IFIP Workshop on Intelligent Vehicle Dependability and Security (IVDS)
January 29, 2021

Designing for Increased Autonomy & Human Control

Ben Shneiderman **@benbendc**

Founding Director (1983-2000), Human-Computer Interaction Lab
Professor, Department of Computer Science

Member, National Academy of Engineering

Photo: BK Adams

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What is Human-Centered AI?

Human-Centered AI

Amplify, Augment, Enhance & Empower People

Human Responsibility

Supertools and Active Appliances

Visual Interfaces to Prevent/Reduce Explanations

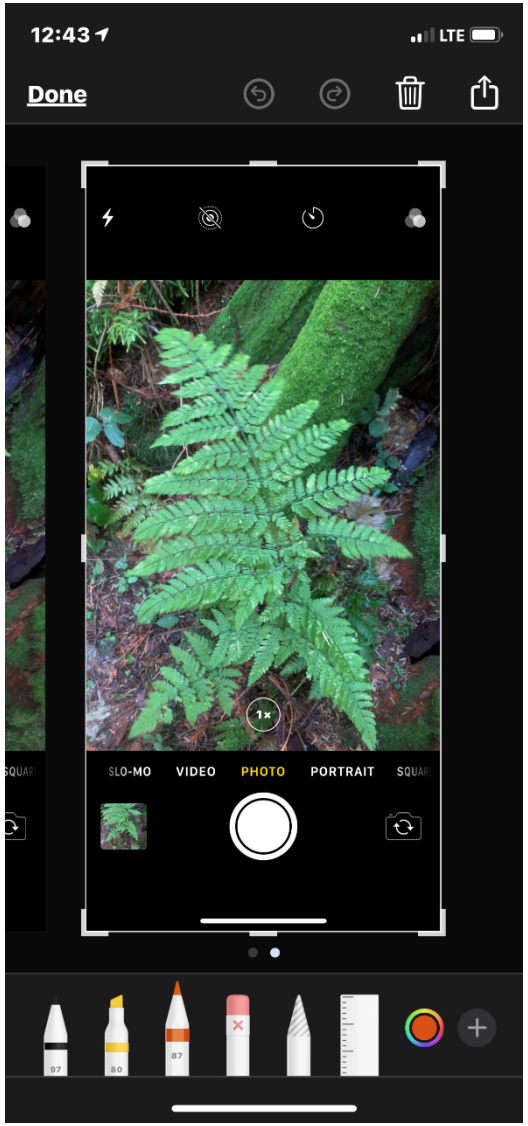
Audit Trails to Analyze Failures & Near Misses

