

*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

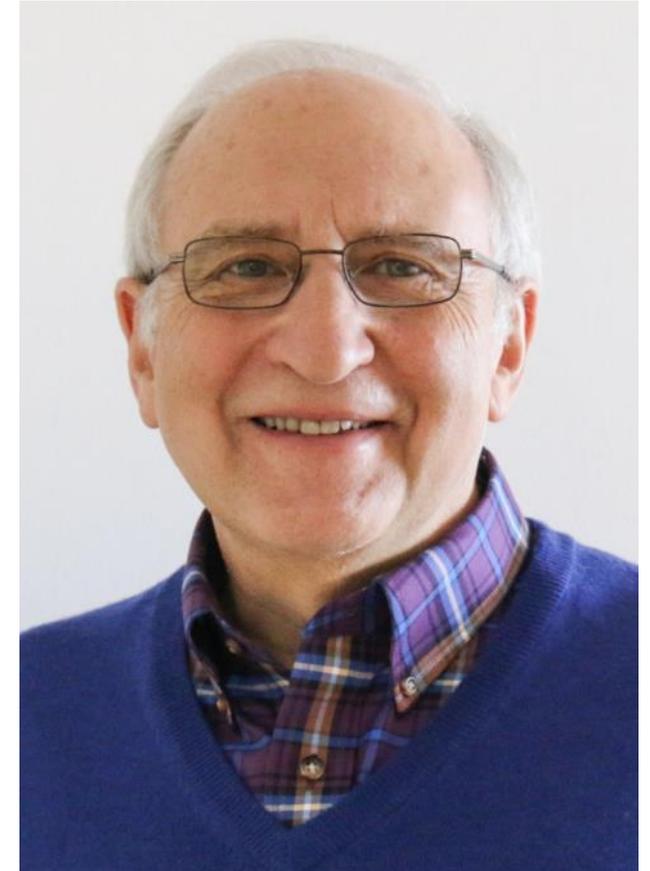


Photo: BK Adams



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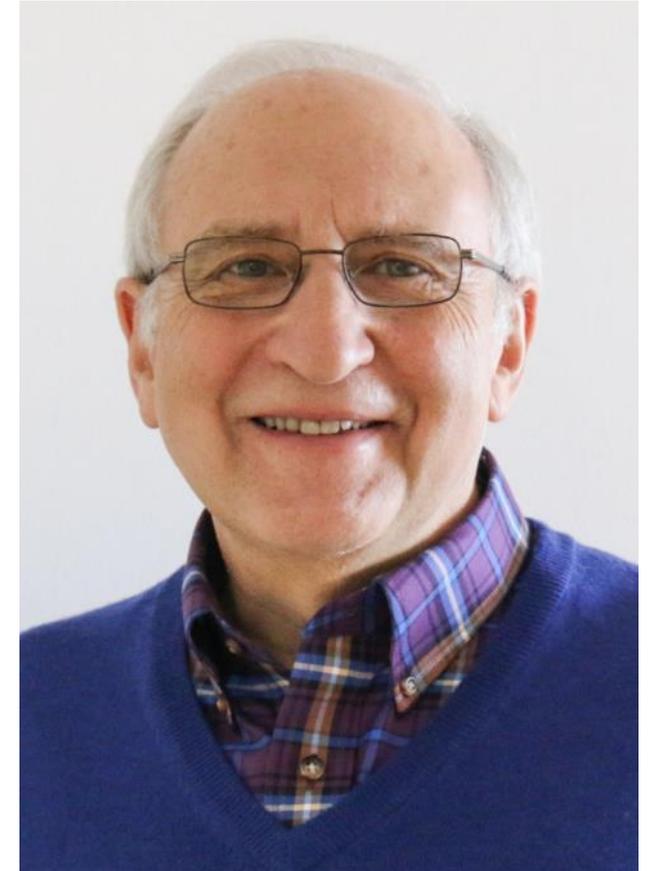


Photo: BK Adams

A sunset over a body of water with mountains in the background and a large ship on the left. The sun is low on the horizon, casting a golden glow across the sky and water. The sky is filled with dark, dramatic clouds, some of which are illuminated from below by the setting sun, creating a mix of orange, yellow, and blue tones. The water in the foreground is dark with a shimmering reflection of the sun. In the distance, a range of dark mountains is visible against the horizon. On the left side of the image, a large ship, possibly a cargo vessel, is silhouetted against the water.

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

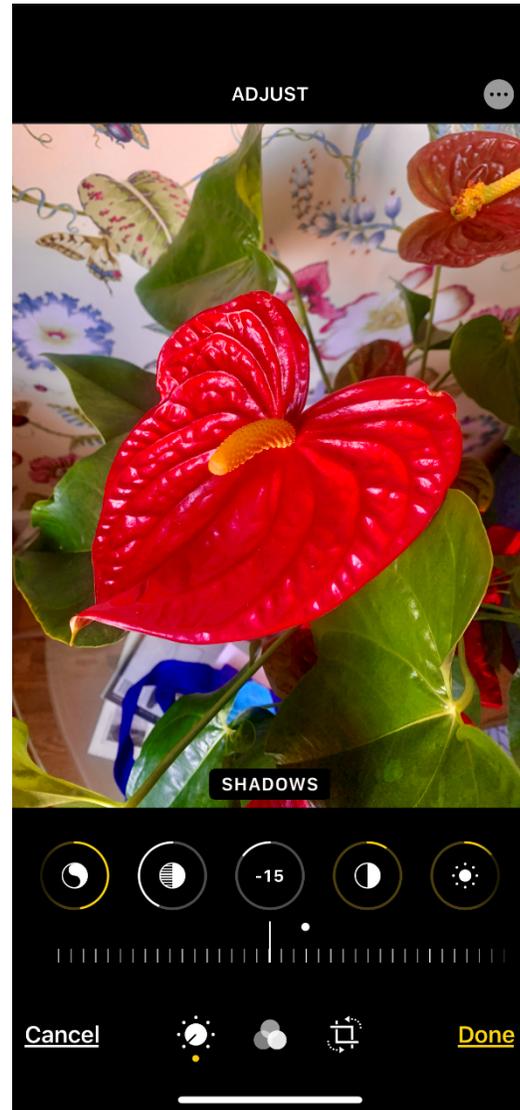
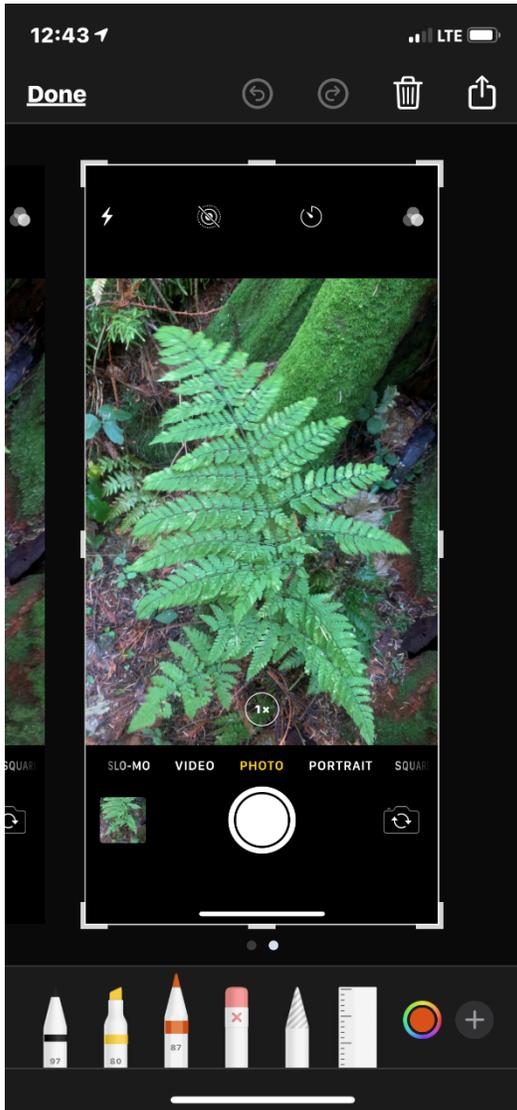
Audit Trails to Analyze Failures & Near Misses

