ADVANCED DESIGN OF INTERACTIVE SYSTEMS

19 FEBRUARY 2026

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WELCOME

LAST LECTURE

ADVANCED DESIGN OF INTERACTIVE SYSTEMS

Thursday 13:30 - 17:00
Room E 212
8 January - 26 February 2026

LECTURES & TOPICS

1 Introduction

Introduction of Goals and Topic

Exercise: DOIS Quiz & Choose groups

Homework: Story Interviews

2 Understanding Humans

Understand underlying cognitive effects:

Grounding, Theory of Mind, Mental Models

Exercise: Concept Development

Homework: Initial Design

3 Agency in HAI

Explainability, Ironies of Automation

How to design for Error, Feedback and Control?

Exercise: Build Prototype

Homework: Storyboard

4 Iterating on Design

Socio-Technical Systems

Exercise: Prototype + Generative Walkthrough

Homework: Revise Concept

5 Evaluating interactive systems

Overview of evaluation methods

Exercise: Revise Video Prototype

Homework: Evaluation protocol

6 Reflection on HAI

Social, legal, sustainability impact of AI

Discuss the role of designers for HAI interaction

Exercise: Poster, Presentation

EXERCISE

REVISED VIDEO PROTOTYPE ___

- Shoot a new 3-5 minute video
- Reveal how your system works by showing how your target user interacts with it
- If you make a mistake, delete and reshoot

→ Upload to the ADOIS ’26 website for grading

You can improve it for the final presentation though!

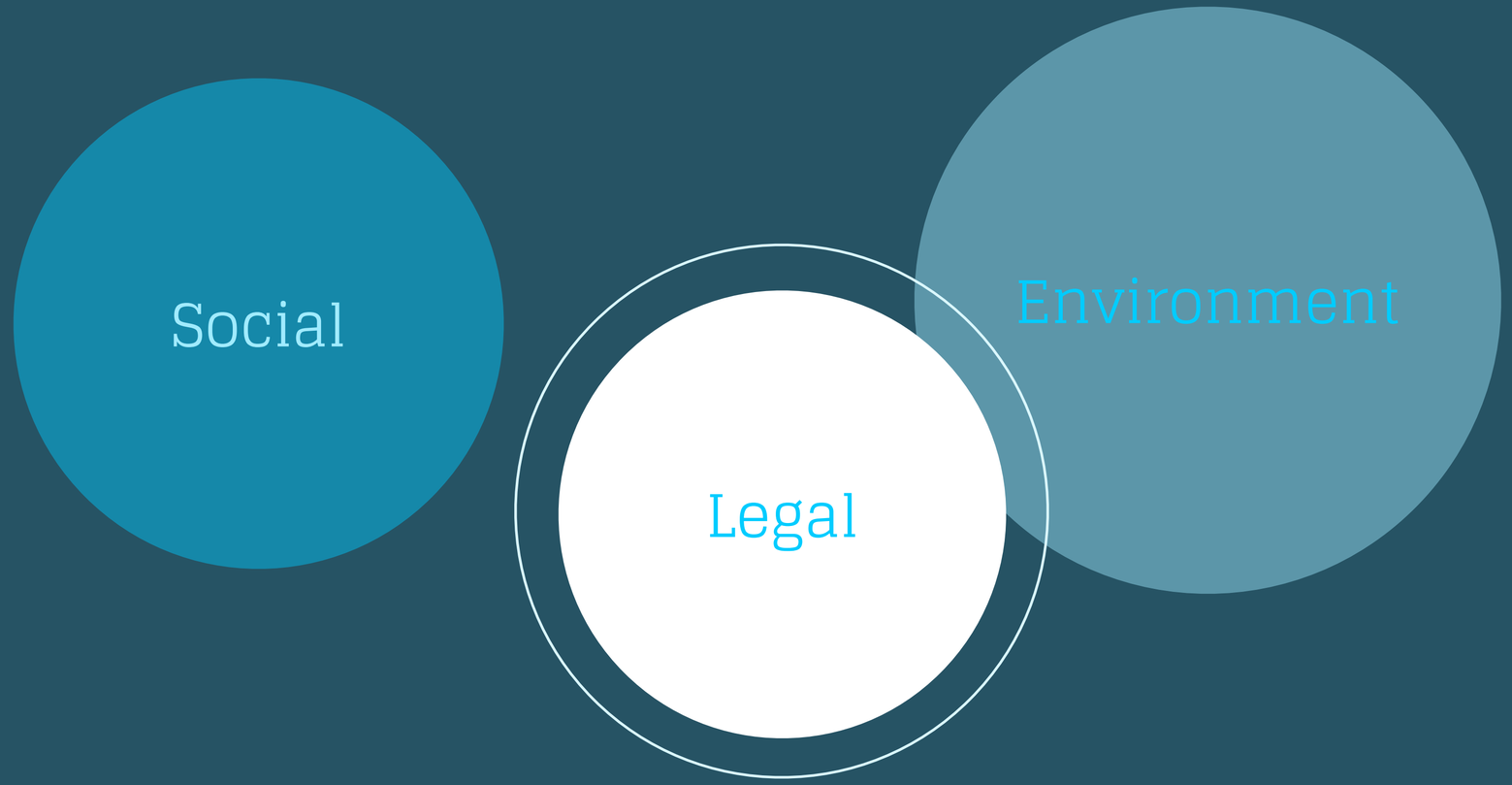
DISCUSS

EVALUATION STUDY___

- Make a study plan for Comparitive or Wizard of Oz study
- Consider:
  - Setup: What is the context of the study?
  - Participants: Who? How many?
  - Process: What are the tasks the user has to do?
  - Data Collection: What would you measure?

REFLECTION

HUMAN-AI INTERACTION



SOCIAL IMPLICATIONS

INTRODUCTION

- Increasing integration of AI in daily life (work, education, healthcare, social interactions).
- Importance of a human-centered approach to ensure AI enhances rather than harms human well-being.
- Key topics: ethics, trust, bias, job displacement, and social relationships.

What role will design have on these topics in the future?

SOCIAL IMPLICATIONS

INTRODUCTION

Examples of the role of design:

- Advocate for human-centered design in AI systems, ensuring user needs and experiences drive AI development.
- Create AI interfaces that are easy to understand and interact with, reducing friction in adoption.
- Conduct user research to understand how AI impacts different demographics, ensuring inclusivity.

