requests and expectations for this course

What is Part of HCI?



My Attempt at a Topology



- Out in the world: lots of different things under the same name, lots of the same things under different names. I recommend not to get too hung up on the exact word choice.
- Some specific definitions (referring to important standards) in a bit!

Content of an Introductory Course

- 2.3.1 Nature of Human-Computer Interaction (N)
  - N1. The Nature of Human-Computer Interaction
- 2.3.2 Use and Context of Computers (U)
  - U1. Social Organization and Work
  - U2. Application Areas
  - U3. Human-Machine Fit and Adaptation
- 2.3.3 Human Characteristics (H)
  - H1. Human Information Processing
  - H2. Language, Communication and Interaction
  - H3. Ergonomics
- 2.3.4 Computer System and Interface Architecture (C)
  - C1. Input and Output Devices
  - C2. Dialogue Techniques
  - C3. Dialogue Genre
  - C4. Computer Graphics
  - C5. Dialogue Architecture
- 2.3.5 Development Process (D)
  - D1. Design Approaches
  - D2. Implementation Techniques and Tools
  - D3. Evaluation Techniques
  - D4. Example Systems and Case Studies

Thomas T. Hewett et al., 1992: ACM SIGCHI Curricula for Human-Computer Interaction, Association for Computing Machinery

My Own Plan for this Course

- **n** sessions (including today), fixed topic for each date
- Time slots contain lecture-like segments with informational content, interactive discussions and mini-exercises, as well as more extensive exercises in individual or team work.
  - Please have a pen and paper with you for the lecture sessions, even if you do not normally take handwritten notes.
- I recommend working on the lecture content afterwards rather than in advance.
  - The lecture dates are planned in such a way that they are understandable for undergraduate students of computer science without having to read the slides in advance. I therefore recommend that you use your self-study time to go through the content again after a lecture and check your own understanding.
- Note: the slides alone (without attendance and your own notes) are not guaranteed to be suitable for self-study. If you are unable to attend the course, self-study will require increased use of the book recommendations and additional research of your own.
- Now: further introduction to usability, then a course overview

Recommendations for Supporting Literature

- Don Norman, 2013: **The Design of Everyday Things: Revised and Expanded Edition**
- Steve Krug, 2014: **Don‘t Make me Think!**
- Jef Raskin, 2000: **The Humane Interface**
- John Ferrara, 2012: **Playful Design**