Independent Oversight

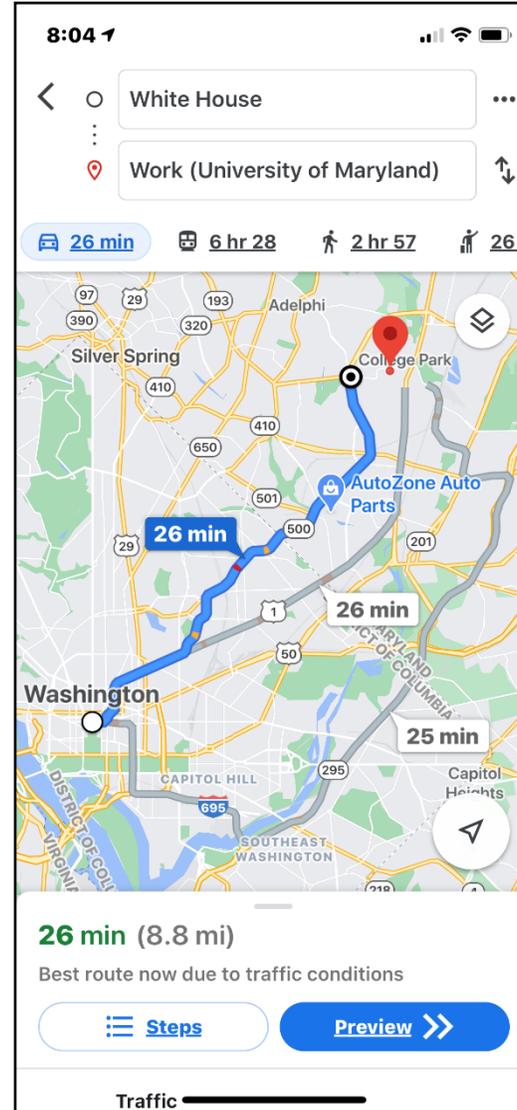
→ Reliable, Safe & Trustworthy

Supertools

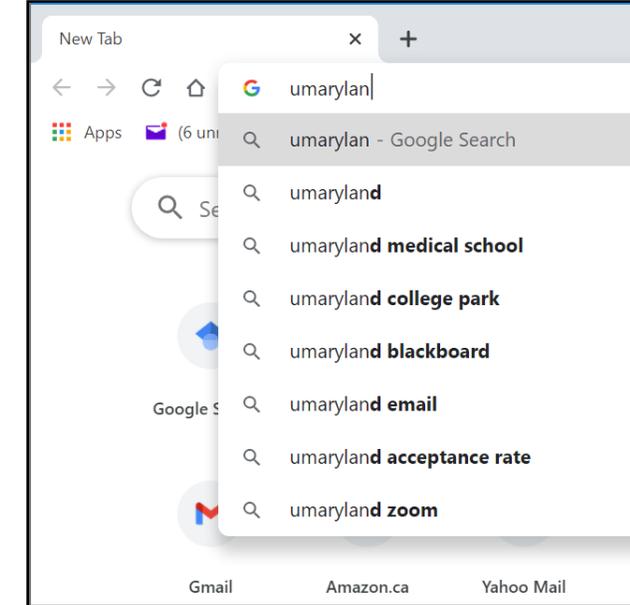
Digital Camera Controls



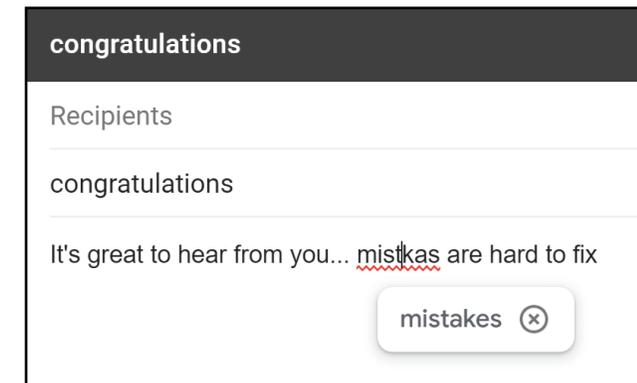
Navigation Choices



Texting Autocompletion



Spelling correction



Active Appliances