Independent Oversight

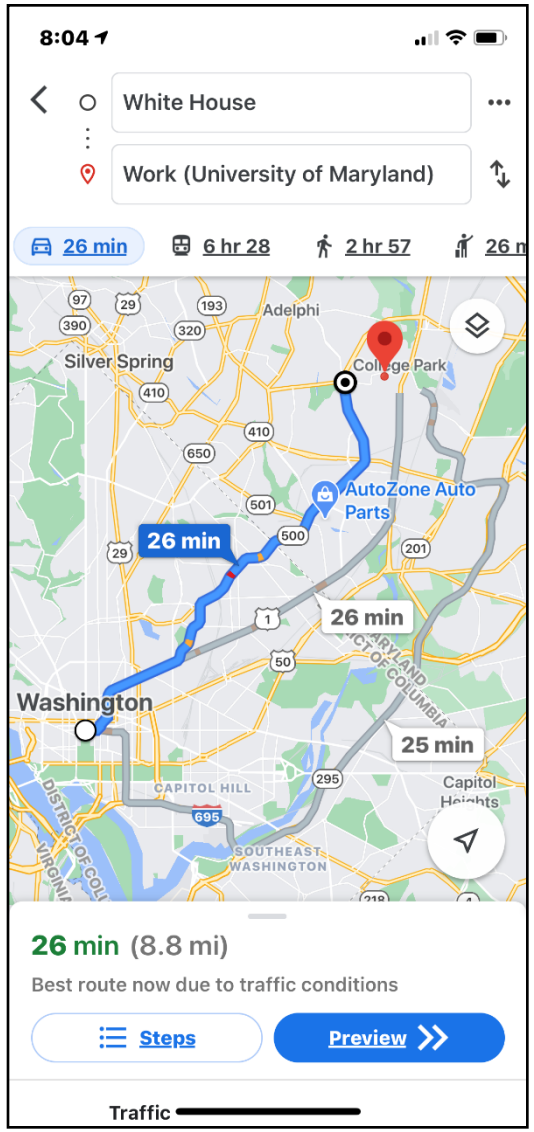
→ Reliable, Safe & Trustworthy

Supertools

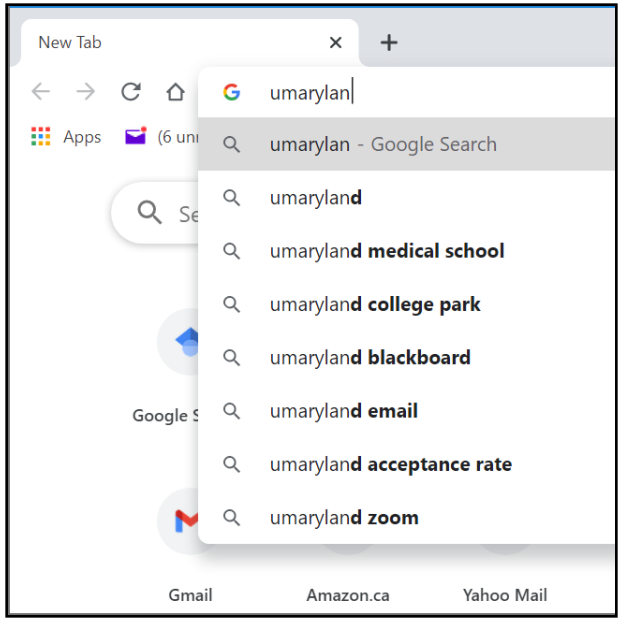
Digital Camera Controls



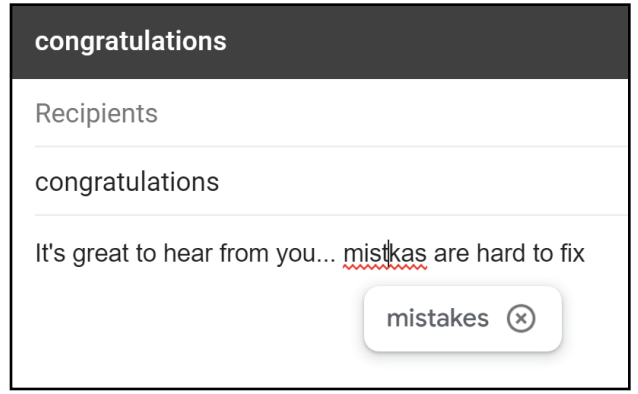
Navigation Choices



Texting Autocompletion

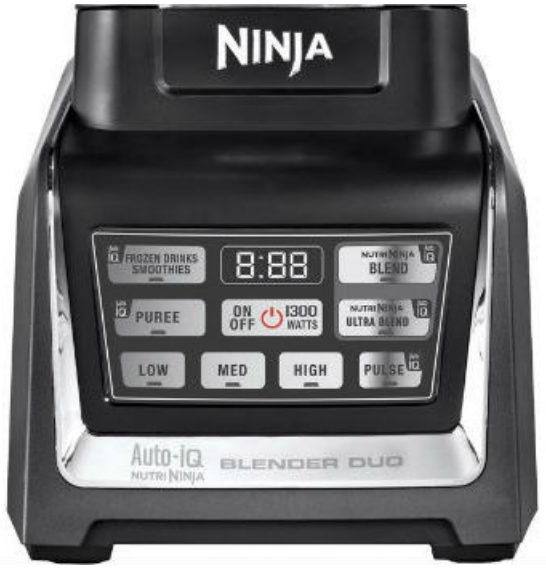


Spelling correction

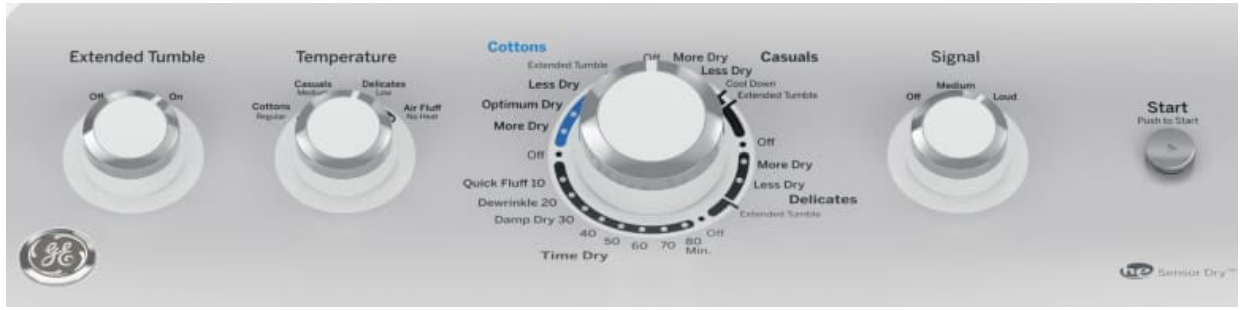


Active Appliances

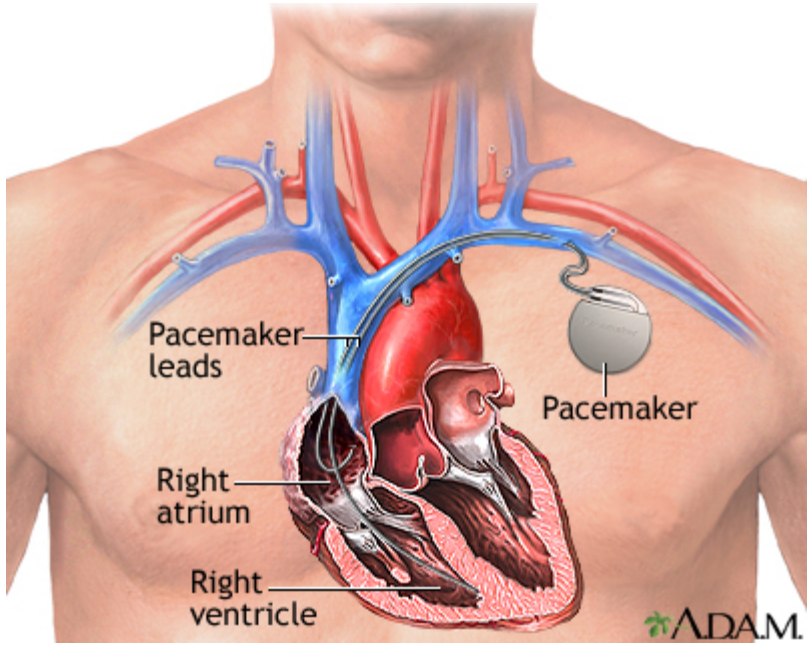
Coffee maker, Rice cooker, Blender

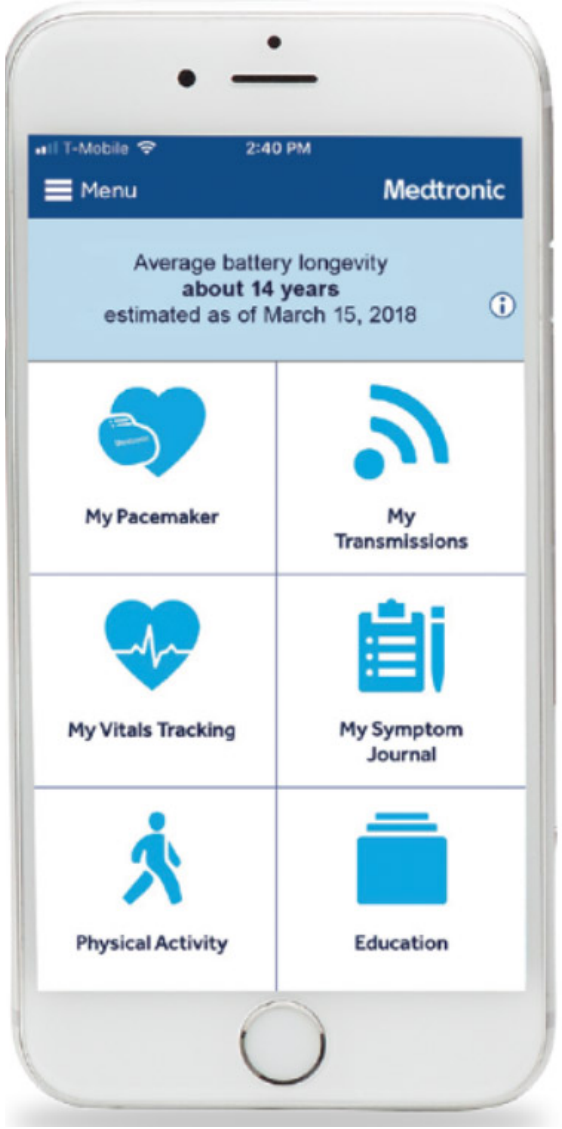


Dishwasher, Clothes Washer/Dryer



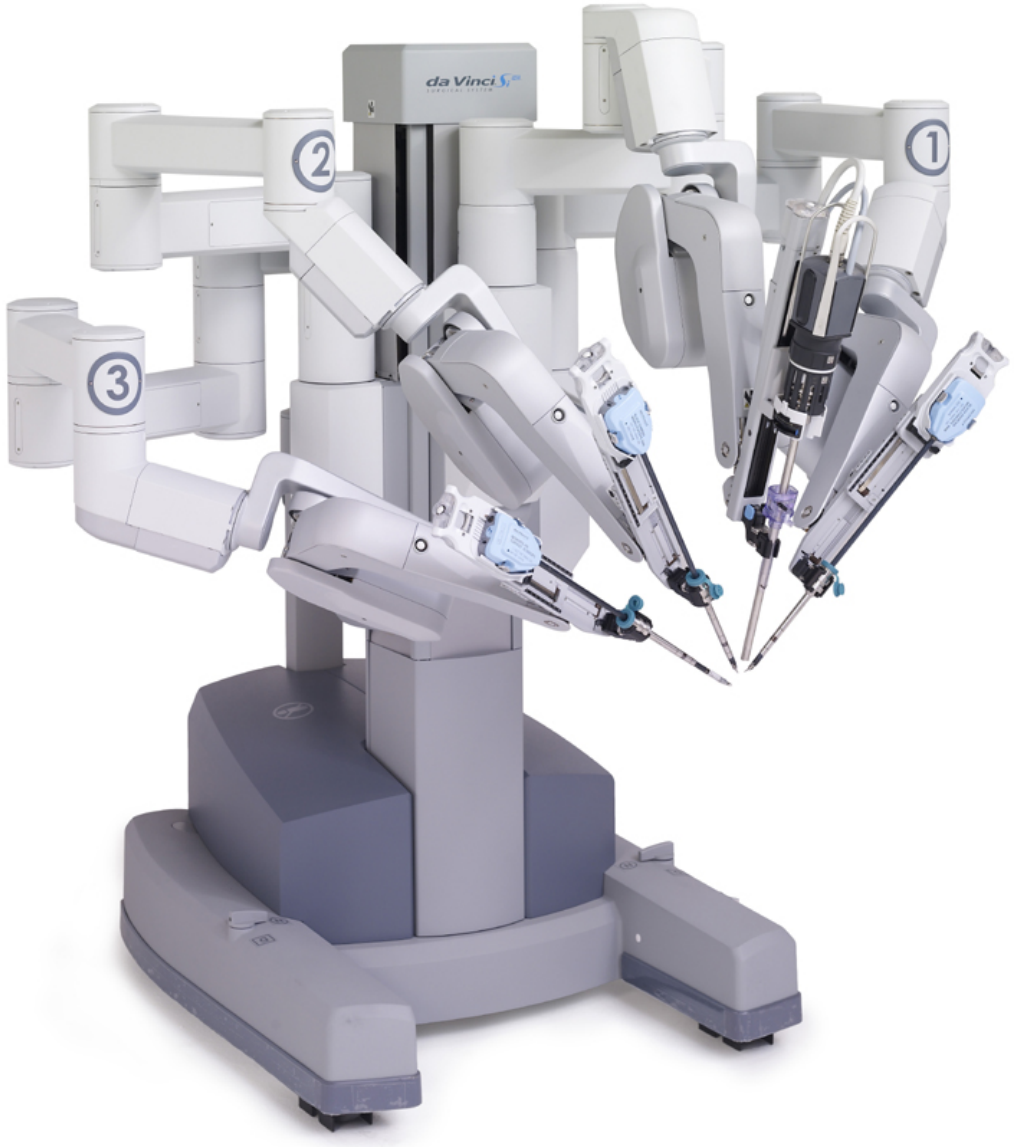
Implanted Cardiac Pacemakers





NASA Mars Rovers are Tele-Operated

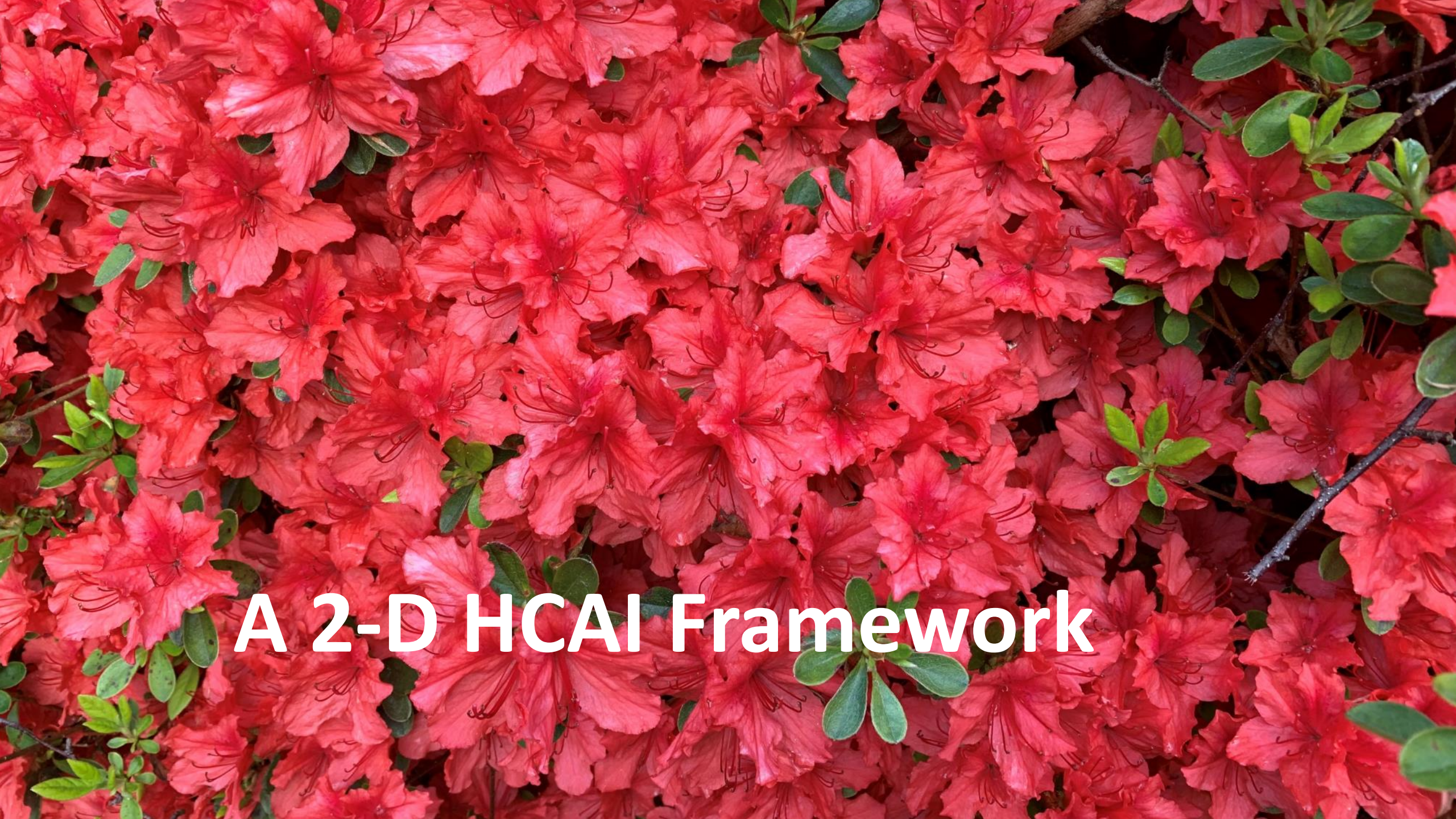
DaVinci Tele-Operated Surgery



"Robots don't perform surgery. Your surgeon performs surgery with da Vinci by using instruments that he or she guides via a console."