SOCIAL IMPLICATIONS

ETHICAL CONCERNS & TRUST IN AI___

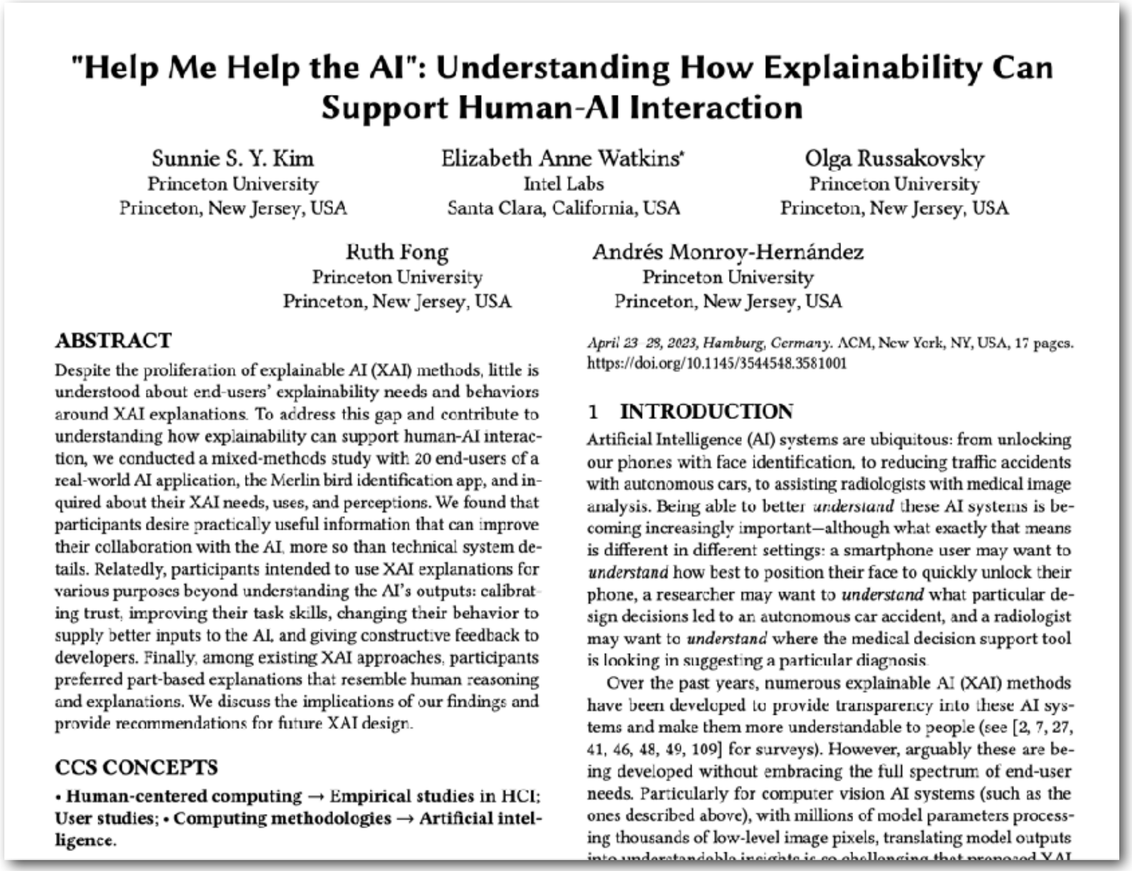
hrtechx.com

Building Trust and Ethical AI

- Transparency: Users must understand AI decision-making processes.
- Accountability: Who is responsible for AI's actions —developers, users, or organizations?
- Bias and Fairness: AI systems can reinforce societal inequalities if not carefully designed.
- Example: AI in hiring—risk of discrimination due to biased training data

SOCIAL IMPLICATIONS

ETHICAL CONCERNS & TRUST IN AI___



"Help Me Help the AI": Understanding How Explainability Can Support Human-AI Interaction

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Elizabeth Anne Watkins*
Intel Labs
Santa Clara, California, USA

Olga Russakovsky
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Princeton, New Jersey, USA

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Princeton, New Jersey, USA

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Princeton, New Jersey, USA

ABSTRACT

Despite the proliferation of explainable AI (XAI) methods, little is understood about end-users' explainability needs and behaviors around XAI explanations. To address this gap and contribute to understanding how explainability can support human-AI interaction, we conducted a mixed-methods study with 20 end-users of a real-world AI application, the Merlin bird identification app, and inquired about their XAI needs, uses, and perceptions. We found that participants desire practically useful information that can improve their collaboration with the AI, more so than technical system details. Relatedly, participants intended to use XAI explanations for various purposes beyond understanding the AI's outputs: calibrating trust, improving their task skills, changing their behavior to supply better inputs to the AI, and giving constructive feedback to developers. Finally, among existing XAI approaches, participants preferred part-based explanations that resemble human reasoning and explanations. We discuss the implications of our findings and provide recommendations for future XAI design.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI**; **User studies**; • **Computing methodologies** → **Artificial intelligence**.

April 23–28, 2023, Hamburg, Germany. ACM, New York, NY, USA, 17 pages. https://doi.org/10.1145/3544548.3581001

1 INTRODUCTION

Artificial Intelligence (AI) systems are ubiquitous: from unlocking our phones with face identification, to reducing traffic accidents with autonomous cars, to assisting radiologists with medical image analysis. Being able to better *understand* these AI systems is becoming increasingly important—although what exactly that means is different in different settings: a smartphone user may want to *understand* how best to position their face to quickly unlock their phone, a researcher may want to *understand* what particular design decisions led to an autonomous car accident, and a radiologist may want to *understand* where the medical decision support tool is looking in suggesting a particular diagnosis.

Over the past years, numerous explainable AI (XAI) methods have been developed to provide transparency into these AI systems and make them more understandable to people (see [2, 7, 27, 41, 46, 48, 49, 109] for surveys). However, arguably these are being developed without embracing the full spectrum of end-user needs. Particularly for computer vision AI systems (such as the ones described above), with millions of model parameters processing thousands of low-level image pixels, translating model outputs into understandable insights is so challenging that proposed XAI

Explainability and Transparency of HAI systems:

- users desire practically useful information that can improve their collaboration with the AI more than technical system details.
- users use XAI explanations for various purposes beyond understanding the AI's outputs:
  - calibrating trust, improving their task skills, changing their behavior to supply better inputs to the AI, and giving constructive feedback to developers.
- Users preferred part-based explanations that resemble human reasoning and explanations

"Help Me Help the AI": Understanding How Explainability Can Support Human-AI Interaction, CHi'23, Kim et al.