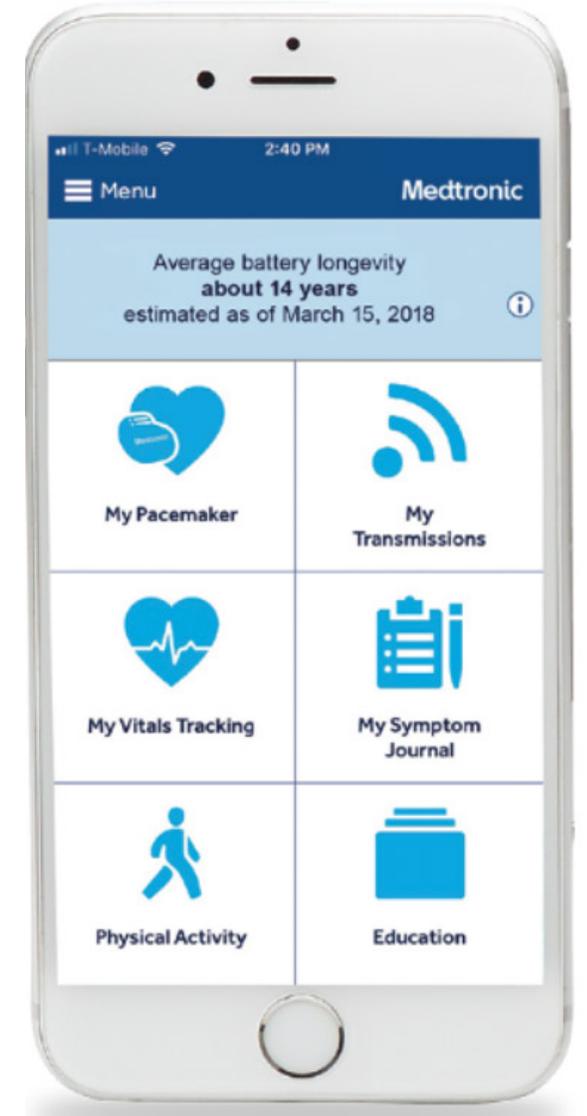
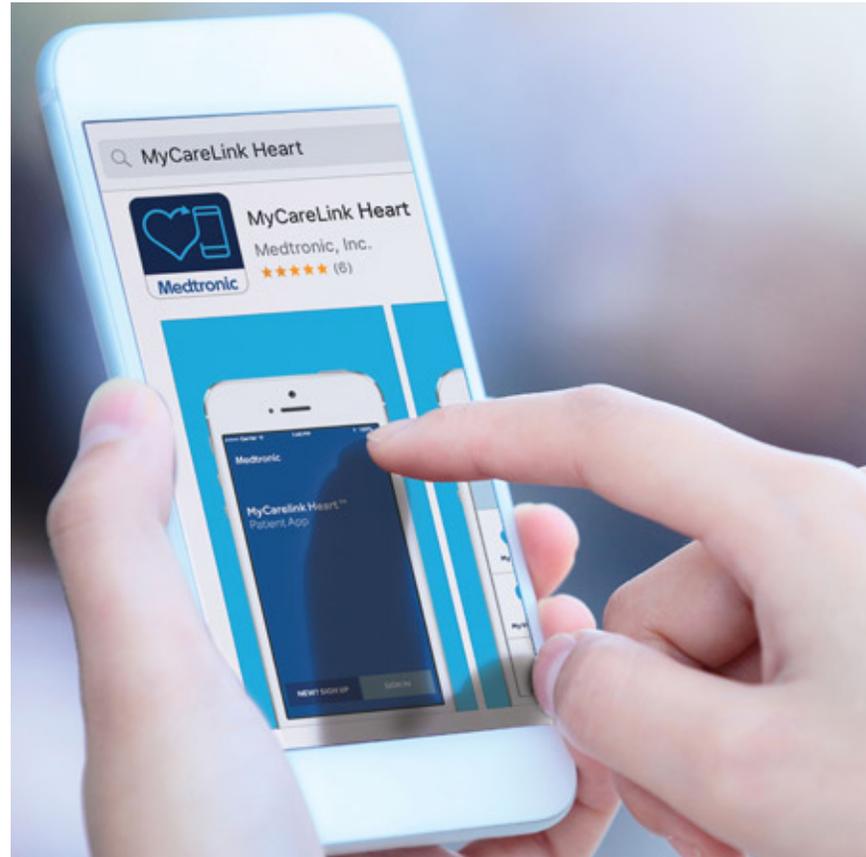
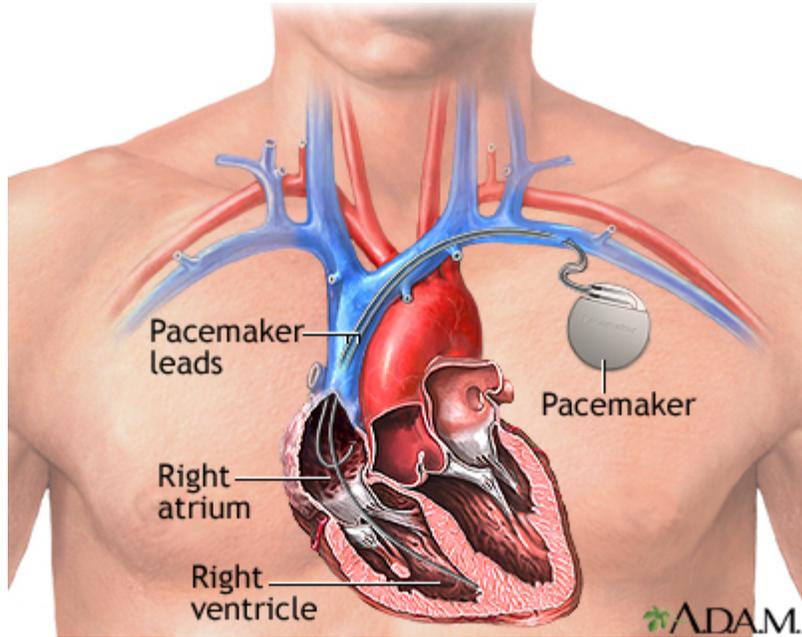
Coffee maker, Rice cooker, Blender



Dishwasher, Clothes Washer/Dryer



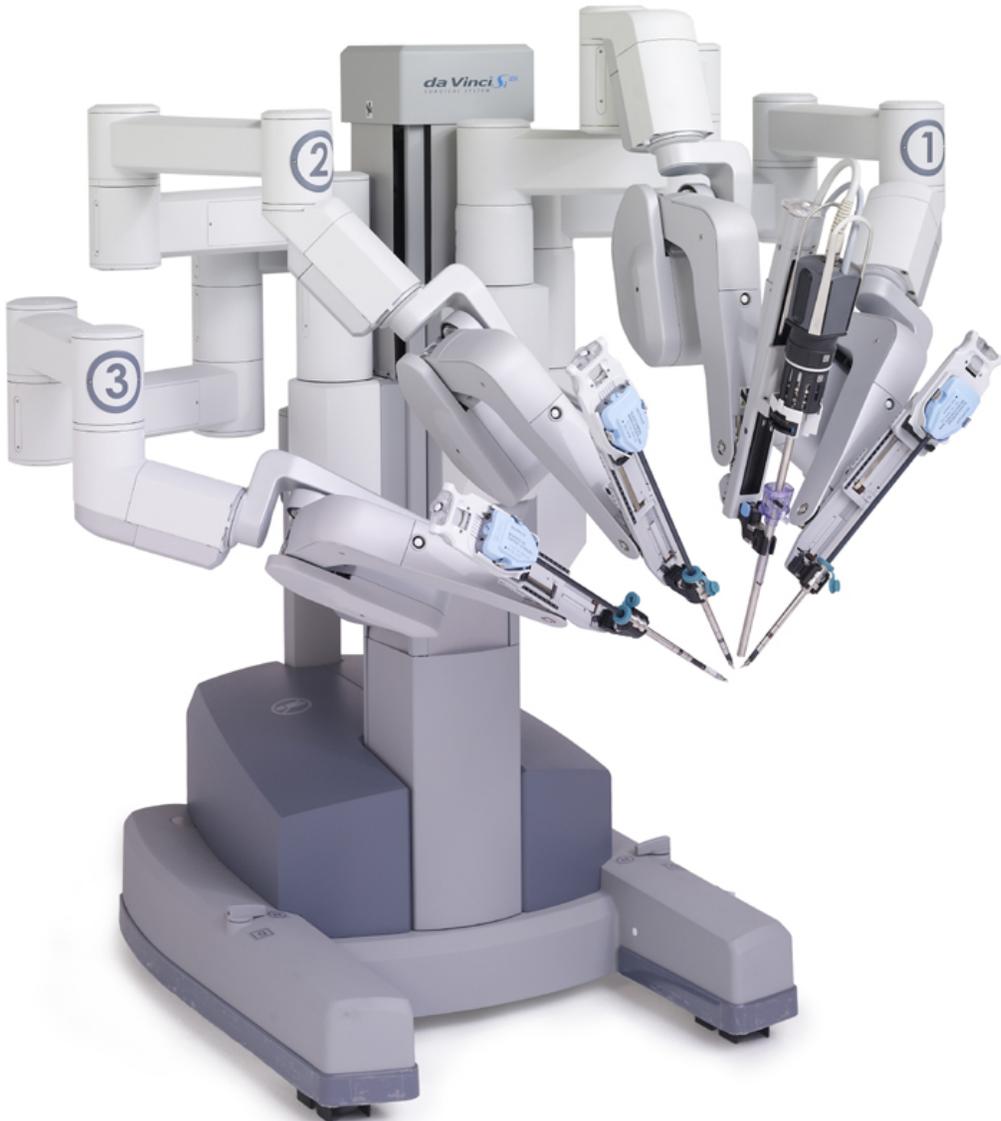
Implanted Cardiac Pacemakers



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.”

