

# Introduction to Intelligent User Interfaces

Introduction and Motivation



## Team



Albrecht Schmidt



Andreas Butz



Sven Mayer



Niels Henze  
University of Regensburg



Daniel Buschek  
University of Bayreuth



Sarah Völkel



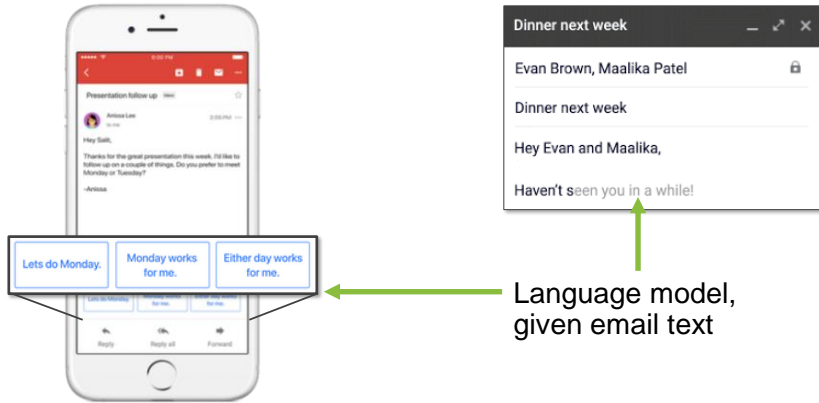
Luke Haliburton

## Lectures

- Introduction to Intelligent User Interfaces
- Artificial Intelligence: An Overview for HCI
- Recommender Systems
- Voice User Interfaces
- Text Analytics and Natural Language Processing
- Text Entry and Text Prediction
- Deceptive User Interfaces
- Context of User in Smart Environments
- Biometrics
- Explainable AI
- Bias and Ethics

# Text Suggestions

Google's Smart Reply & Smart Compose

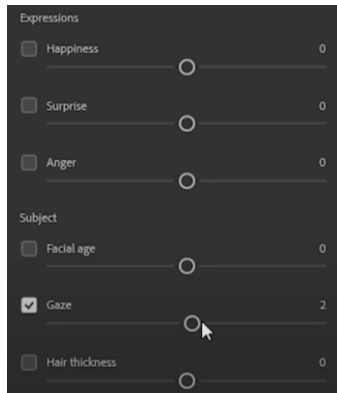


<https://blog.google/products/gmail/save-time-with-smart-reply-in-gmail/>  
<https://ai.googleblog.com/2018/05/smart-compose-using-neural-networks-to.html>

Discussion: Impact on Language use? How will this impact our communication?

## Semantic Image Manipulation

„Smart Portrait Filters“ in Adobe’s Photoshop



Generative model,  
learned from many portraits

<https://blog.adobe.com/en/2020/10/20/photoshop-the-worlds-most-advanced-ai-application-for-creatives.html>  
<https://blogs.nvidia.com/blog/2020/10/20/adobe-max-ai/>, <https://github.com/NVlabs/stylegan2>

Introduction and Motivation

5

Daniel Buschek

Discussion: semantic image manipulation? What is it good for?

How can you misuse it?

What happens, if we have this available in real time for video, e.g. for a skype call?

# Recommender Systems

How do recommender systems impact the user experience?



Carlos A. Gomez-Urbe and Neil Hunt. 2015. The Netflix Recommender System: Algorithms, Business Value, and Innovation. ACM Trans. Manage. Inf. Syst. 6, 4, Article 13 (December 2015), 19 pages. DOI: <https://doi.org/10.1145/2843948>

- Why are recommender systems used?  
Netflix, Amazon.com? ebay? YouTube? Spotify?
- How do recommender work?
- What data do recommender systems require?

Discussion: Why is Netflix giving me a poor user experience?

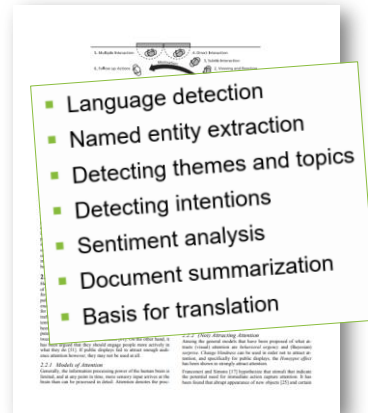
How can we improve (as users) the performance of recommender systems?

What data is useful to provide better recommendation, e.g. for shopping?

# Text analytics

Where can we use it and how can it improve interaction?