SOCIAL IMPLICATIONS

ROLE OF DESIGN___

Ethical Concerns & Trust in AI

- Develop explainable AI interfaces that allow users to understand AI decisions (e.g., why an AI recommends a loan approval)
- Design feedback loops where users can question, appeal, or adjust AI decisions (e.g., transparency dashboards).

A designer working on an AI-driven hiring platform can create interactive transparency features that show candidates why they were selected or rejected, fostering trust and fairness.

SOCIAL IMPLICATIONS

AI AND THE FUTURE OF WORK

Workforce Disruptions and Opportunities

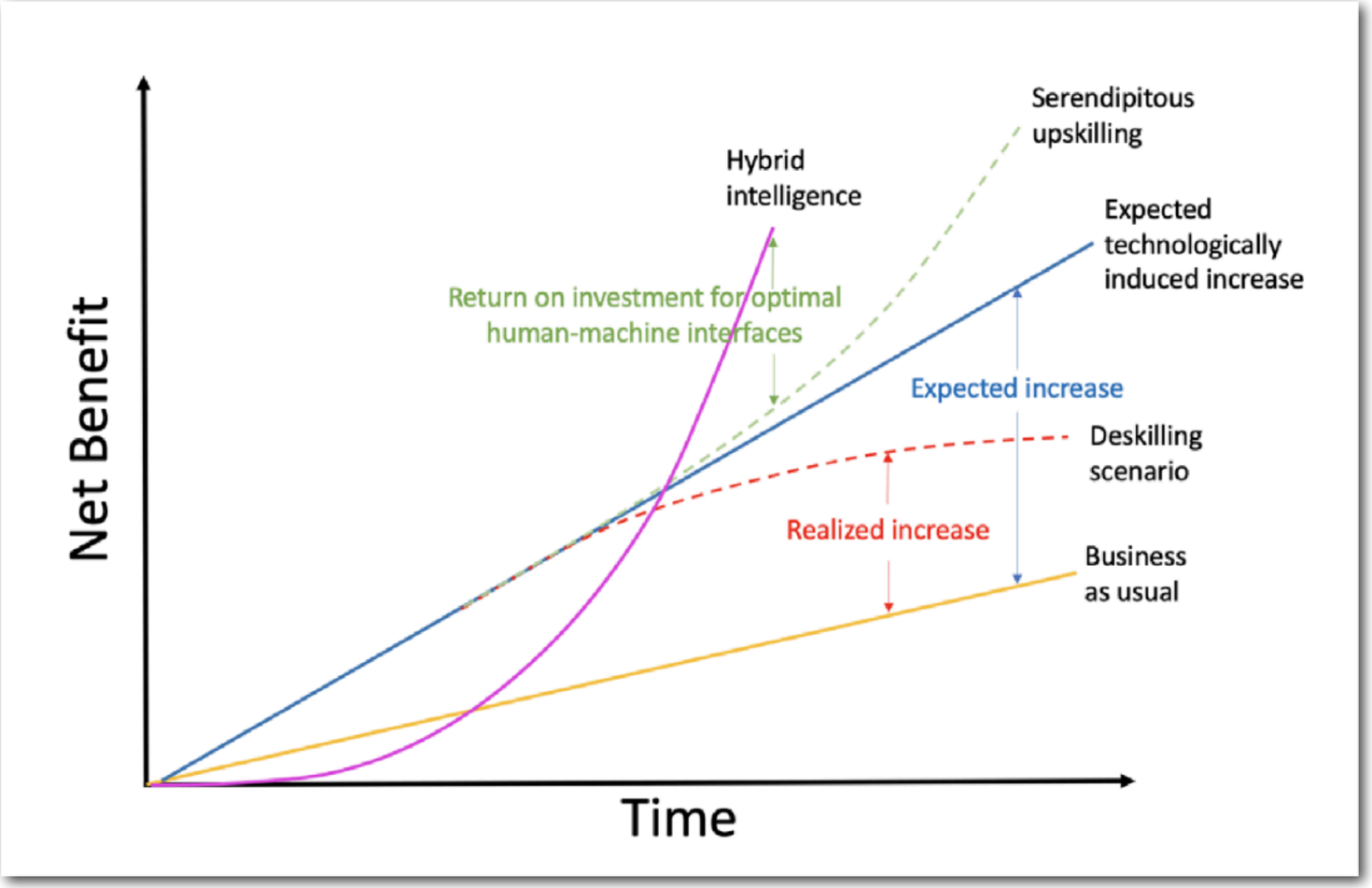
- Automation vs. Augmentation: Will AI replace jobs or enhance human work?
- Skills shift: Need for digital literacy and human-AI collaboration skills.
- Ethical responsibility of companies and policymakers to provide re-skilling programs.
- Example: AI in customer service—job losses vs. creation of new AI management or supervision roles.

SOCIAL IMPLICATIONS

AI AND THE FUTURE OF WORK

Hybrid Intelligence may:

- lower costs
- improve performance
- job satisfaction
- prevent management from creating unintended organization-wide deskilling



Deskilling, Upskilling, and Reskilling: a Case for Hybrid Intelligence (2021) Rafner et al.

SOCIAL IMPLICATIONS

ROLE OF DESIGN___

Ethical Concerns & Trust in AI	Future of Work	
▪ Develop explainable AI interfaces that allow users to understand AI decisions (e.g., why an AI recommends a loan approval) ▪ Design feedback loops where users can question, appeal, or adjust AI decisions (e.g., transparency dashboards).	▪ Design AI-powered tools that augment rather than replace human workers ▪ Develop user-friendly AI training interfaces to help employees upskill and adapt to AI integration in their industries.	
A designer working on an AI-driven hiring platform can create interactive transparency features that show candidates why they were selected or rejected, fostering trust and fairness.	A UX designer for an AI-powered project management tool ensures that automation improves workflow efficiency without removing human decision-making, allowing workers to focus on creativity and strategy.	

SOCIAL IMPLICATIONS

AI'S IMPACT ON RELATIONSHIPS & SOCIAL BEHAVIOR

Social AI: Connecting or Isolating Us?