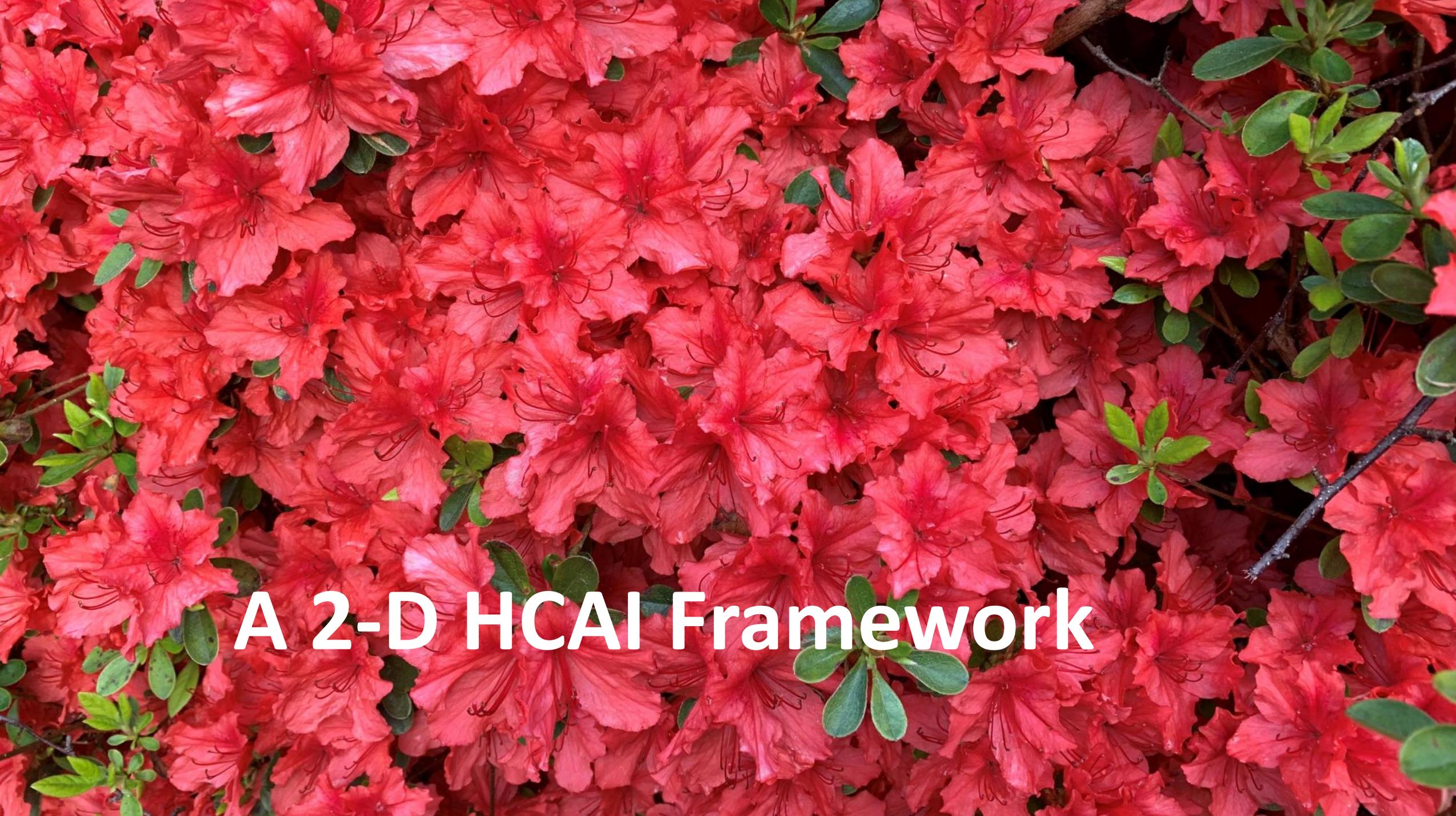
<https://www.davincisurgery.com/>



Bloomberg Terminal



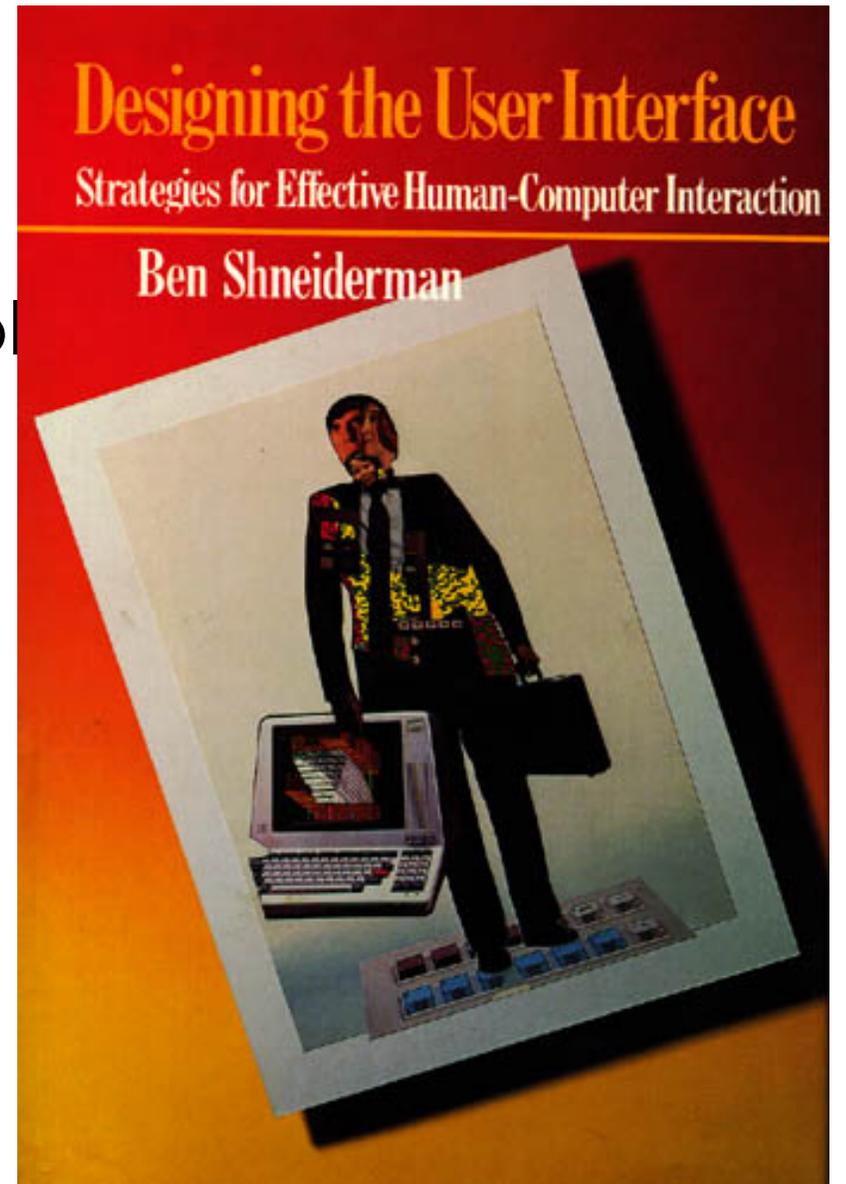


A close-up, top-down view of a dense cluster of bright red azalea flowers. The flowers are in full bloom, showing five petals and prominent stamens. Interspersed among the flowers are several green, oval-shaped leaves. The overall color palette is dominated by vibrant reds and greens.