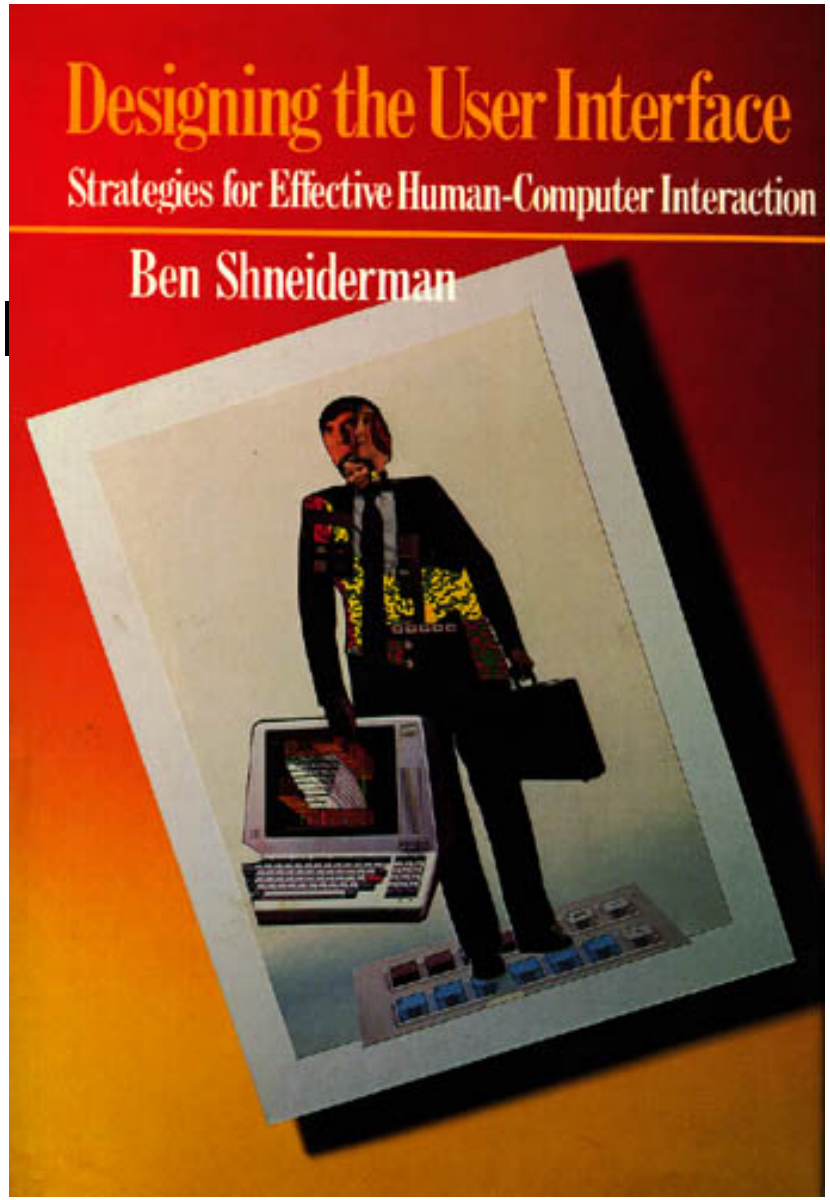
https://www.davincisurgery.com/

Bloomberg Terminal


A 2-D HCAI Framework

Designing the User Interface

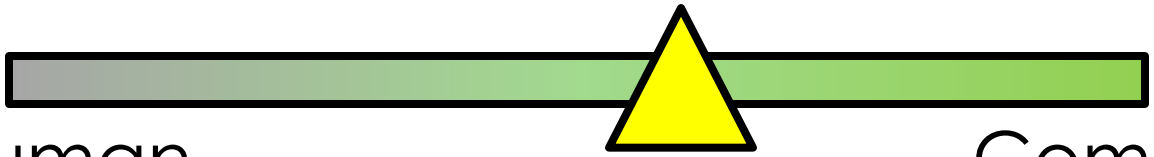
Balancing automation & human control



First Edition: 1986

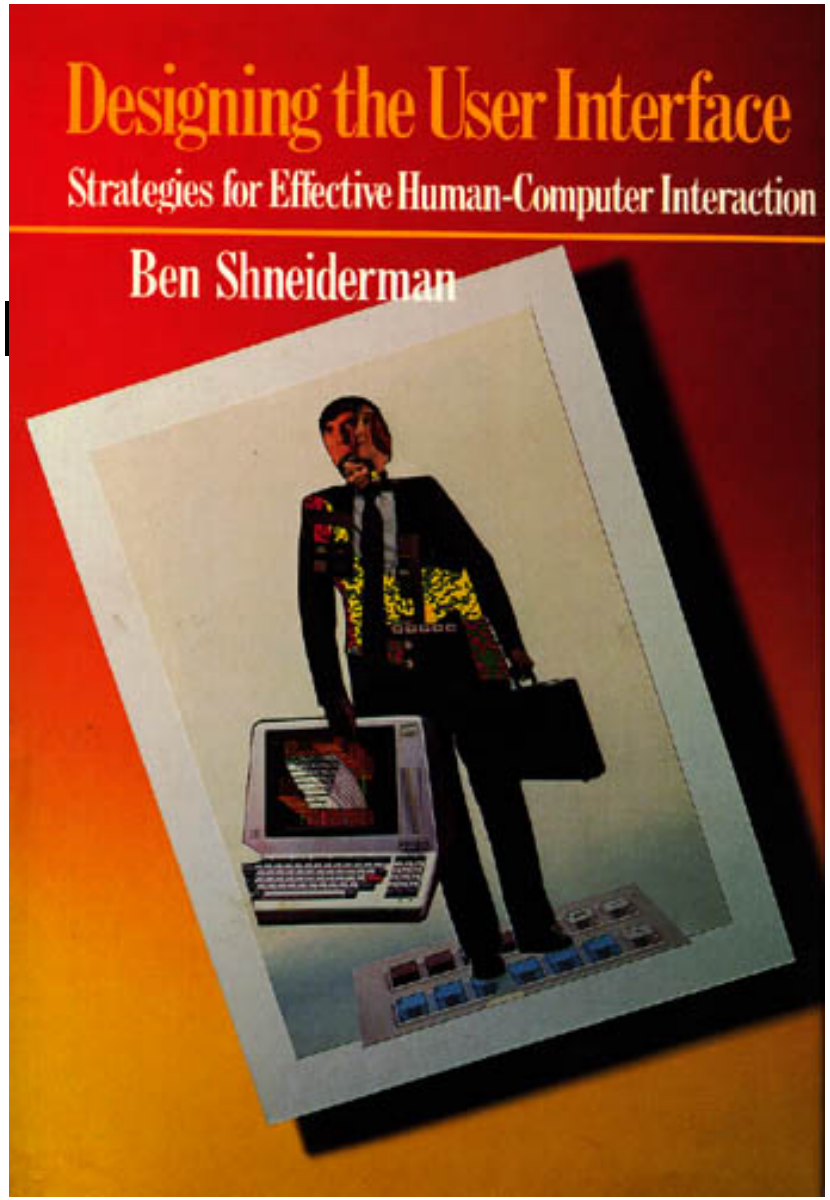
Designing the User Interface

Balancing automation & human control



Human control

Computer automation



First Edition: 1986

LEVELS OF DRIVING AUTOMATION

0

NO AUTOMATION

Manual control. The human performs all driving tasks (steering, acceleration, braking, etc.).

1

DRIVER ASSISTANCE

The vehicle features a single automated system (e.g. it monitors speed through cruise control).

2

PARTIAL AUTOMATION

ADAS. The vehicle can perform steering and acceleration. The human still monitors all tasks and can take control at any time.

3

CONDITIONAL AUTOMATION

Environmental detection capabilities. The vehicle can perform most driving tasks, but human override is still required.

4

HIGH AUTOMATION

The vehicle performs all driving tasks under specific circumstances. Geofencing is required. Human override is still an option.

5

FULL AUTOMATION

The vehicle performs all driving tasks under all conditions. Zero human attention or interaction is required.