- Increasing AI-driven communication (chatbots, virtual assistants, AI companions).
- AI's role in social media algorithms—creating echo chambers or fostering inclusivity?
- Emotional impact: Can AI provide real companionship, or does it lead to increased loneliness?
- Example: AI caregivers for elderly people—helpful or replacing human connection?

SOCIAL IMPLICATIONS

AI'S IMPACT ON RELATIONSHIPS & SOCIAL BEHAVIOR

Compared discourses and perceptions of Conversational Agents in the US and China:

- Chinese participants view CAs hedonically, perceived voice-based and physically embodied CAs as warmer and more competent
- US participants saw CAs more functionally, with an ambivalent attitude.
- Warm perception was a key driver of positive emotions toward CAs in both countries

Understanding Public Perceptions of AI Conversational Agents: A Cross-Cultural Analysis ,CHi'24, Liu et al.

SOCIAL IMPLICATIONS

ROLE OF DESIGN___

Ethical Concerns & Trust in AI	Future of Work	Relationships & Social Behavior
▪ Develop explainable AI interfaces that allow users to understand AI decisions (e.g., why an AI recommends a loan approval) ▪ Design feedback loops where users can question, appeal, or adjust AI decisions (e.g., transparency dashboards).	▪ Design AI-powered tools that augment rather than replace human workers ▪ Develop user-friendly AI training interfaces to help employees upskill and adapt to AI integration in their industries.	▪ Design AI interfaces that encourage meaningful human-human connections instead of isolating users (e.g., AI that facilitates social engagement). ▪ Ensure AI in social media promotes healthy engagement rather than reinforcing addictive behaviors or echo chambers.
A designer working on an AI-driven hiring platform can create interactive transparency features that show candidates why they were selected or rejected, fostering trust and fairness.	A UX designer for an AI-powered project management tool ensures that automation improves workflow efficiency without removing human decision-making, allowing workers to focus on creativity and strategy.	A designer creating an AI-powered mental health chatbot ensures that it provides supportive conversations but also encourages users to seek real human interaction when needed.

REFLECTION

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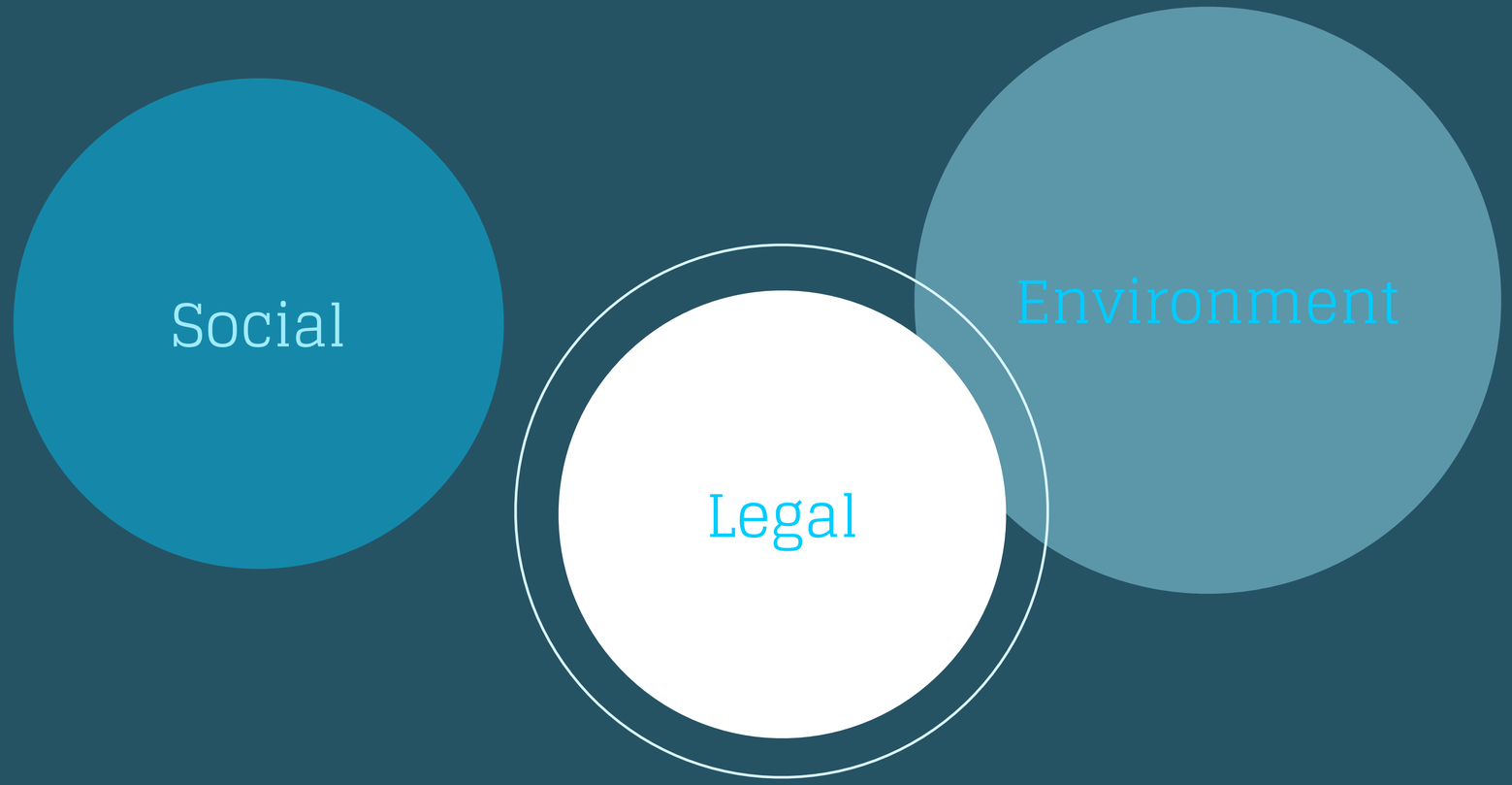