A 2-D HCAI Framework

Designing the User Interface

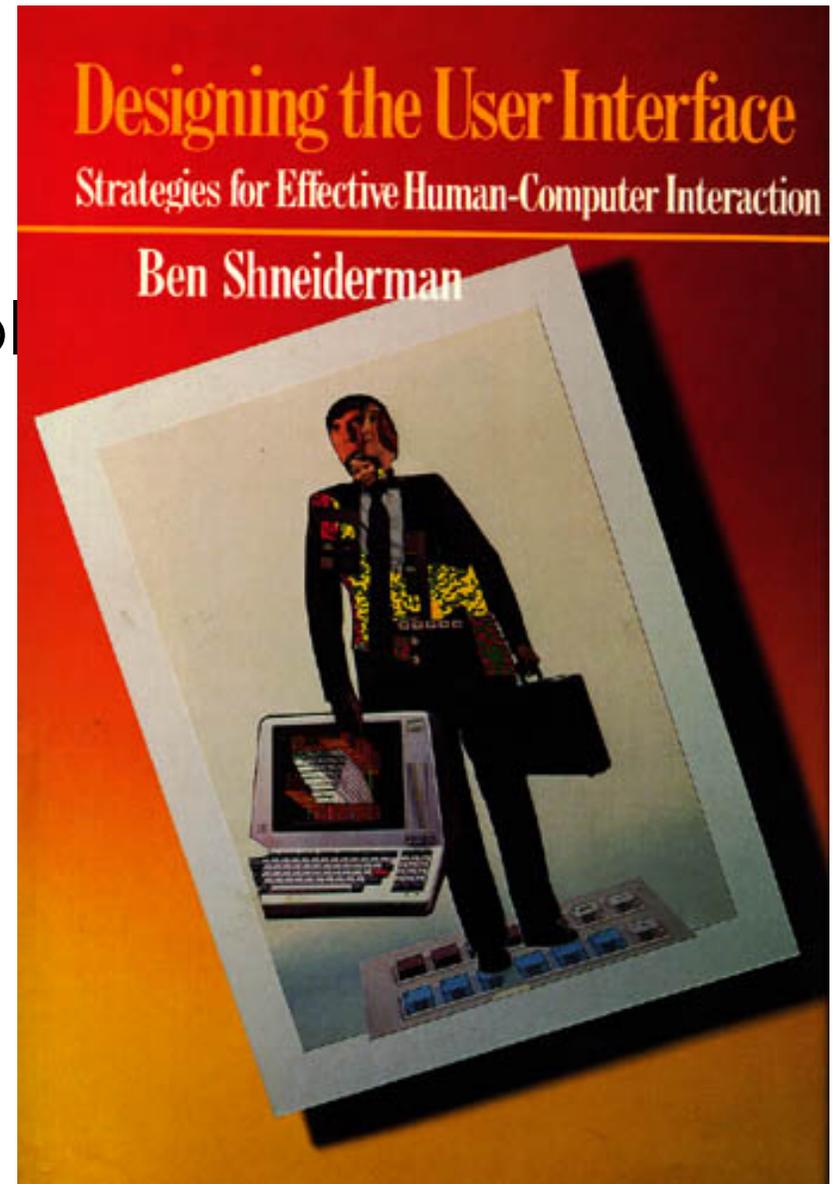
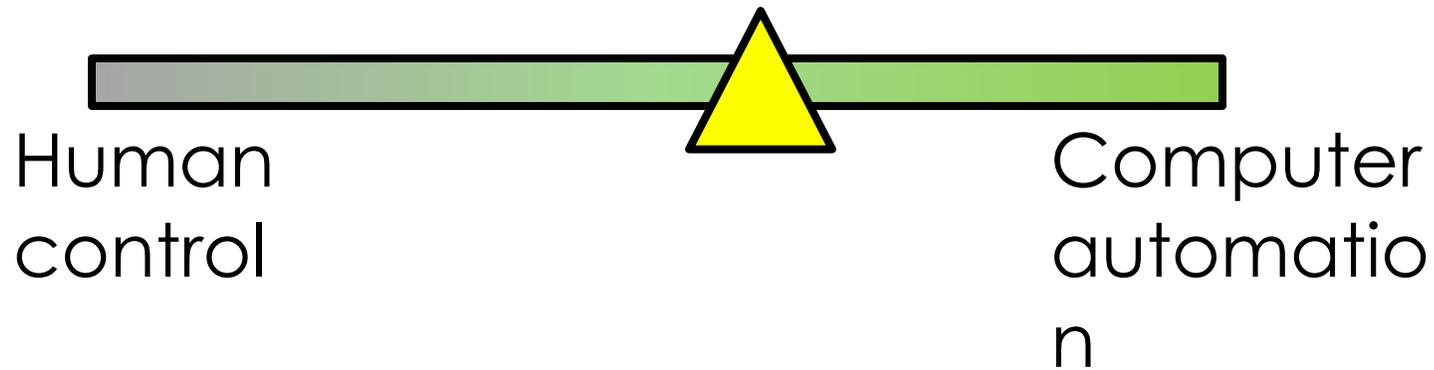
Balancing automation & human control



First Edition: 1986

Designing the User Interface

Balancing automation & human control



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

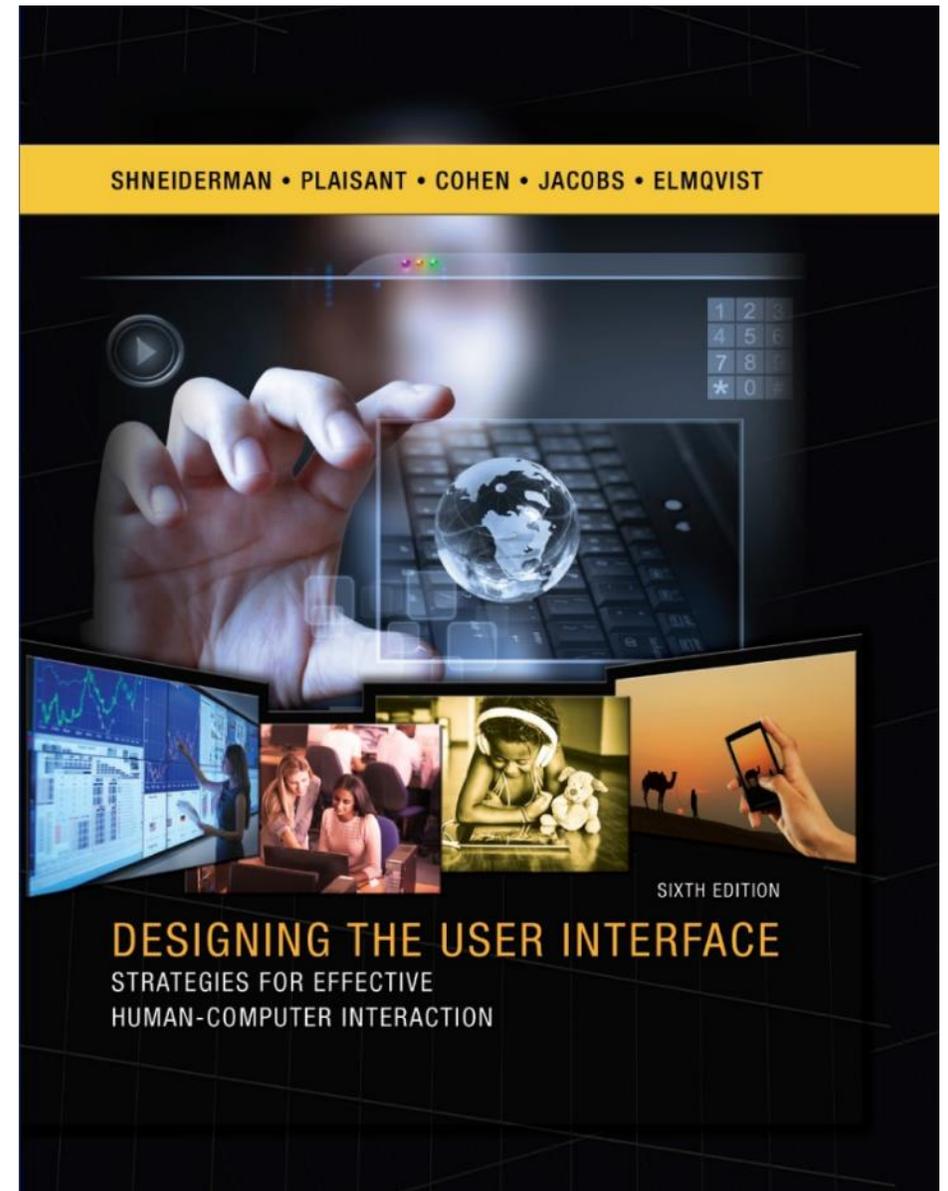
The vehicle performs all driving tasks under all conditions. Zero human attention or interaction is required.