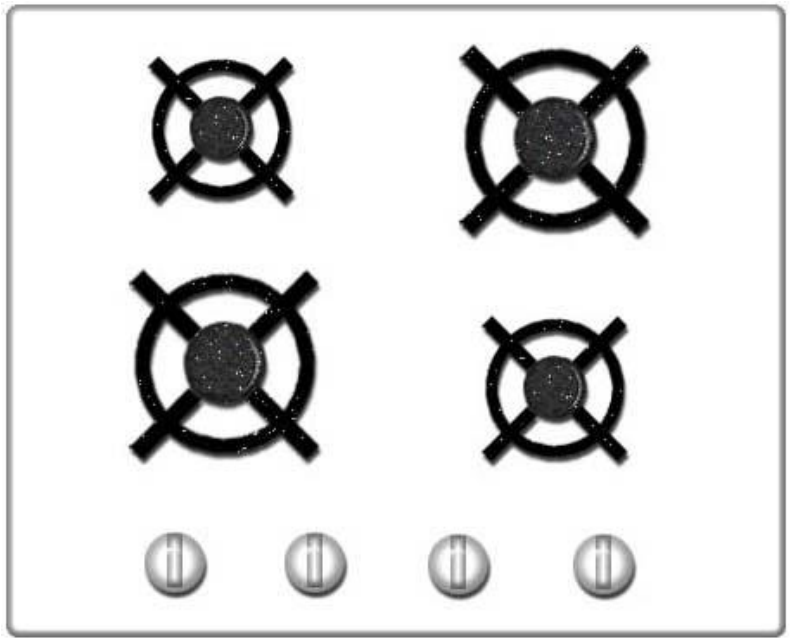
Usability – Everyday Examples

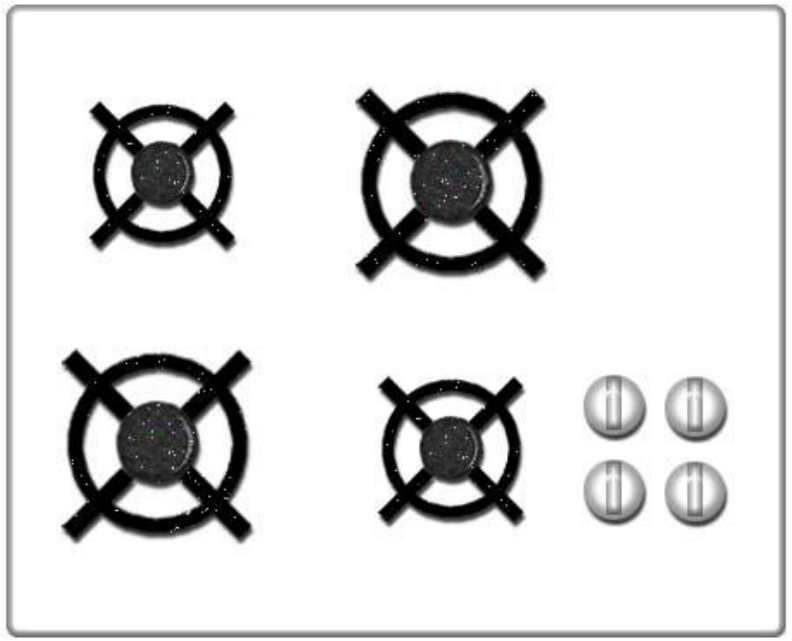
VS.

Scott Jenson, 2024: Microwave comparison, Mastodon / CC BY-SA 4.0

Usability – Everyday Examples

An interaction design classic: stovetop controls





User:G5dvdyeh, 2008: Old style kitchen stove & Kitchen stove with full natural mappings controls, Wikimedia Commons / FAL 1.3

Case Study – Iran Air 655

Aegis Combat System Mk7, US Navy, 1988

July 4, 1988

The Washington Post

Navy Missile Downs Iranian Jet Liner Over Gulf; Iran Says 290 Are Dead; U.S. Expresses Regret

Pentagon Says Radar on Aegis Cruiser Mistook Airbus for Attacking F14

Washington Post, July 4 1988

Kyra Dempsey, 2022: The Long Shadow of War: The story of the shootdown of Iran Air flight 655, Medium

Usability – Definition

Usability

from *use/usage* and *ability*

> **Usability** is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.

ISO 9241-11:2018

Usability – Definition

Usability is the extent to which a product can be used by specified users to achieve specified goals with **effectiveness**, **efficiency**, and **satisfaction** in a specified context of use.

ISO 9241-11:2018

- **Effectiveness:** accuracy and completeness of achieving the goal
- **Efficiency:** the cost (time, effort, resources) is low in relation to the result
- **Satisfaction:** using the system fulfills the expectations of the person who is using it

Discussion: Usability

- Can you think of an example from your everyday life where you have been annoyed by poor usability?
- How was the effectiveness, efficiency or satisfaction affected in that case?
- What are possible consequences of poor usability in everyday life?

HCI – Definition

Human-computer interaction is a discipline concerned with the **design**, **evaluation** and **implementation** of **interactive computing systems for human use** and with the study of major phenomena surrounding them.

Thomas T. Hewett et al., 1992: ACM SIGCHI Curricula for Human-Computer Interaction, Association for Computing Machinery

HCI – Definition

Human-computer interaction includes:

- Understanding how people interact with computers and what happens in the process
- Designing and implementing new ways for people to interact with computers

The term “computer” here can mean a desktop computer, but also includes laptops, tablets, cell phones, digital glasses or a variety of other interactive electronics. It refers to both the software and hardware involved.

HCI research involves both behavioral science (observing and understanding) and design science (constructing and evaluating).

Philip Guo, 2012: Clarifying Human-Computer Interaction,
Communications of the ACM Volume 57, Number 2

We now proceed to the preview...

Section 2: Basics of Cognition

- Nervous system
- Thinking and planning
- Learning and remembering
- Mental models
- Intuition, intuitive use
- Design metaphors

Section 3: Perception and Communication

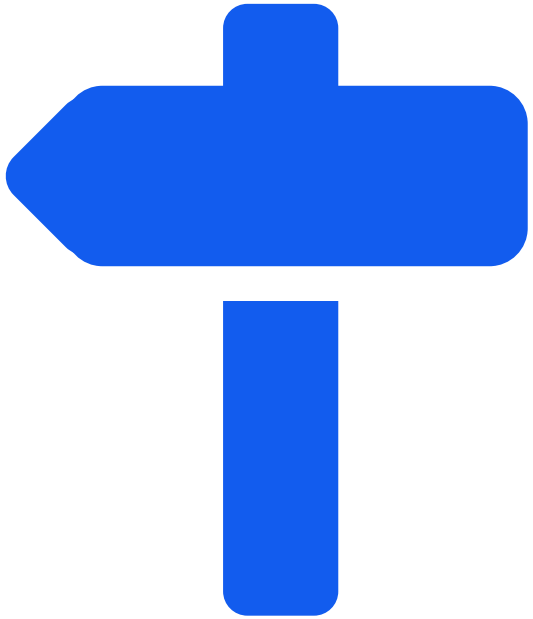
- Sensory modalities
- Visual perception
  - Image recognition
  - Surface recognition
  - Object recognition
  - Category recognition
- Communication
  - Basic semiotics
  - Parts of a language system
  - Acts of communication