LEGAL IMPLICATIONS

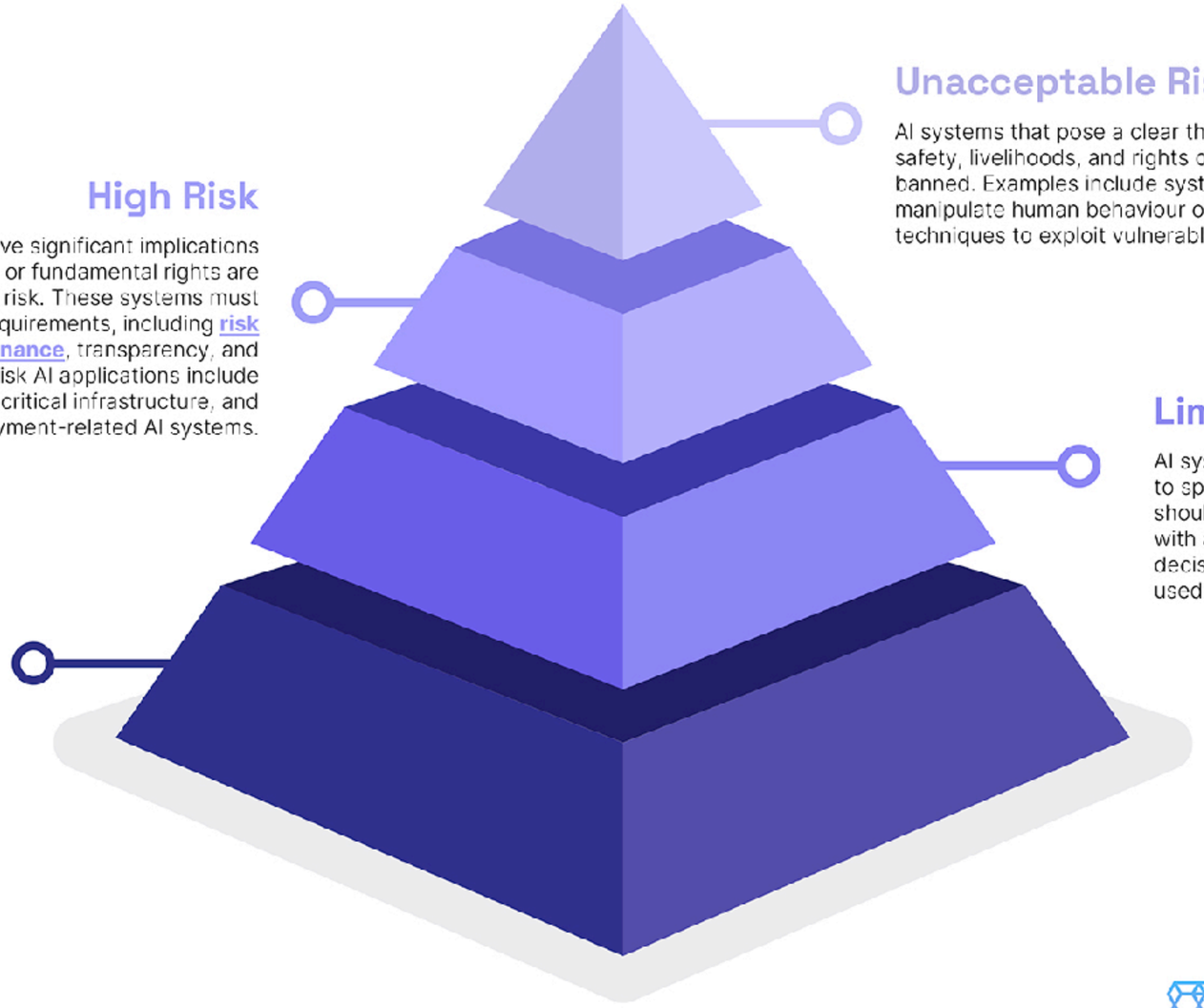
INTRODUCTION TO THE EUROPEAN AI ACT

- The European AI Act is a landmark regulation designed to ensure AI systems are safe, transparent, and human-centric.
- It classifies AI applications into risk categories (e.g., unacceptable, high, limited, and minimal risk) to protect fundamental rights.

> *"a software that is developed with one or more of the techniques and approaches listed in Annex I and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with"*

European Commission

RISK CATGEORIES IN THE AI ACT



Unacceptable Risk

AI systems that pose a clear threat to the safety, livelihoods, and rights of people are banned. Examples include systems that manipulate human behaviour or use subliminal techniques to exploit vulnerable individuals.

High Risk

AI systems that have significant implications for health, safety, or fundamental rights are classified as high risk. These systems must comply with stringent requirements, including risk management, data governance, transparency, and human oversight. High-risk AI applications include biometric identification, critical infrastructure, and employment-related AI systems.

Limited Risk

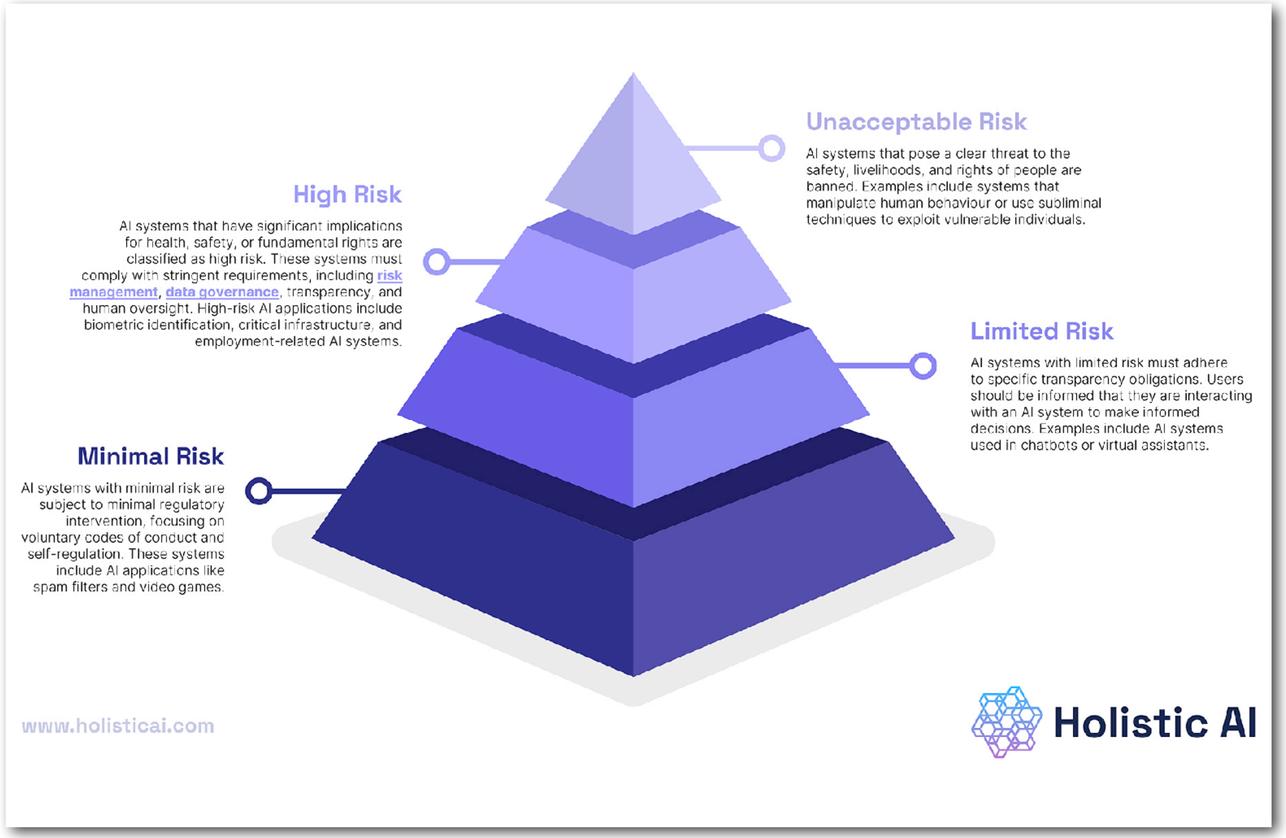
AI systems with limited risk must adhere to specific transparency obligations. Users should be informed that they are interacting with an AI system to make informed decisions. Examples include AI systems used in chatbots or virtual assistants.