- Answering questions like
  - What is this text about?
  - What did the person communicate?
  - What is the key information in this document?
  - What feelings are communicated?
  - Is this different from what was said before?
- Application areas
  - Social media analytics, e.g. twitter
  - Communication and reading interfaces
  - Customer reviews and feedback
  - Chat bots
  - Text Forensics



<http://www.medien.ifi.lmu.de/pubdb/publications/pub/mueller2010mm/mueller2010mm.pdf>

Screenshot from

<http://www.medien.ifi.lmu.de/pubdb/publications/pub/mueller2010mm/mueller2010mm.pdf>

How do you – as a human – answer these questions?

What does it take to be able to answer these questions?

What applications can we imagine using text analytics for personal communication?

How do you think sentiment analysis works?

## VUI design process

### How to design a dialog structure?

- Think of alternatives
  - structure
  - wording
- Try out your dialog
  - wizard of Oz technique!
  - use outside people
- Refine, Revise, Repeat



Image by Gregory Varnum, CC BY-SA 4.0 via Wikimedia Commons  
[https://commons.wikimedia.org/wiki/File:Amazon\\_Echo\\_Dot\\_-\\_June\\_2018\\_\(1952\).jpg](https://commons.wikimedia.org/wiki/File:Amazon_Echo_Dot_-_June_2018_(1952).jpg)

[https://de.m.wikipedia.org/wiki/Datei:Amazon\\_Echo\\_Dot\\_-\\_June\\_2018\\_\(1952\).jpg](https://de.m.wikipedia.org/wiki/Datei:Amazon_Echo_Dot_-_June_2018_(1952).jpg)

Do you know examples where voice assistance worked well? What do they have in common?

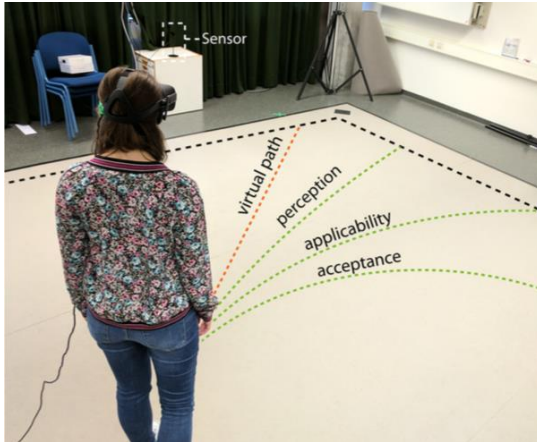
Where do voice assistants have problems? Which types of conversations will not work?

How would you do wizard of Oz for a voice interface prototype?



## A Deceptive UI: redirected Walking

What is real in an intelligent UI?



M. Rietzler, J. Gugenheimer, T. Hirzle, M. Deubzer, E. Langbehn and E. Rukzio, "Rethinking Redirected Walking: On the Use of Curvature Gains Beyond Perceptual Limitations and Revisiting Bending Gains," *2018 IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*, Munich, Germany, 2018, pp. 115-122, doi: 10.1109/ISMAR.2018.00041.

Image from <https://ieeexplore.ieee.org/abstract/document/8613757>

Introduction and Motivation

9

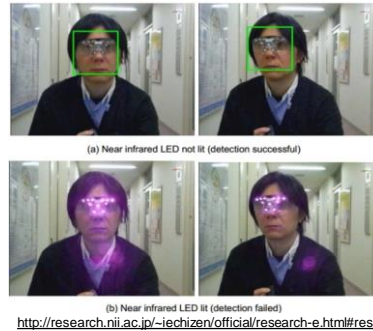
Andreas Butz

Why should computers/interfaces deceive us?  
Is it ethical to have deceptive Uis?

# Facial Recognition

Convenient biometric or overly powerful?

- Unlock your phone
  - Hands-free identification
  - What are the major issues?
  
- Surveillance
  - Privacy
  - Tricks to „hide“ from facial recognition technology



<https://pxhere.com/en/photo/1620437>

What are pros and cons of face recognition?

What happens if face recognition becomes ubiquitous?

## HCI Replacing Human-Human-Interaction in Stores

„Just Walk Out“ shopping experience at Amazon Go

- Surveillance-powered shopping
  - Does not use facial recognition
- How does it work?
  - Is it „intelligent“? How so?



Image by SounderBruce, CC BY-SA 4.0 via Wikimedia Commons  
[https://commons.wikimedia.org/wiki/File:Amazon\\_Go\\_in\\_Seattle,\\_December\\_2016.jpg](https://commons.wikimedia.org/wiki/File:Amazon_Go_in_Seattle,_December_2016.jpg)

How does the Amazon “Just walk out” store work?  
What design choice do you make?  
Why do people want such stores? Or do they?  
How do they relate to online shopping?  
How do they relate to in-store shopping?

## AI Recruiting

Is an AI a “fairer” recruiter?