THE HUMAN MONITORS THE DRIVING ENVIRONMENT

THE AUTOMATED SYSTEM MONITORS THE DRIVING ENVIRONMENT

Designing the User Interface

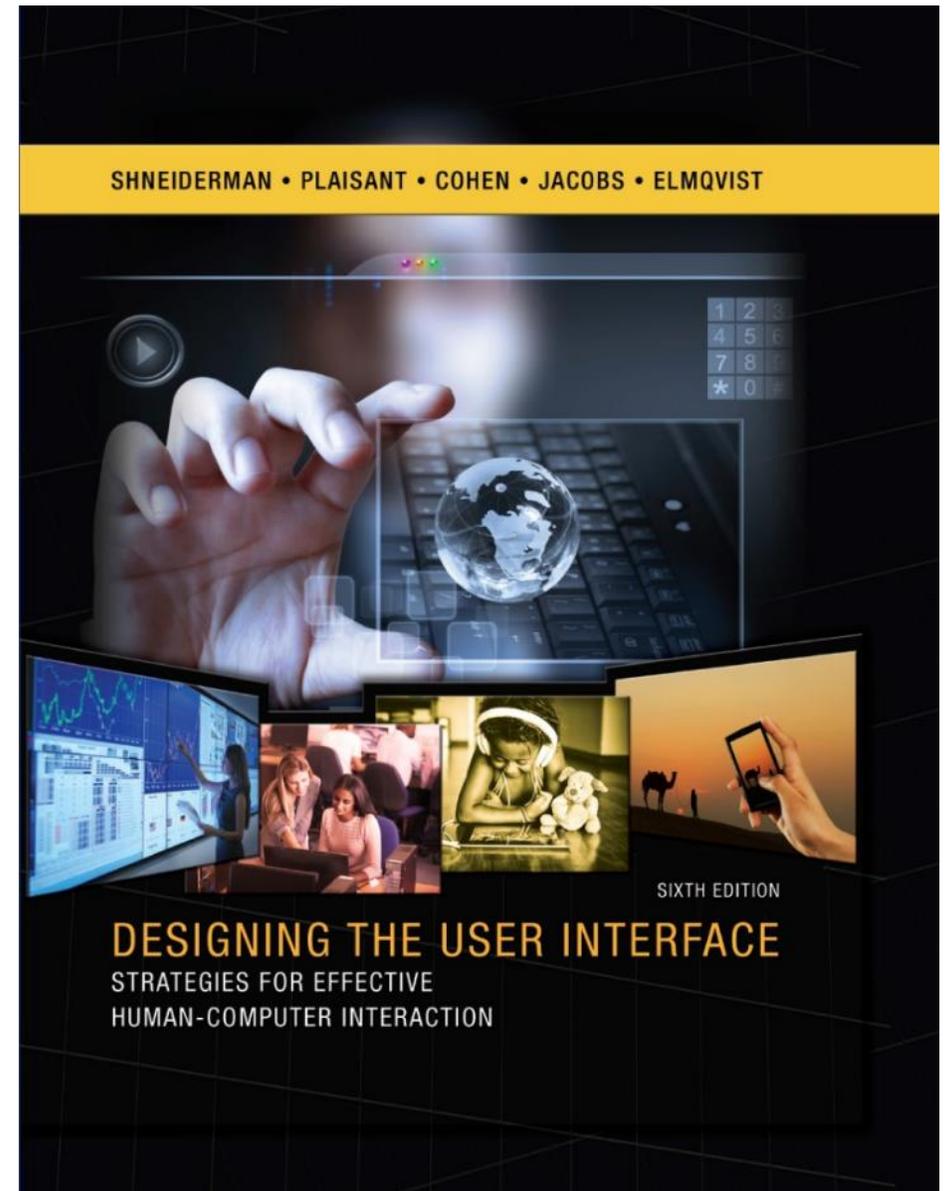
Ensuring human control
while increasing automation