Minimal Risk

AI systems with minimal risk are subject to minimal regulatory intervention, focusing on voluntary codes of conduct and self-regulation. These systems include AI applications like spam filters and video games.

LEGAL IMPLICATIONS

RISK CATGEORIES IN THE AI ACT



- **Risk management:** Implementing a comprehensive risk management system to identify, assess, and mitigate potential risks associated with AI systems.
- **Data governance:** Ensuring high-quality and representative datasets are used to train AI systems, minimizing biases and inaccuracies.
- **Documentation:** Maintaining detailed documentation to demonstrate compliance with the Act's requirements, including technical specifications, design processes, and risk assessments.
- **Transparency and human oversight:** Providing clear information on how AI systems make decisions and ensuring human oversight to prevent adverse outcomes.

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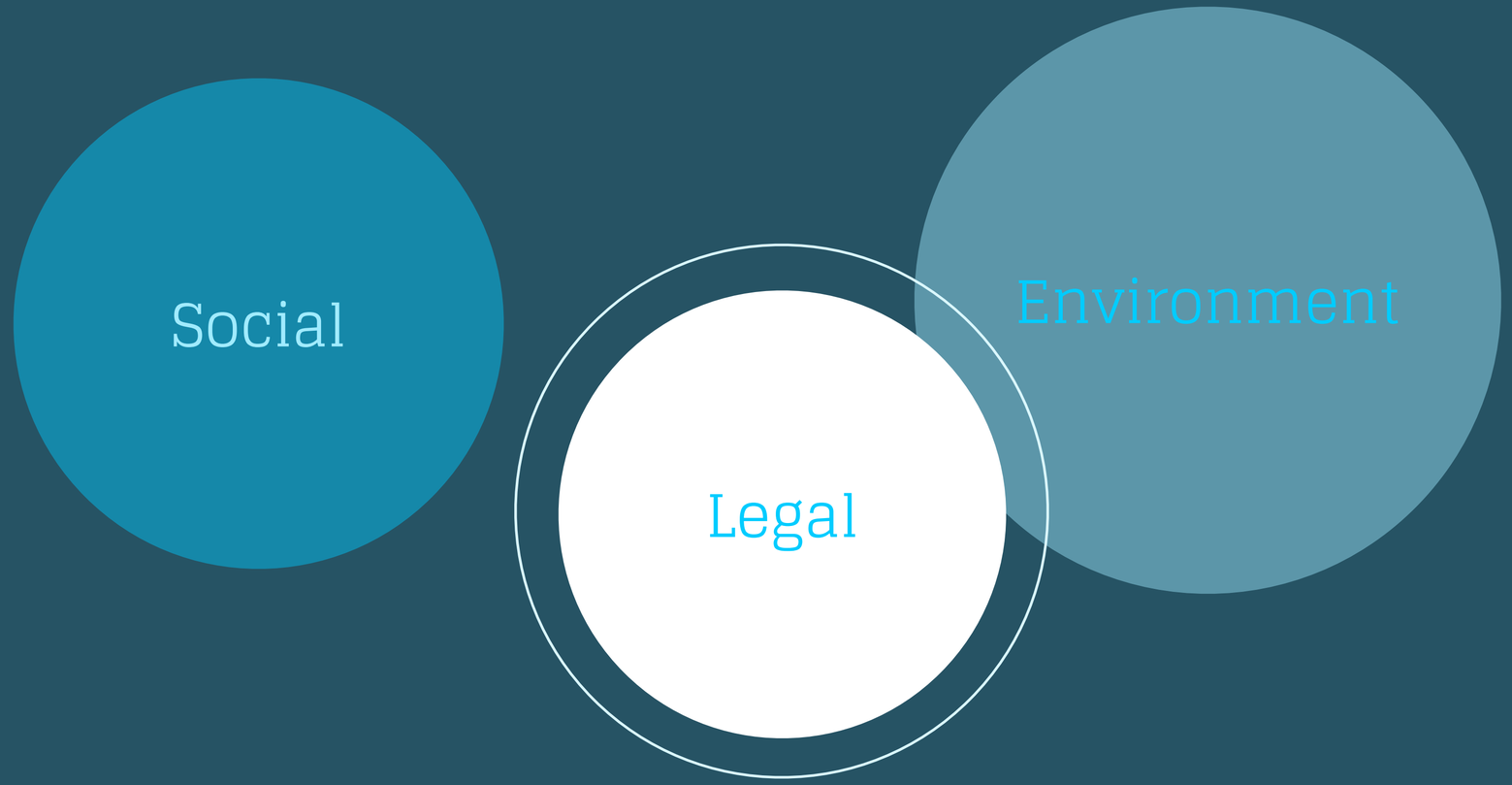


ENVIRONMENTAL IMPLICATIONS

INTRODUCTION

- AI’s Growing Influence: Artificial Intelligence is revolutionizing industries, from healthcare to finance, but its rapid expansion comes with environmental costs.
- Key Concerns: AI systems require massive energy, water, and computing resources, leading to high carbon emissions, increased electricity demand, and water consumption for cooling data centers.
- Objective: This presentation explores the environmental impact of AI and highlights strategies for sustainable AI development.