Introduction and Motivation

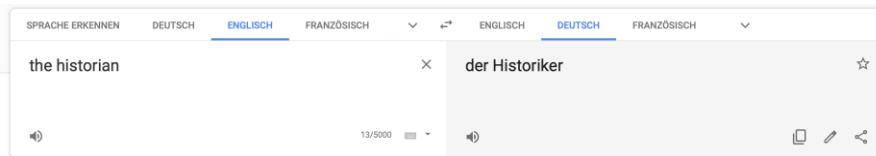
12

Sarah Theres Völkel

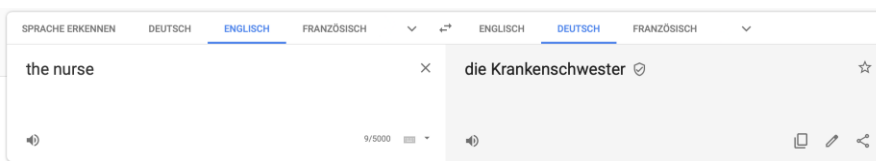
Created by Sarah Völkel base on free Pictures requireing no attribution  
What happens if you train your AI Recruiter on past decisions your company made?  
Can you just remove features from the data (e.g. gender, age, birthplace) to avoid bias? No – The AI will find some of it implicitly (at least with certain probabiliy)

# Natural Language Translation

Female historians and male nurses do not exist?



Google Translate



<https://translate.google.com>  
<https://algorithmwatch.org/en/story/google-translate-gender-bias/>

Introduction and Motivation

13

Sarah Theres Völkel

How does the underlying algorithm impact bias?

Why are these translations assuming gender?

What are solutions for automated translation, where not intervention should take place? Using the more probable translation will give a higher accuracy... but may reinforce bias

Check out Algorithmwatch.org for more examples

## Intelligent Touch

Why are we so precise with our fingers on a screen?



Henze, N., Mayer, S., Le, H.V. and Schwind, V. Improving software-reduced touchscreen latency. *Proc. MobileHCI '17* <https://doi.org/10.1145/3098279.3122150> <https://www.youtube.com/watch?v=l6Nz8wVUU74>

Introduction and Motivation

14

Sven Mayer

Predicting where you are next? How does this work?  
How can you make an interface, where this matters less?  
What information should be used to predict the line the user draws?

## Predictions Based on Data Sets

### Who gets credit approval?

ID	Income	Gender	Car Owner	Age	Education	Credit Approved
1	1.000,00 €	male	no	24	BSc	NO
2	4.000,00 €	female	yes	42	MSc	YES
3	4.000,00 €	male	no	51	MSc	NO
4	2.000,00 €	female	yes	42	.	YES
5	3.000,00 €	female	yes	26	BSc	YES
...	...	...	...	...	...	...

### Breakout Task

- Write a software (pseudo-code) that decides if a credit is approved or not – based on the Income, Gender, Car Ownership, Age and Education?
- Which problems do you encounter, assuming above is your complete training data set?

What is wrong with this data?

My simple algorithm:

(1)

If (age < 25 || age > 50) then „NO credit approval“ else „YES credit approval“

(2)

If (Gender == male) then „NO credit approval“ else „YES credit approval“

What are problems when you learn from data only (especially if it is high dimensional)?

How can you hand craft a expert system? Why is this really hard for real world problems?

# ACM SIGCHI IUI Conference Series

<https://iui.acm.org>

- Application areas
  - Internet of Things (IoT)
  - Education and learning-related technologies
  - Health and intelligent health technologies
  - Assistive technologies
  - Social media and other Web technologies
  - Mobile applications
  - Artificial personal assistants
  - Information retrieval, search, and recommendation system
- Interface types
  - Affective and aesthetic interfaces
  - Collaborative interfaces
  - Speech-based interfaces
  - AR/VR interfaces
  - Intelligent wearable and mobile interfaces
  - Ubiquitous smart environments
- Modalities
  - Agent based interfaces (e.g., embodied agents, virtual assistants)
  - Multi-modal interfaces (speech, gestures, eye gaze, face, etc.)
  - Conversational interfaces
  - Tangible interfaces
  - Intelligent visualization
- Methods and approaches
  - Methods for explanations (e.g., transparency, control, and trust)
  - Persuasive technologies in IUI
  - Privacy and security of IUI
  - Planning and plan recognition for IUI
  - Knowledge-based approaches
  - User Modelling for Intelligent Interfaces
  - User-Adaptive interaction and personalization
  - Crowd computing and human computation
  - Human-in-the loop machine learning
- Evaluations of intelligent user interfaces
  - User experiments, User studies
  - Reproducibility (including benchmarks, datasets, and challenges)
  - Meta-analysis
  - Mixed-methods evaluations

[https://iui.acm.org/2021/call\\_for\\_papers.html](https://iui.acm.org/2021/call_for_papers.html)