THE HUMAN MONITORS THE DRIVING ENVIRONMENT

THE AUTOMATED SYSTEM MONITORS THE DRIVING ENVIRONMENT

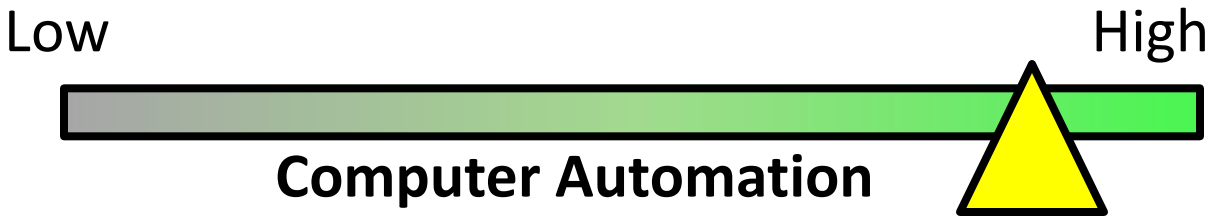
Designing the User Interface

Ensuring human control
while increasing automation

Sixth Edition: 2016

Designing the User Interface

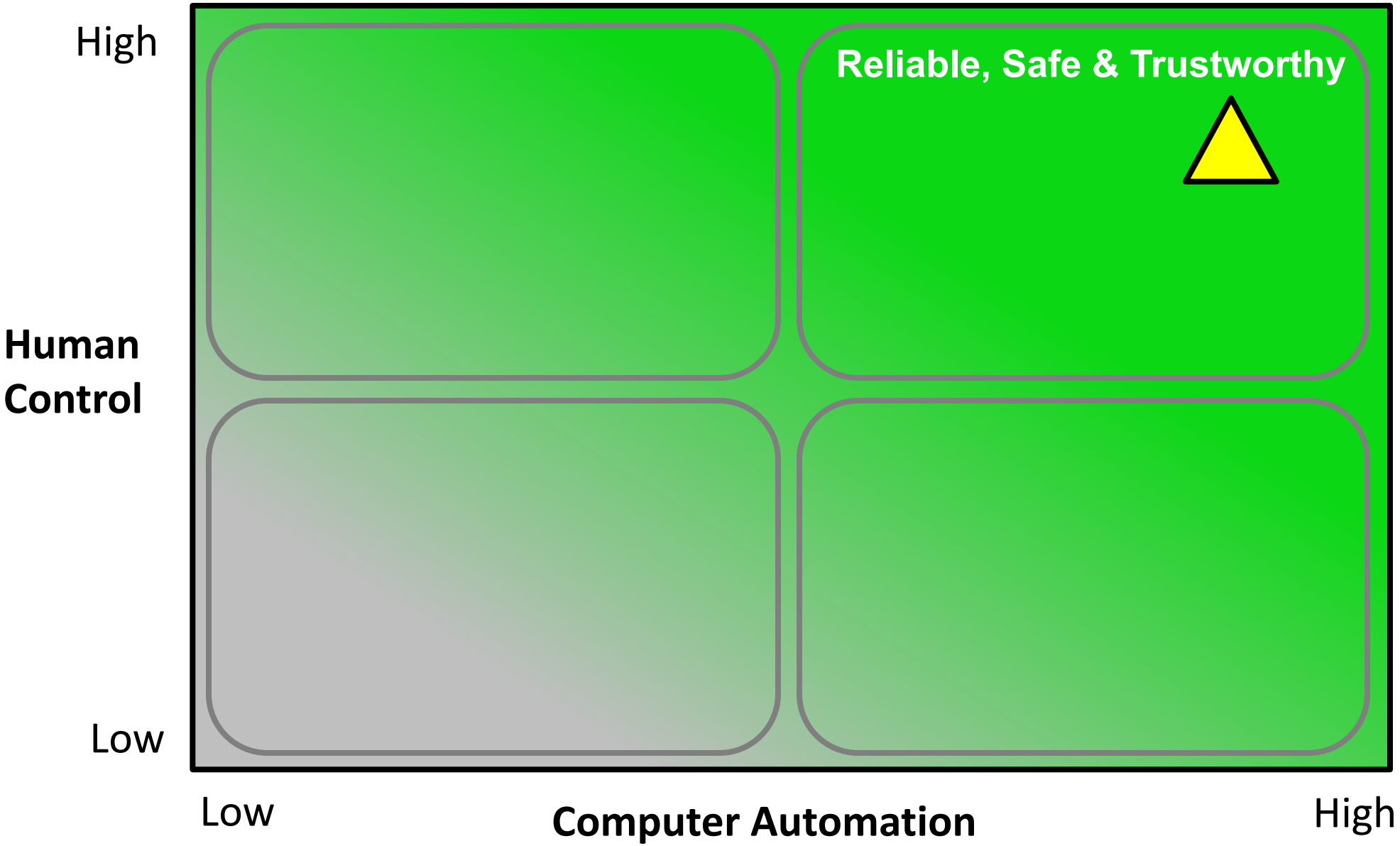
Ensuring human control
while increasing automation