ENVIRONMENTAL IMPLICATIONS

ENERGY CONSUMPTION OF AI SYSTEMS

- Rising Energy Demands: In 2023, AI power consumption was estimated at 4.5 gigawatts, accounting for approximately 8% of data center power usage. This figure is projected to more than triple by 2028, potentially reaching 20% of data center power consumption.
- Training Large Models: Developing advanced AI models, such as GPT-3, resulted in emissions of 552 metric tons of CO_2 during training, equivalent to the annual emissions of 123 gasoline-powered passenger vehicles.
- Comparative Impact: The carbon footprint of training a single deep learning model can be comparable to the lifetime emissions of five cars.

Call to make tech firms report data centre energy use as AI booms

Experts say mandatory reporting on energy and water use is needed to avoid irreparable damage to environment

The report said there was no reliable data on how much energy and water is used by data

The Guardian, Fri 7 Feb 2025 (Sandra Laville)

Environmental impact of AI - statistics & facts, statista.com

ENVIRONMENTAL IMPLICATIONS

WATER USAGE IN AI INFRASTRUCTURE

- Cooling Requirements: Data centers utilize substantial water resources for cooling purposes. AI-related infrastructure may soon consume six times more water than Denmark, a country of 6 million people.
- Environmental Concerns: The significant water consumption by AI infrastructure raises concerns, especially considering that a quarter of humanity already lacks access to clean water and sanitation.

AI has an environmental problem. Here's what the world can do about that.
UN environment programme

ENVIRONMENTAL IMPLICATIONS

THE ROLE OF DESIGN IN SUSTAINABLE AI

Optimizing User Interfaces for Efficiency

- Well-designed interfaces reduce unnecessary AI computations, minimizing energy consumption.
- Example: Low-power UI modes that adapt AI processing based on user needs.

Transparency & Awareness

- Design can inform users about the CO2 footprint of AI interactions, fostering responsible use.
- Example: A “Green AI” indicator showing energy consumption per AI query.

Encouraging Sustainable User Behavior

- Interaction design can promote eco-friendly choices, such as energy-efficient AI settings or low-carbon AI alternatives.
- Example: AI assistants suggesting low-energy tasks or sustainable computing practices.

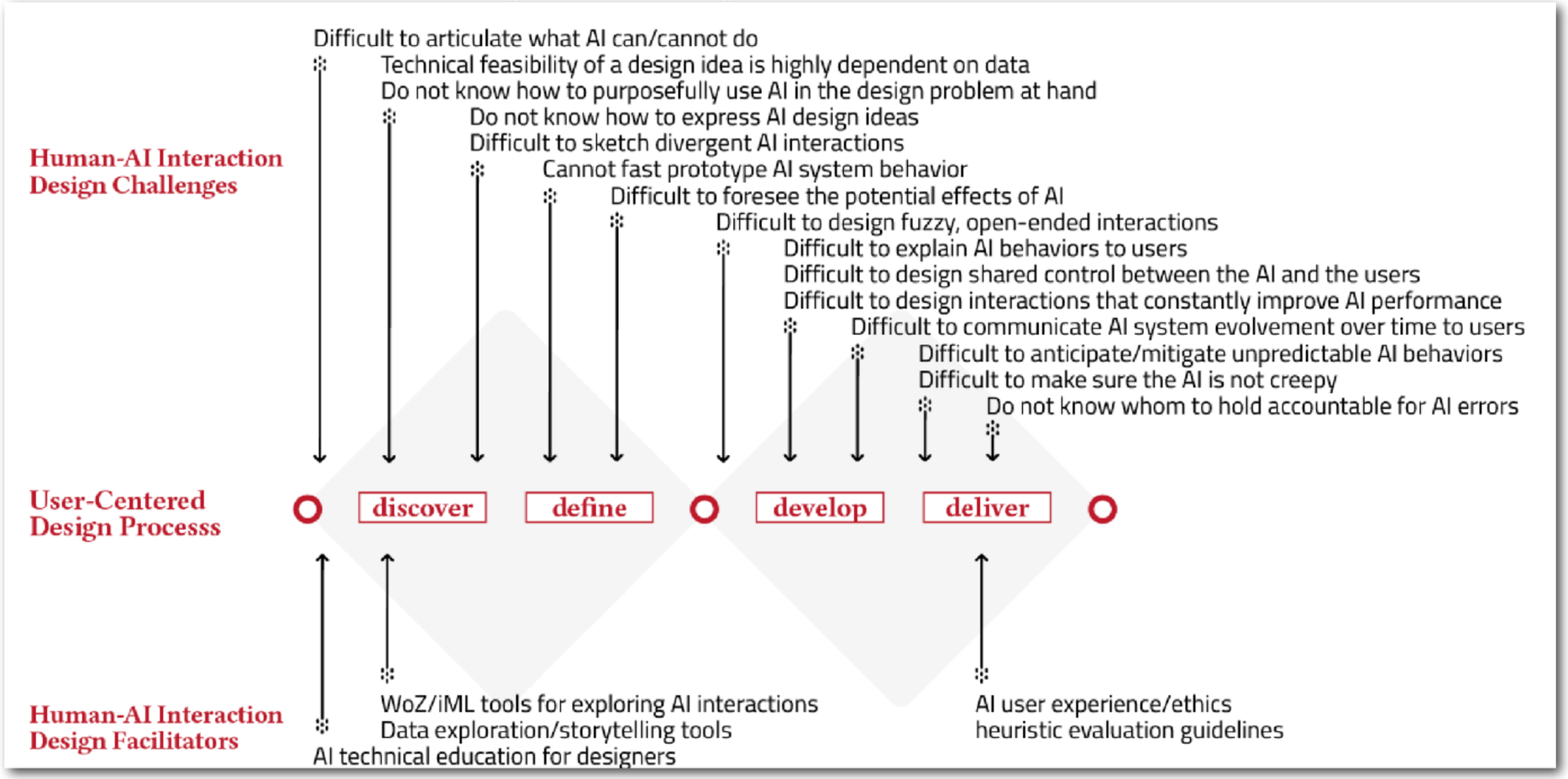
Minimizing Unnecessary AI Engagement

- Reducing unnecessary AI interactions, such as automated responses vs. full AI processing, helps conserve resources.
- Example: Smart caching mechanisms to avoid redundant AI computations.