Sixth Edition: 2016

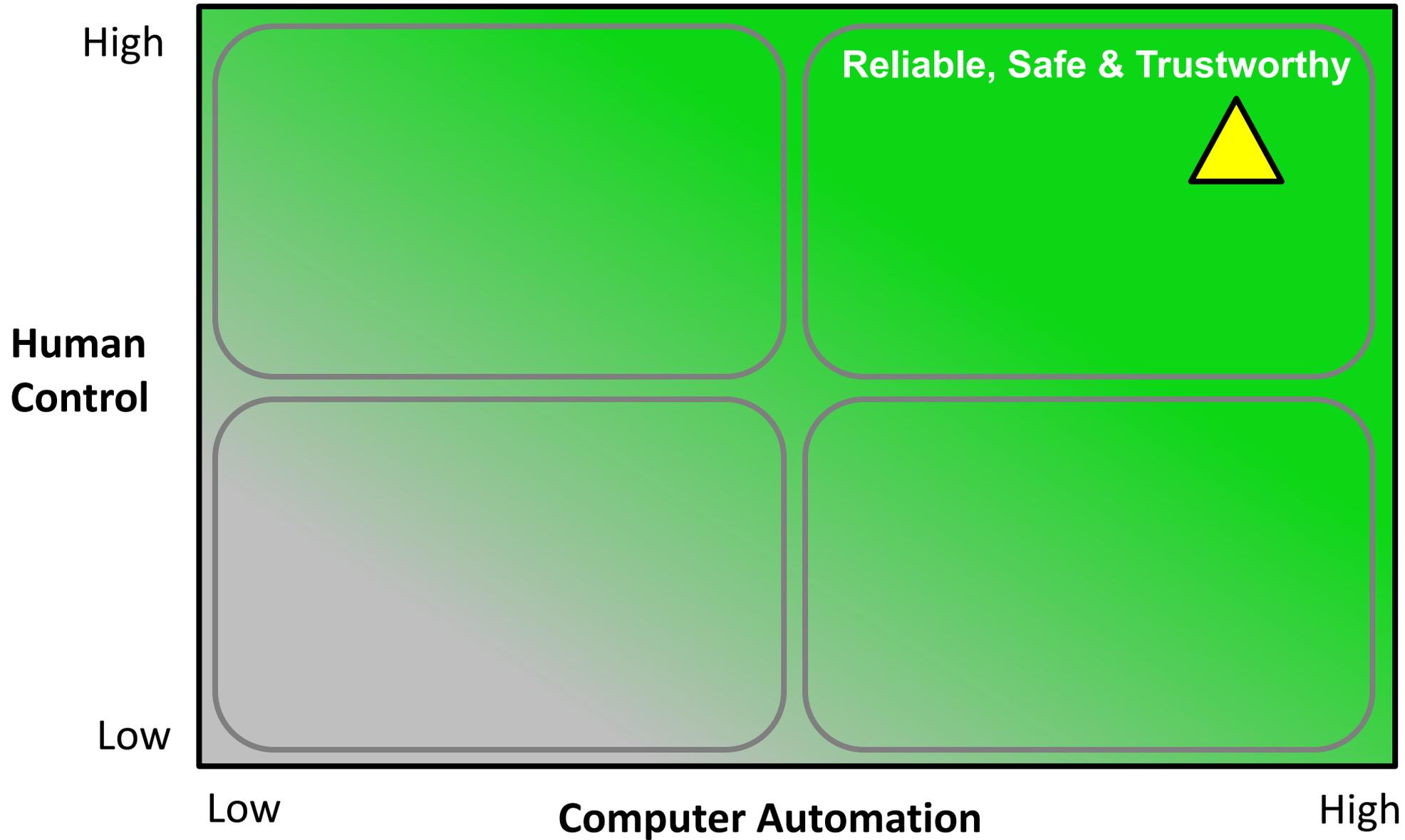
Designing the User Interface

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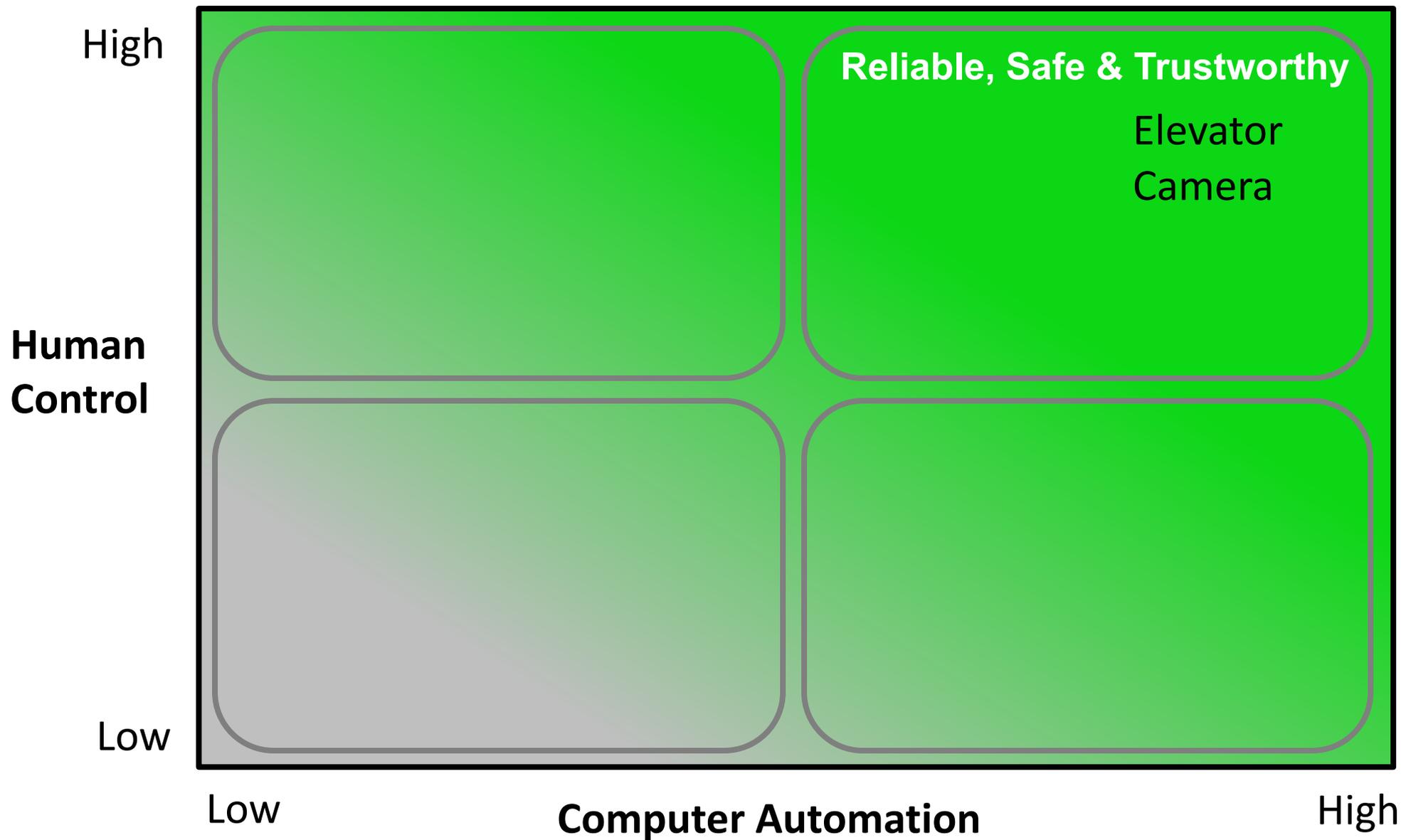


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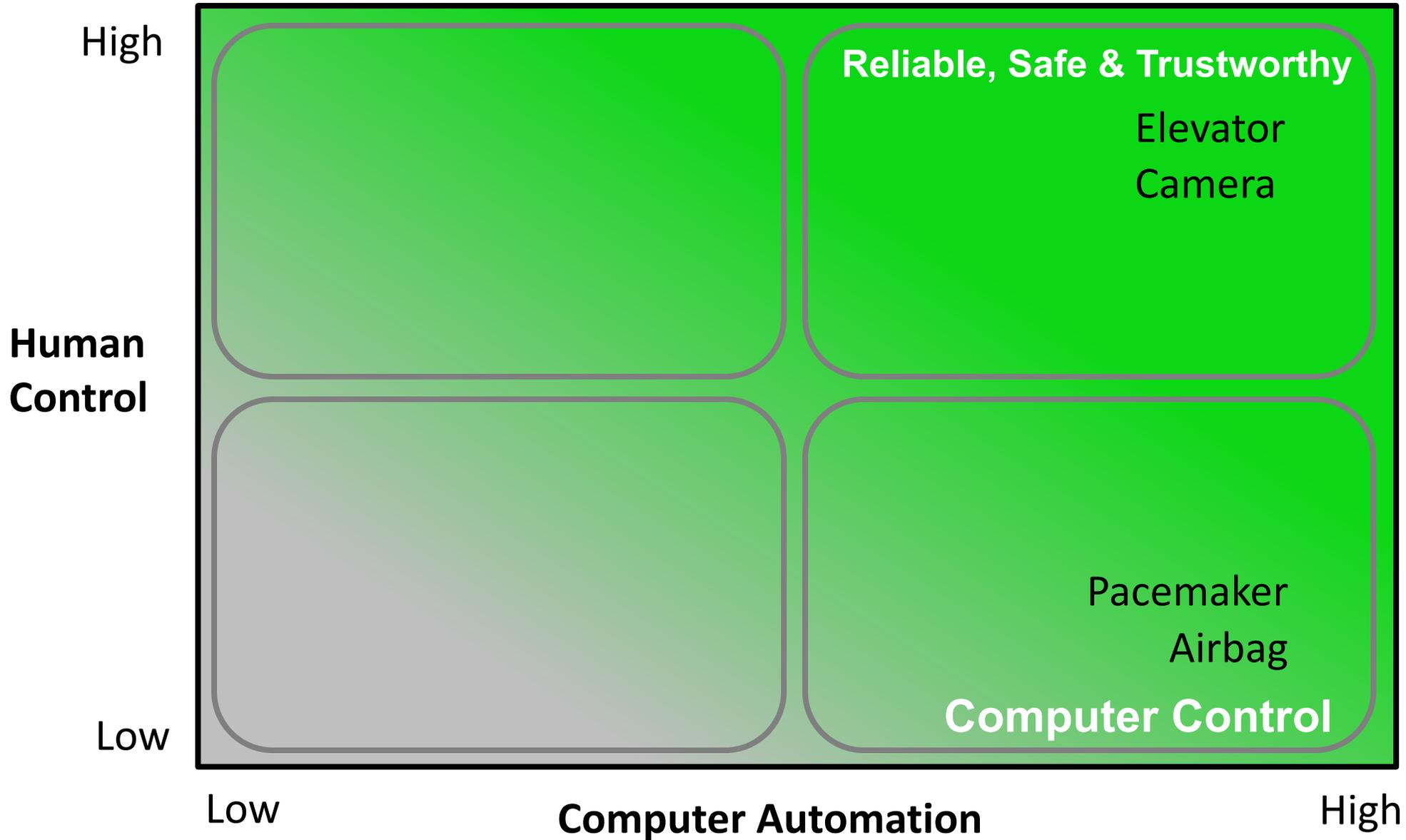
Human-Centered AI