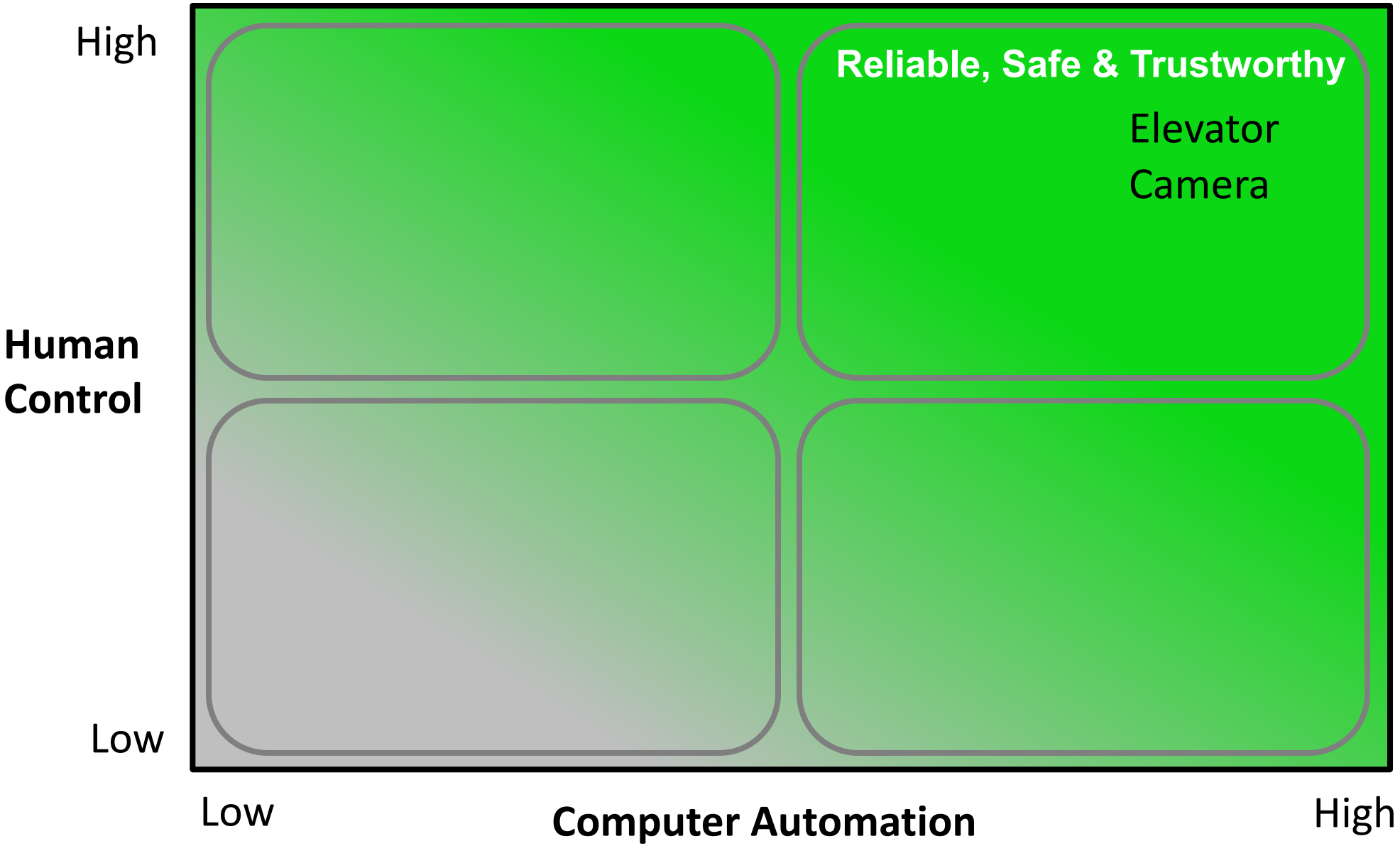
Sixth Edition: 2016

IJHCI (2020) **https://doi.org/10.1080/10447318.2020.1741118**

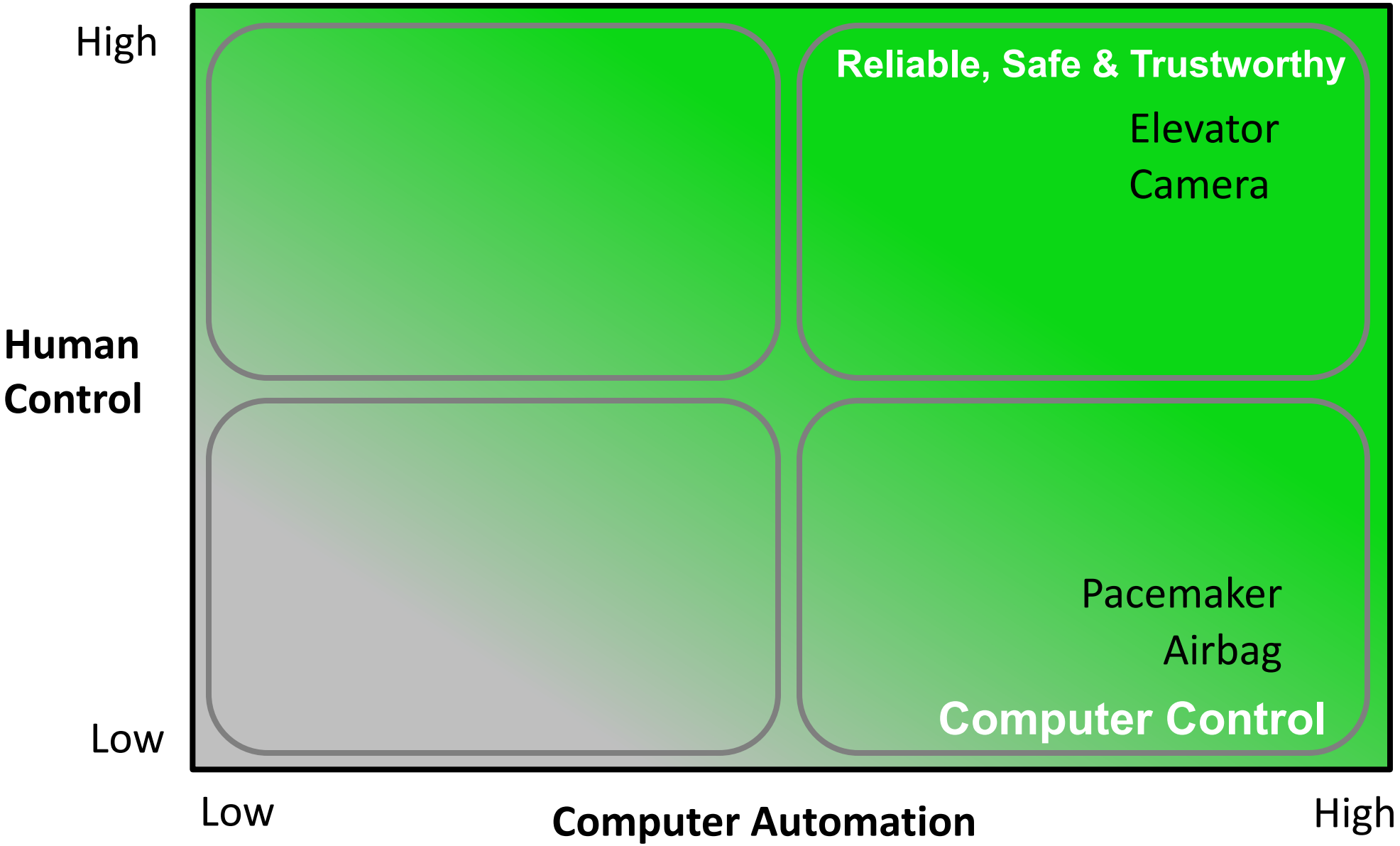
Human-Centered AI



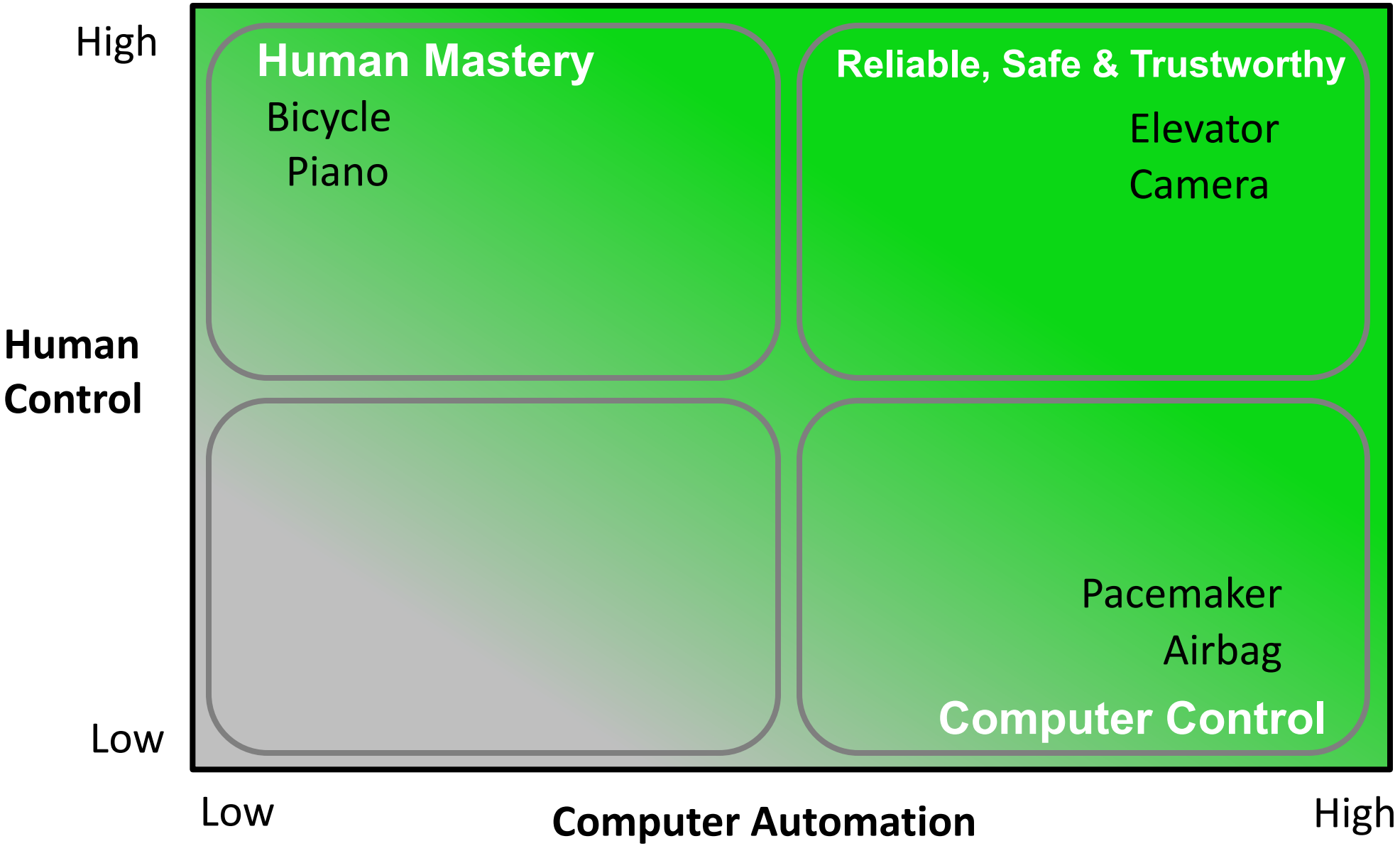
Human-Centered AI



Human-Centered AI



Human-Centered AI