Section 4: Guidelines for Interaction Design

- Laws
- Standards and norms
- Heuristics
- Style Guides

Section 5: The Usability Engineering Process

- Purpose of process models
- User-Centered Design
  - Process phases
  - Perspectives on UCD
- Human-Centered Design
- Contextual Design
  - Central questions
  - Process
- Participatory Design



Section 6: Context Analysis

- Observational studies
- Contextual inquiry
- Diary studies
- Personas
- Use cases

Section 7: Design and Prototyping

- Generating ideas
- Design methods
- Kinds of prototypes
- Paper prototypes
- Digital prototyping tools

Section 8: Evaluation

- Purpose of evaluation
- Evaluation methods
  - Questionnaires
  - Interviews
  - Observational studies
  - etc.
- Choosing methods
- Planning an evaluation

Section 9: Interaction Paradigms

- Specifics of the different “worlds”
- PC / laptop
- Mobile
- Web
- Extended Reality (XR)
- Conversational UI

Section 10: Computer-Supported Cooperative Work

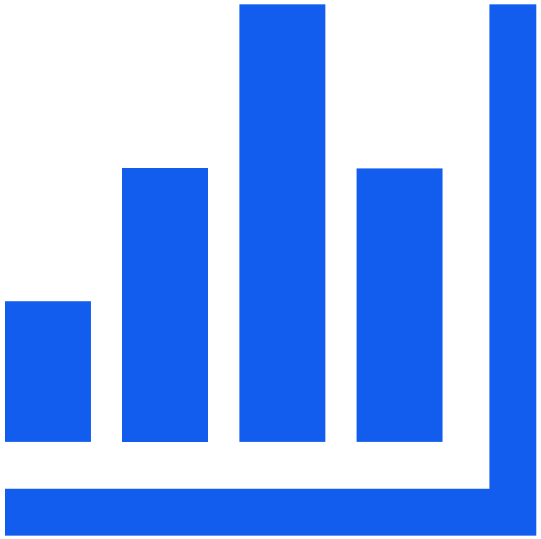
- Basic concepts
- Shared tools and spaces
- Communication via computers
- Social platforms

Section 11: Accessibility

- What is accessibility
- Common handicaps
- Technical aids
- Accessible web development

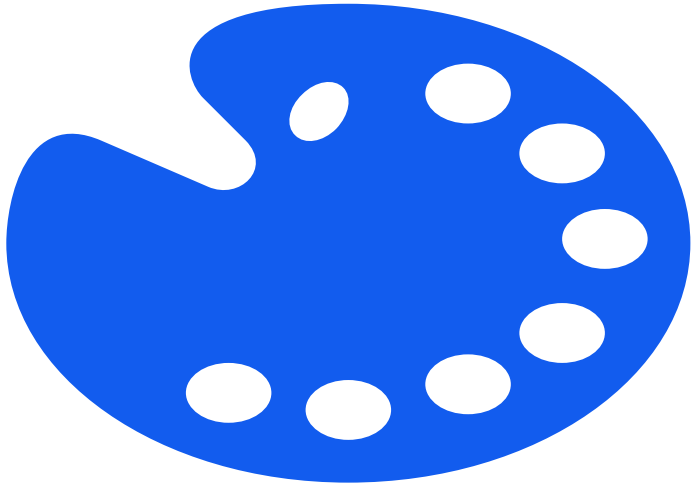
Section 12: Information Architecture and Data Visualization

- Information architecture
  - Principles
  - Navigation patterns
- Data visualization
  - Principles
  - Scales, dimensions, axes
  - Diagram types



Section 13: Visual Design

- Colors
  - Basic color theory
  - Color spaces
  - Color palettes
- Graphics
  - Raster graphics
  - Vector graphics
  - File formats
- Typography
  - Fonts
  - Text formatting



Section 14: HCI over Time

- History of interactive systems
  - Groundbreaking user interfaces
  - Forgotten highlights
- HCI methods over the decades
  - What is the current “HCI zeitgeist”?
- Where are we headed?

Section 15: Professional Values and Ethics

- What are the ethical boundaries of HCI and UX?
- What responsibilities do we shoulder?
- What professional values do we embody?
  - How do they manifest in our work?

Overview

1	Introduction and Overview
2	Basics of Cognition
3	Perception and Communication
4	Guidelines for Interaction Design
5	The Usability Engineering Process
6	Context Analysis
7	Design and Prototyping
8	Evaluation
9	Interaction Paradigms
10	Computer-Supported Cooperative Work
11	Accessibility
12	Information architecture and data visualization
13	Visual Design
14	HCI over Time
15	Professional Values and Ethics

Part I: Fundamentals

What context does HCI take place in? What are we working with?

Part II: Methods

What do we do? In what order? What are our success criteria?

Part III: Expertise

What else should we be aware of and what are ways to specialize?

Part IV: Reflection

What do we need to understand about ourselves?