SUMMARY

THE FUTURE OF DESIGN FOR HAI

Human-AI interaction design challenges in the literature in a user-centered design process

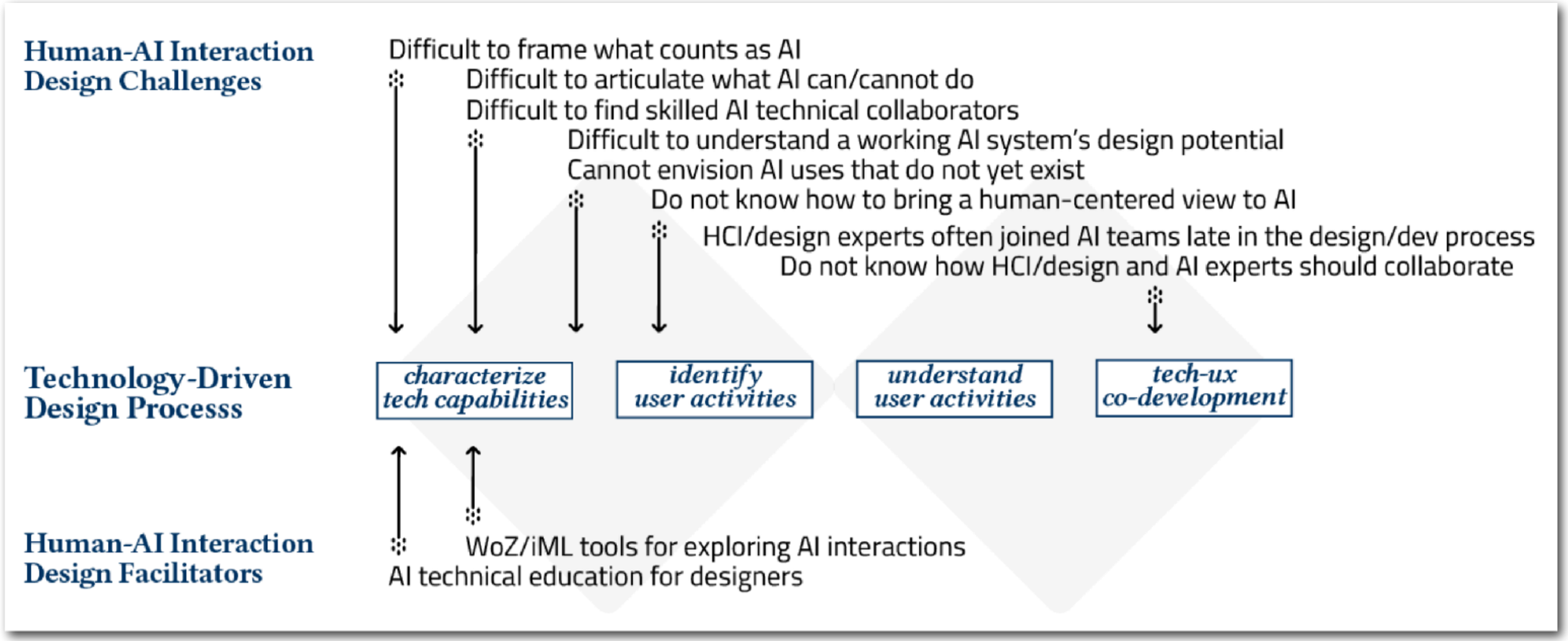


Re-examining Whether, Why, and How Human-AI Interaction Is Uniquely Difficult to Design, CHI'20, Yang et al.

SUMMARY

THE FUTURE OF DESIGN FOR HAI

UX design challenges of AI in prior research in a technology-driven design innovation process



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SUMMARY

THE FUTURE OF DESIGN FOR HAI

ENHANCING HUMAN-AI COLLABORATION

Making AI More Intuitive & Accessible

- Well-designed interfaces ensure AI is easy to understand and use, regardless of technical expertise.
- Example: Conversational AI with adaptive language that adjusts based on user familiarity.

Building Trust & Transparency

- Clear explanations of AI decisions help users trust and rely on AI responsibly.
- Example: AI-generated content with confidence scores or explainable AI visualizations.

SUMMARY

THE FUTURE OF DESIGN FOR HAI

Designing for Diverse Users

- AI interfaces must be inclusive to accommodate different abilities, languages, and cultures.
- Example: Multimodal interaction (voice, text, and gestures) for accessibility.

Reducing Bias & Enhancing Fairness

- Interaction design can highlight AI biases and offer user feedback loops for corrections.
- Example: A bias-awareness feature that alerts users to possible fairness issues in AI response

DESIGNING ETHICAL & INCLUSIVE AI

NEXT WEEK

FINAL PRESENTATION ___

Grading:

- Participation (individual) — 10%
- Story Interviews (individual) — 30%
- Prototypes (group) — 30%
- Final Presentation (group) — 30%

- Each presentation should be max. 15 min
- Your presentation can be prepared in any format, but has to be sent to me by 12 noon (Janin.Koch@inria.fr)
- Arrive 10 min before class starts (13:20)
- Groups will be announced randomly
- Every group member should be involved in the final presentation
- Q&A session: 5-10 min, including Jury questions and class questions

Context of your design

Describe:

- What are the user’s goals?
- Problem (supported by your interviews)
- Target users your design addresses
- What is the envisioned situation your design is used in?

- Describe your design idea
- What alternatives did you consider
- Use visual means e.g. sketches or design diagrams

Initial design concept

Reasoning for your initial collaboration concept

- What was the role of the user and the system?
- How did your integrate control by design?
- How did you consider errors in your design?

- Provide excerpts from the feedback you received.
- How did you apply socio-technical principles and the golden rules in your design?

Redesign of your protoype

Prototype video

- Show video
- Talk over it… don’t just stand there

- Highlight which aspects of your system would be possible to achieve using existing technology.
- What are the parts you would design and how?

Explain the role of the system and how feasible it is?

Reflect on the impact of the system on your users

- How does your design support control
- Does your design support upskilling or downskilling of the user?
- Should we use AI for it?

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