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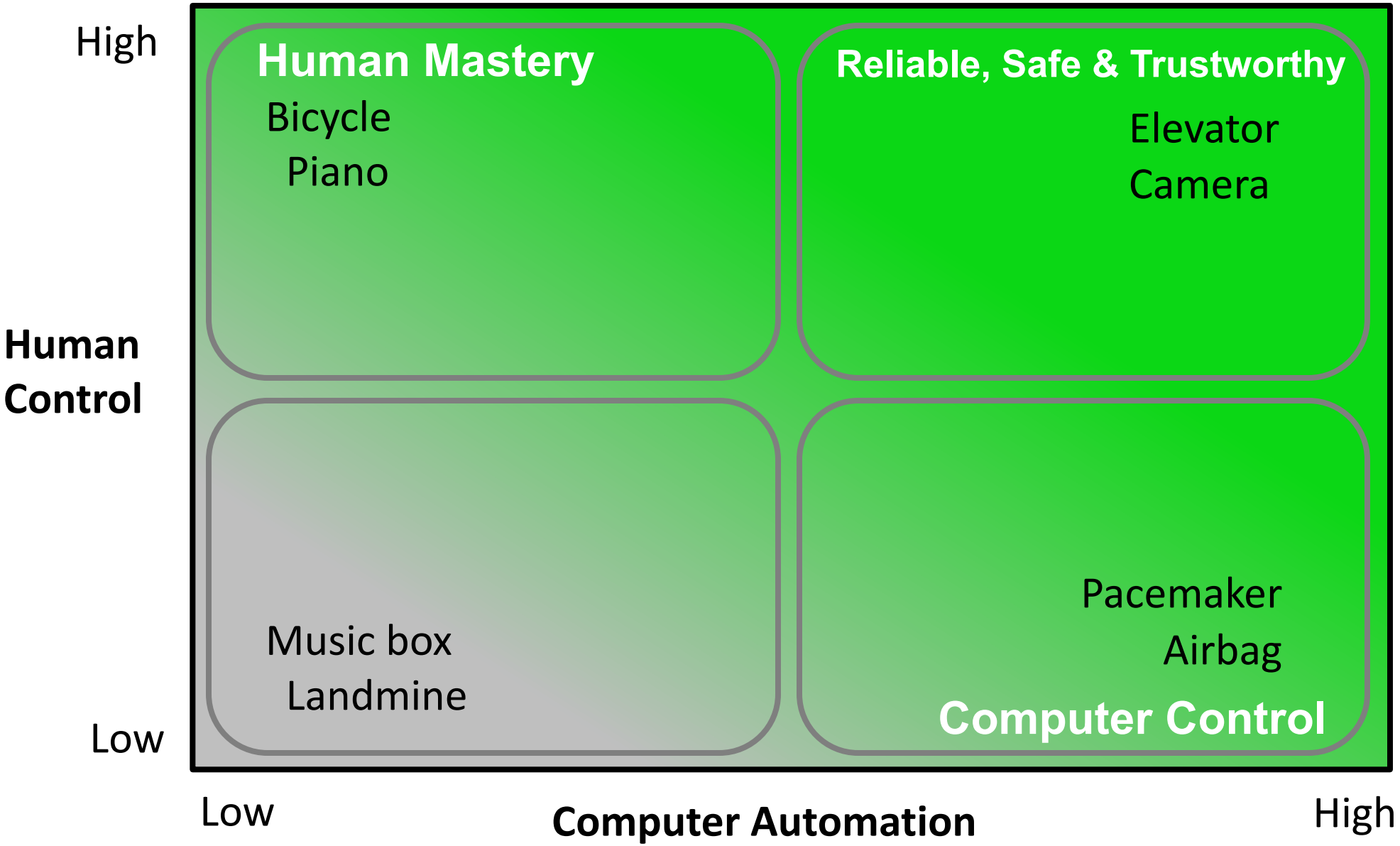
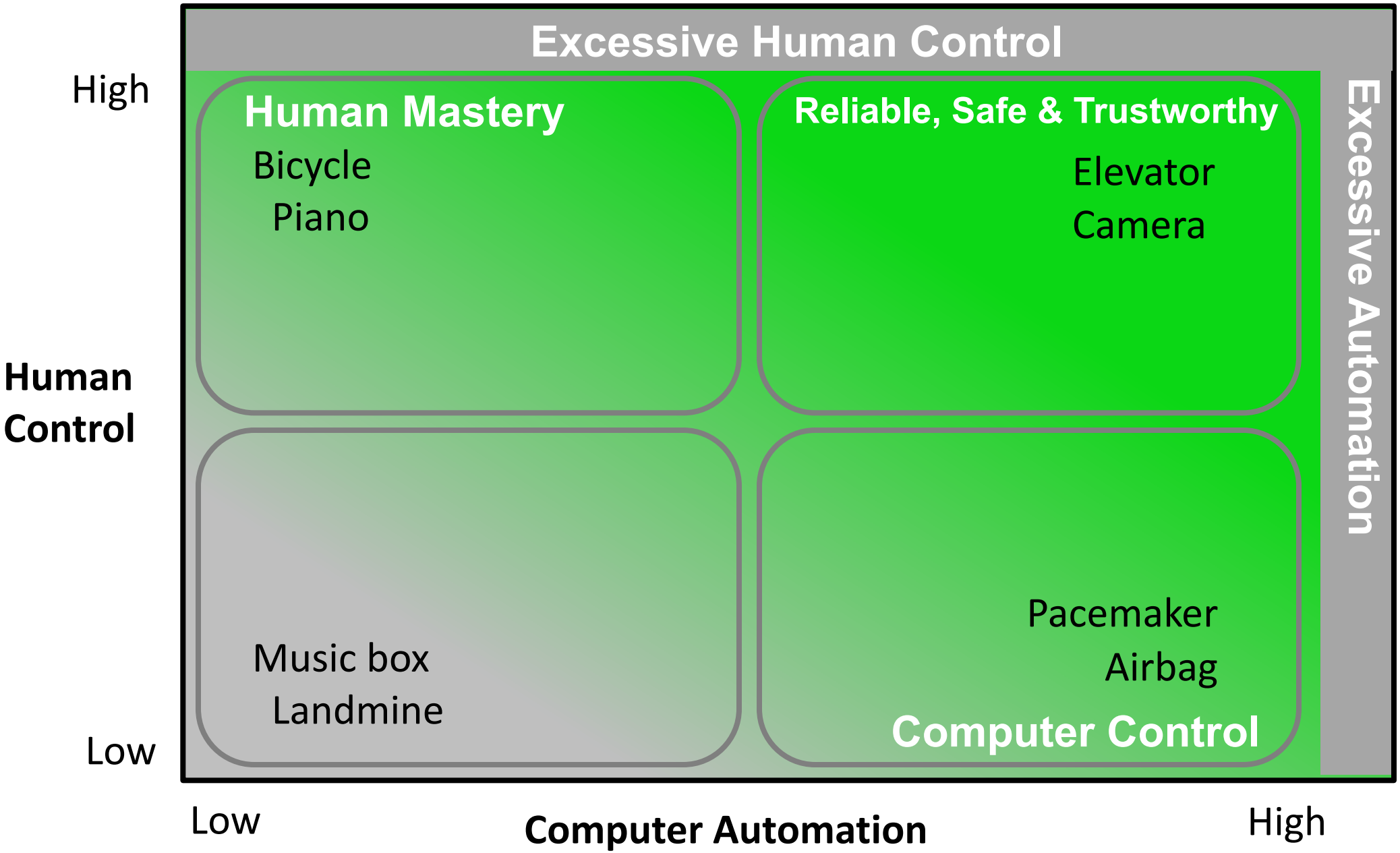
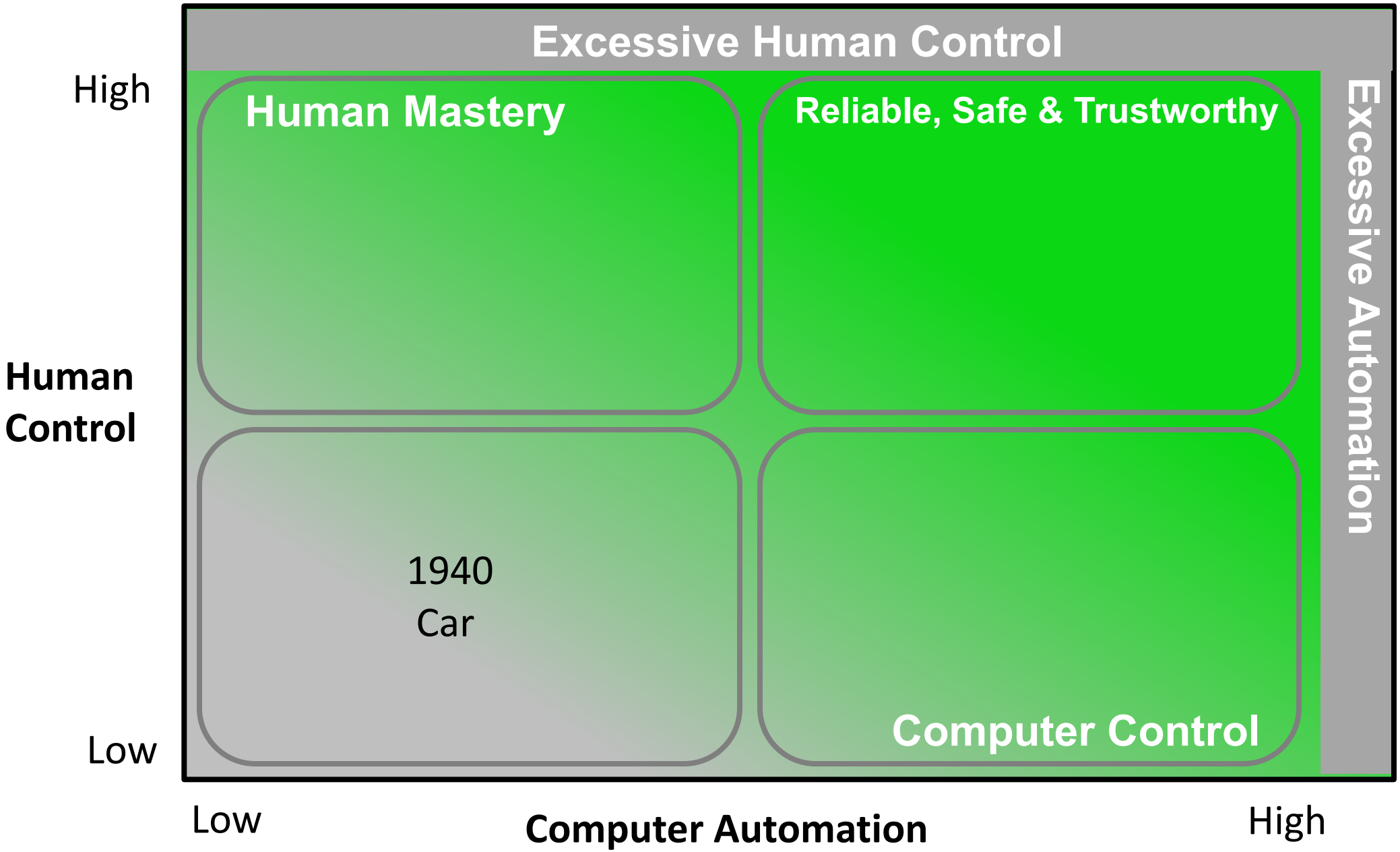


Human-Centered AI



Car Control Designs



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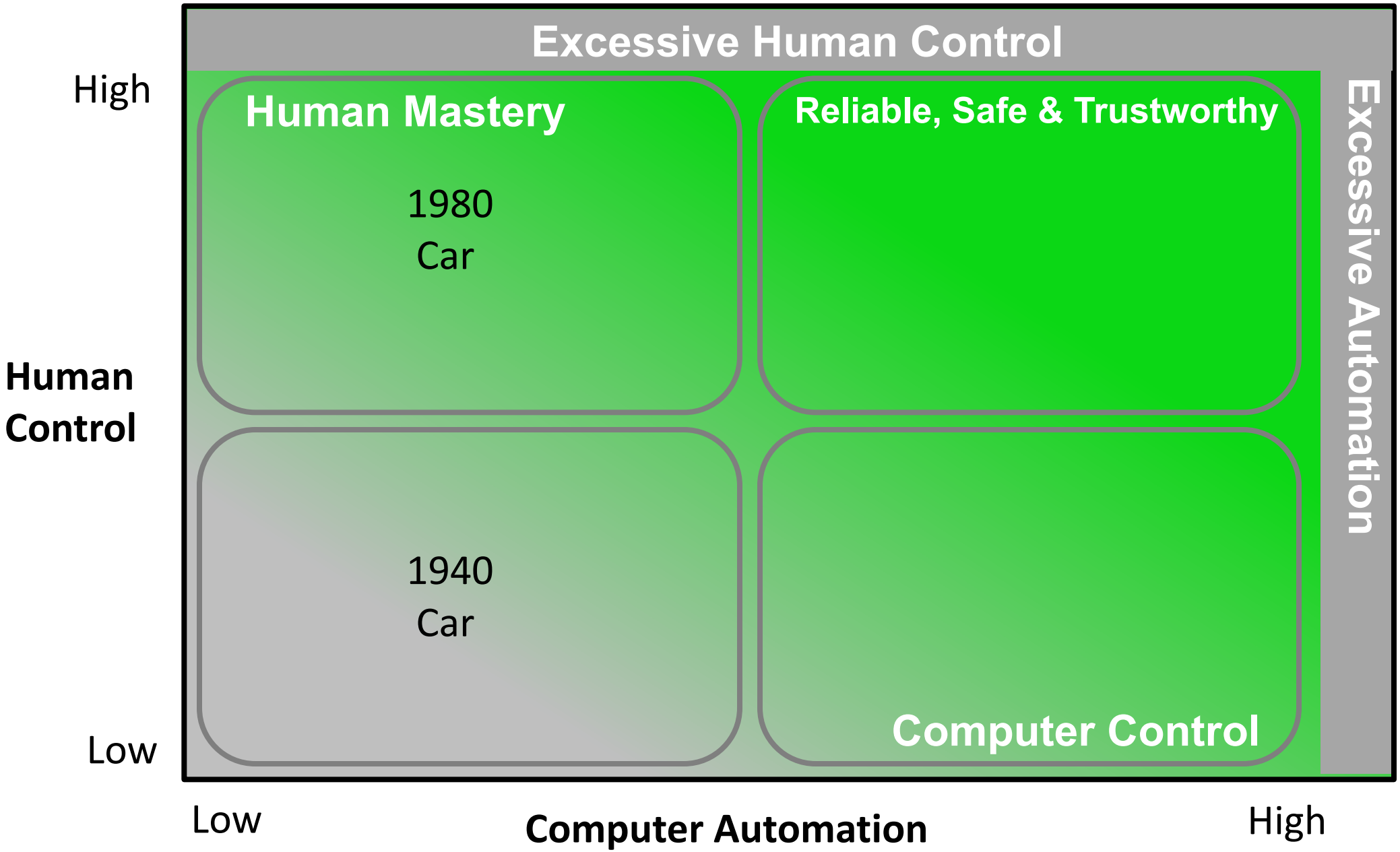

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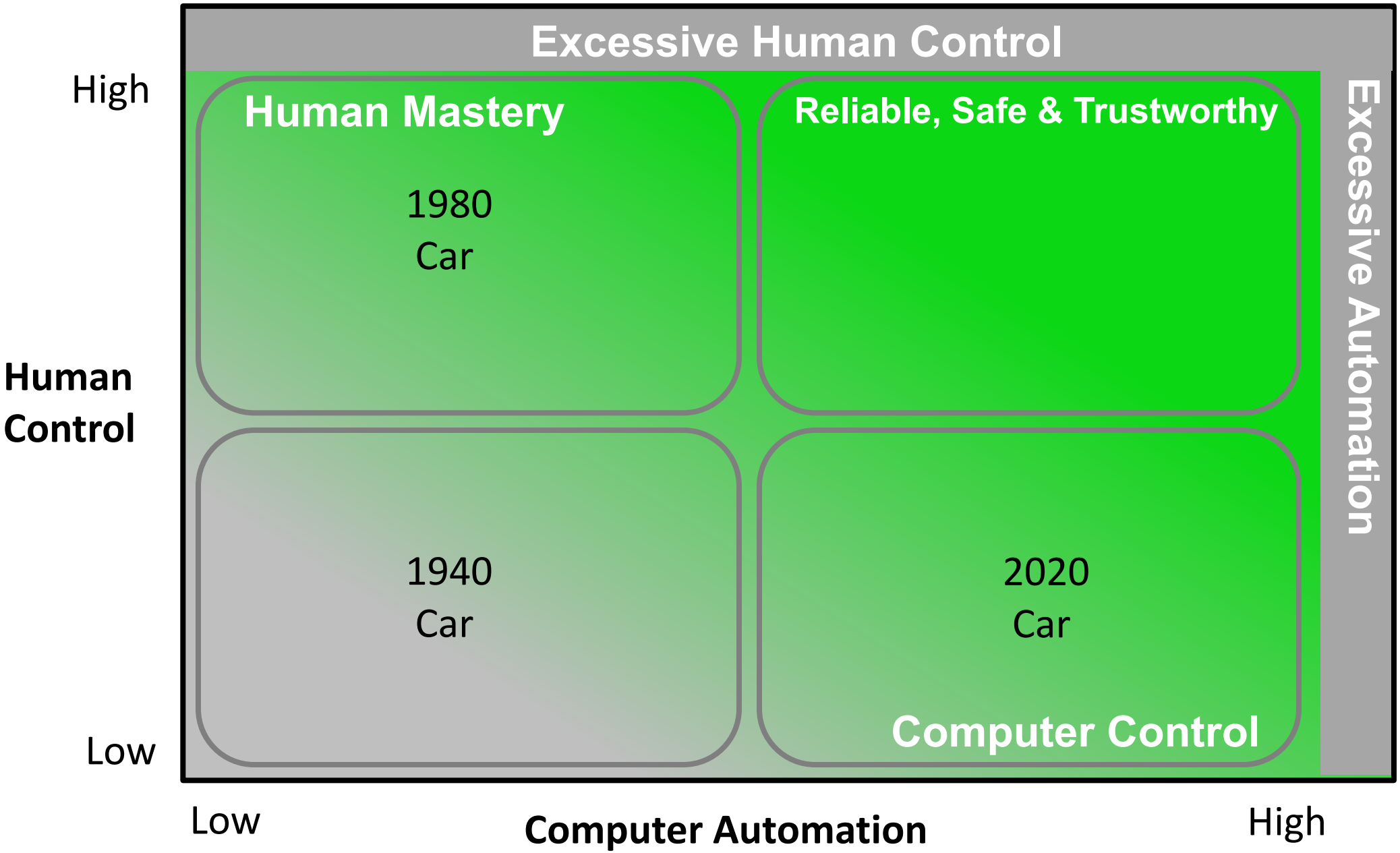

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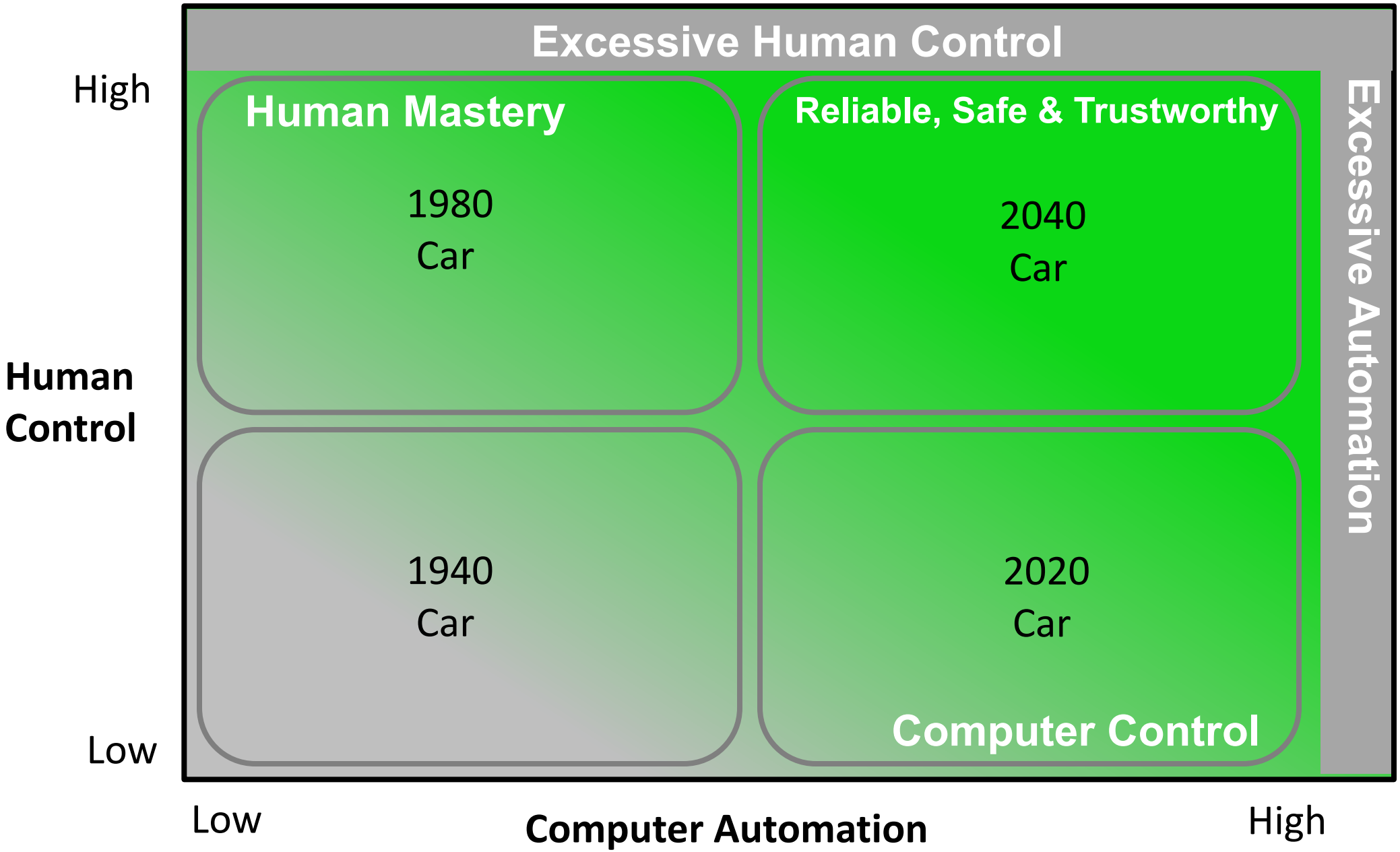
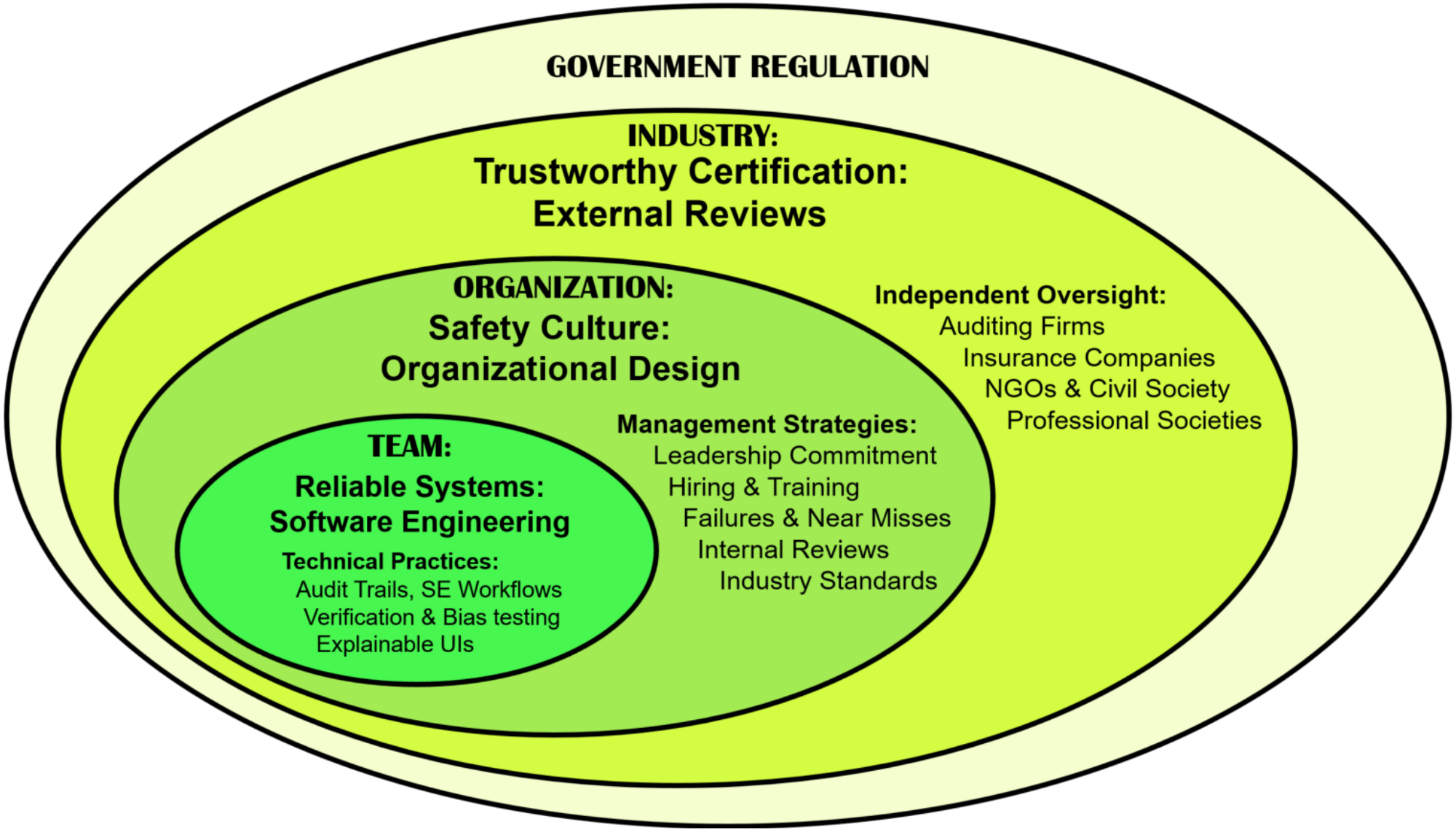


Governance Structures for Human-Centered AI



https://dl.acm.org/doi/10.1145/3419764

Summary

Human-Centered AI

Amplify, Augment, Enhance & Empower People

Human Responsibility

Supertools and Active Appliances

Visual Interfaces to Prevent/Reduce Explanations

Audit Trails to Analyze Failures & Near Misses

Independent Oversight

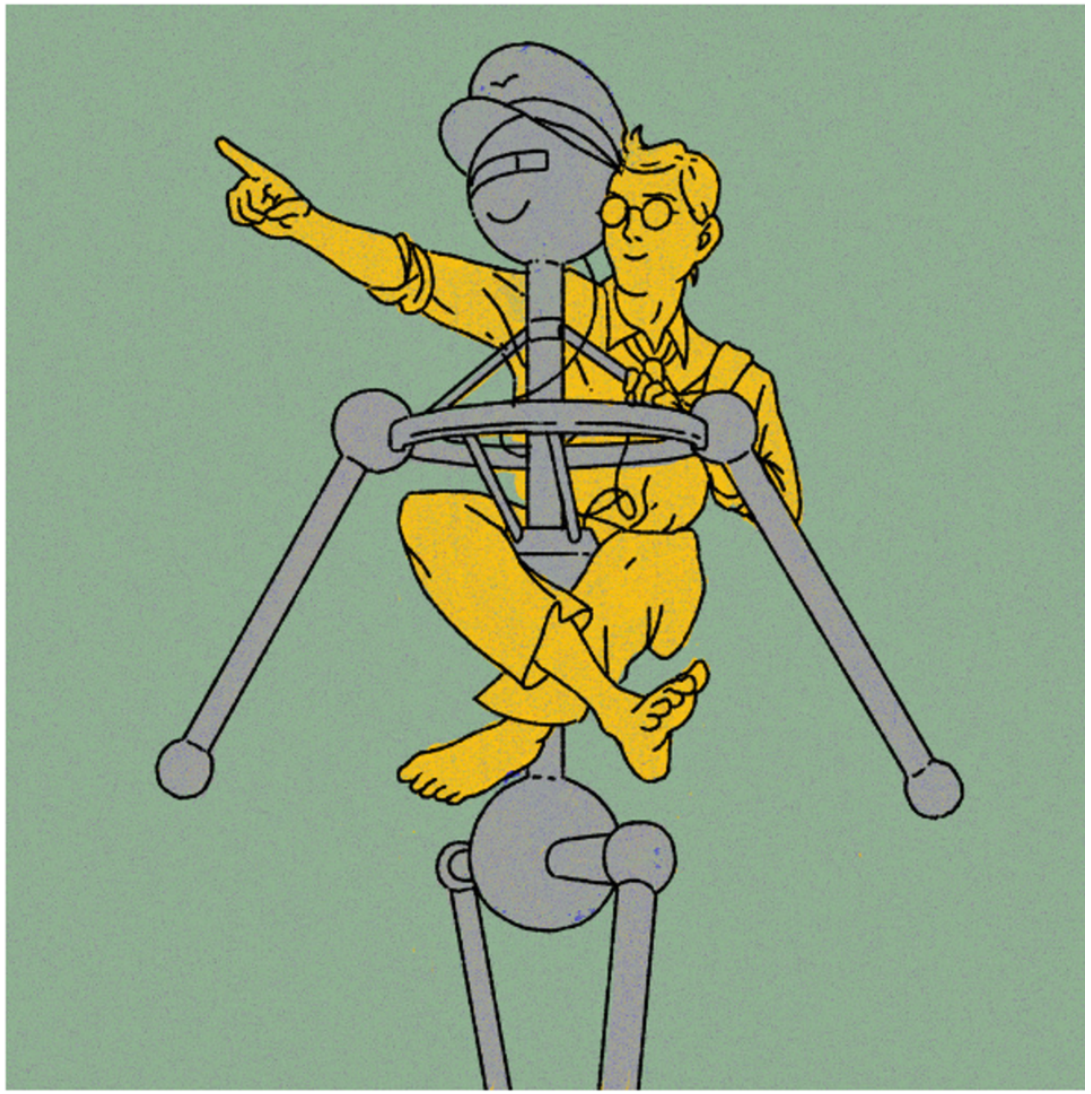
→ Reliable, Safe & Trustworthy

A Case for Cooperation Between Machines and Humans

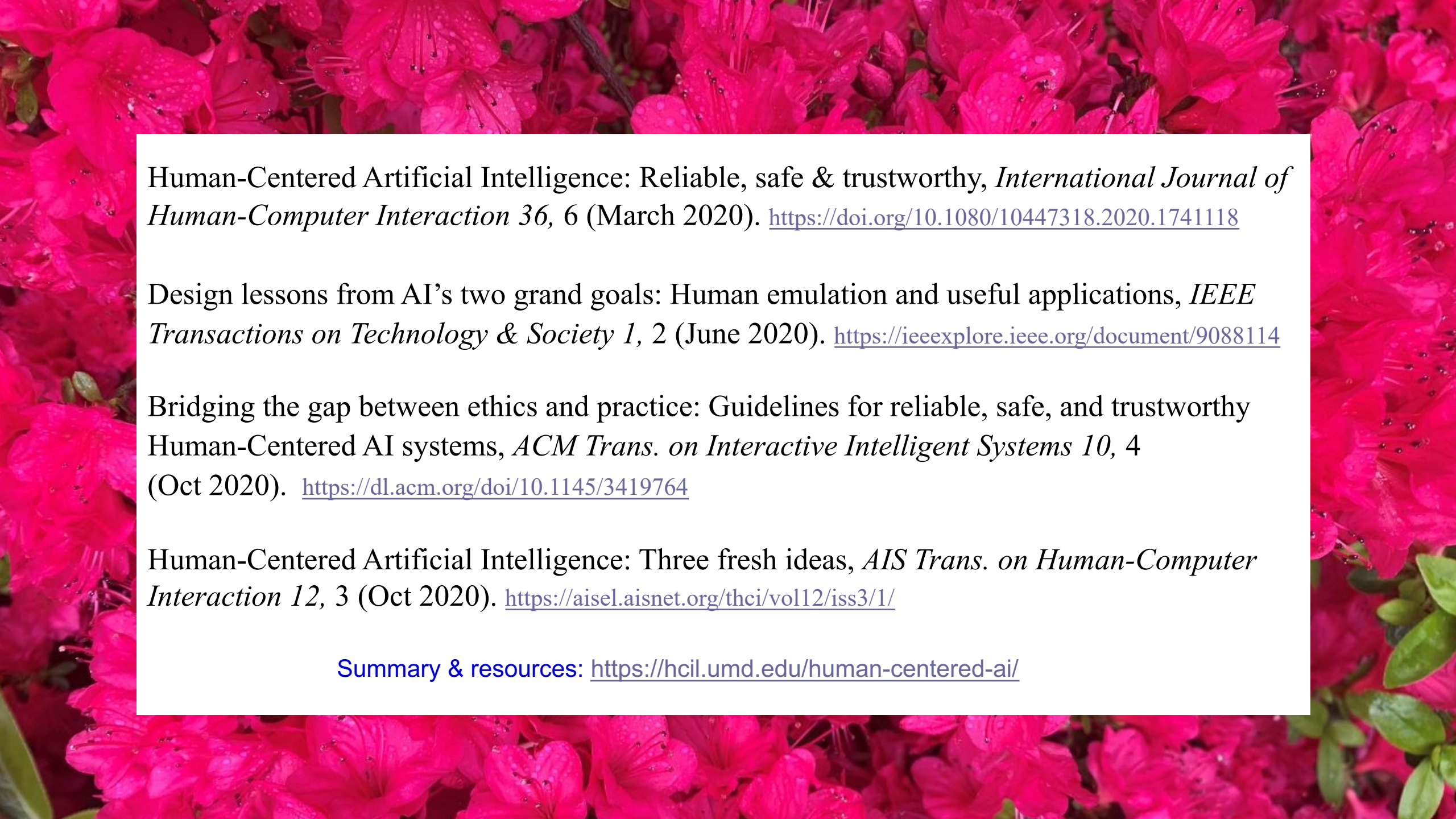
A computer scientist argues that the quest for fully automated robots is misguided, perhaps even dangerous. His decades of warnings are gaining more attention.

By John Markoff

May 21, 2020 Updated 3:09 p.m. ET



https://www.nytimes.com/2020/05/21/technology/ben-shneiderman-automation-humans.html



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Summary & resources: https://hcil.umd.edu/human-centered-ai/