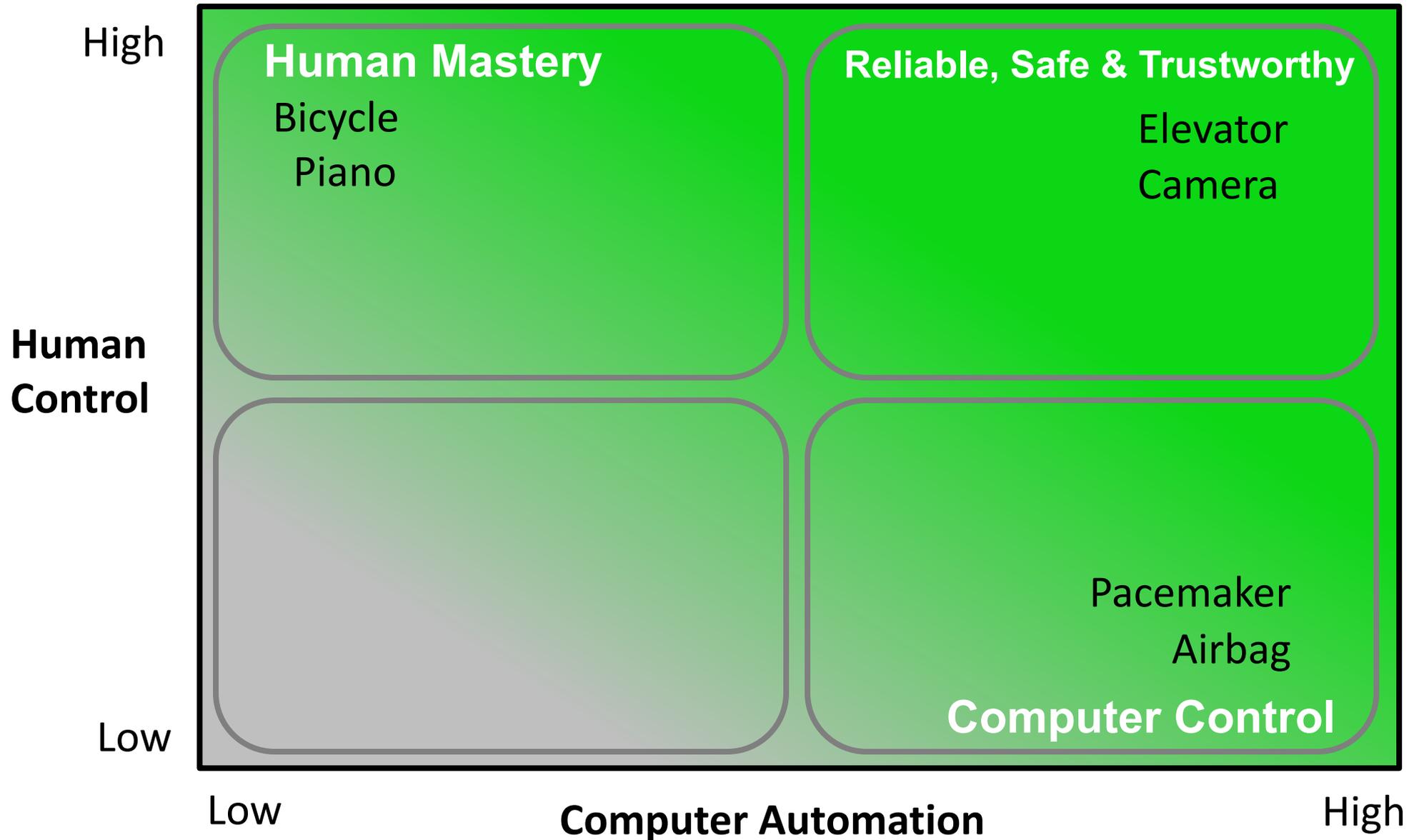
Human-Centered AI



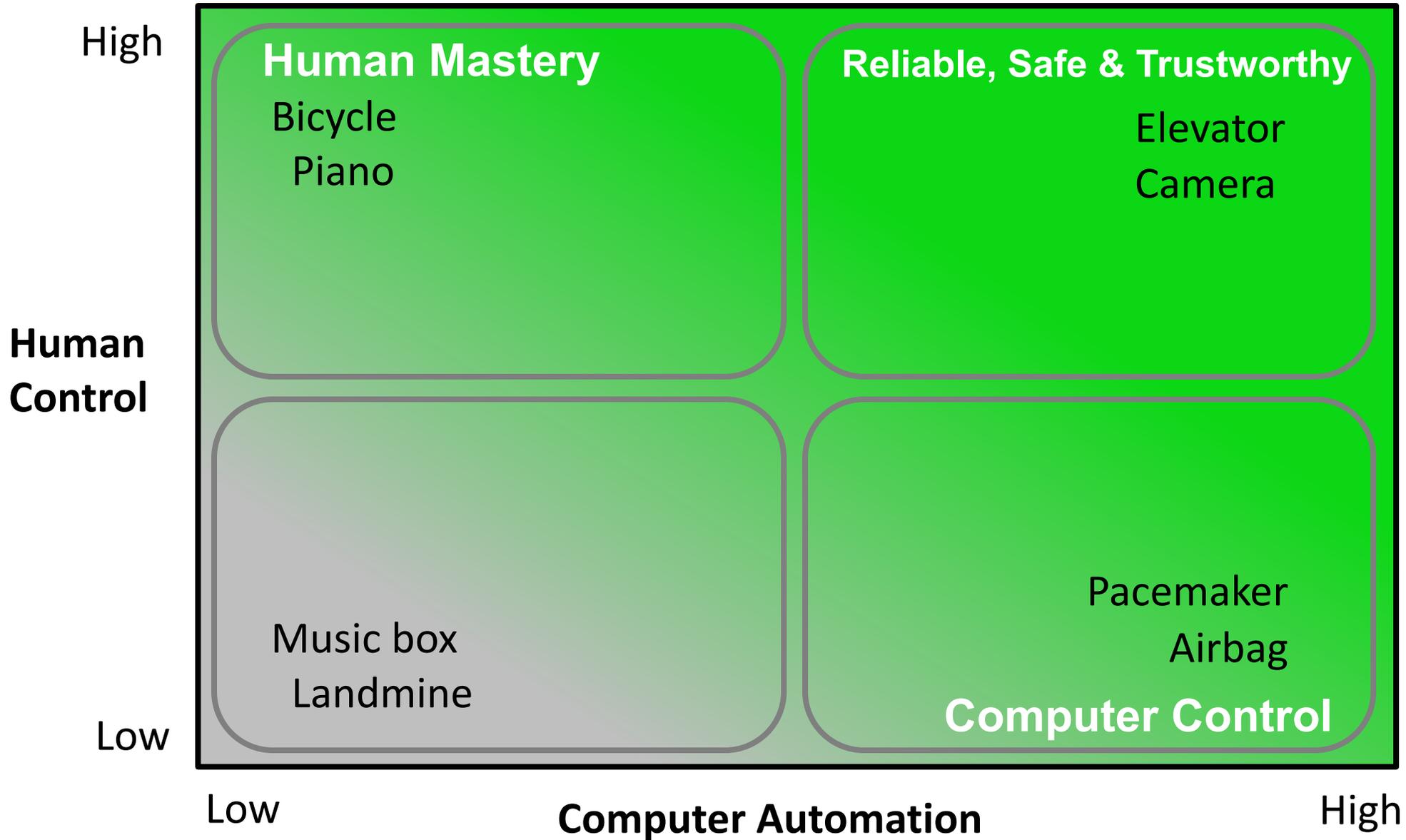
Human-Centered AI



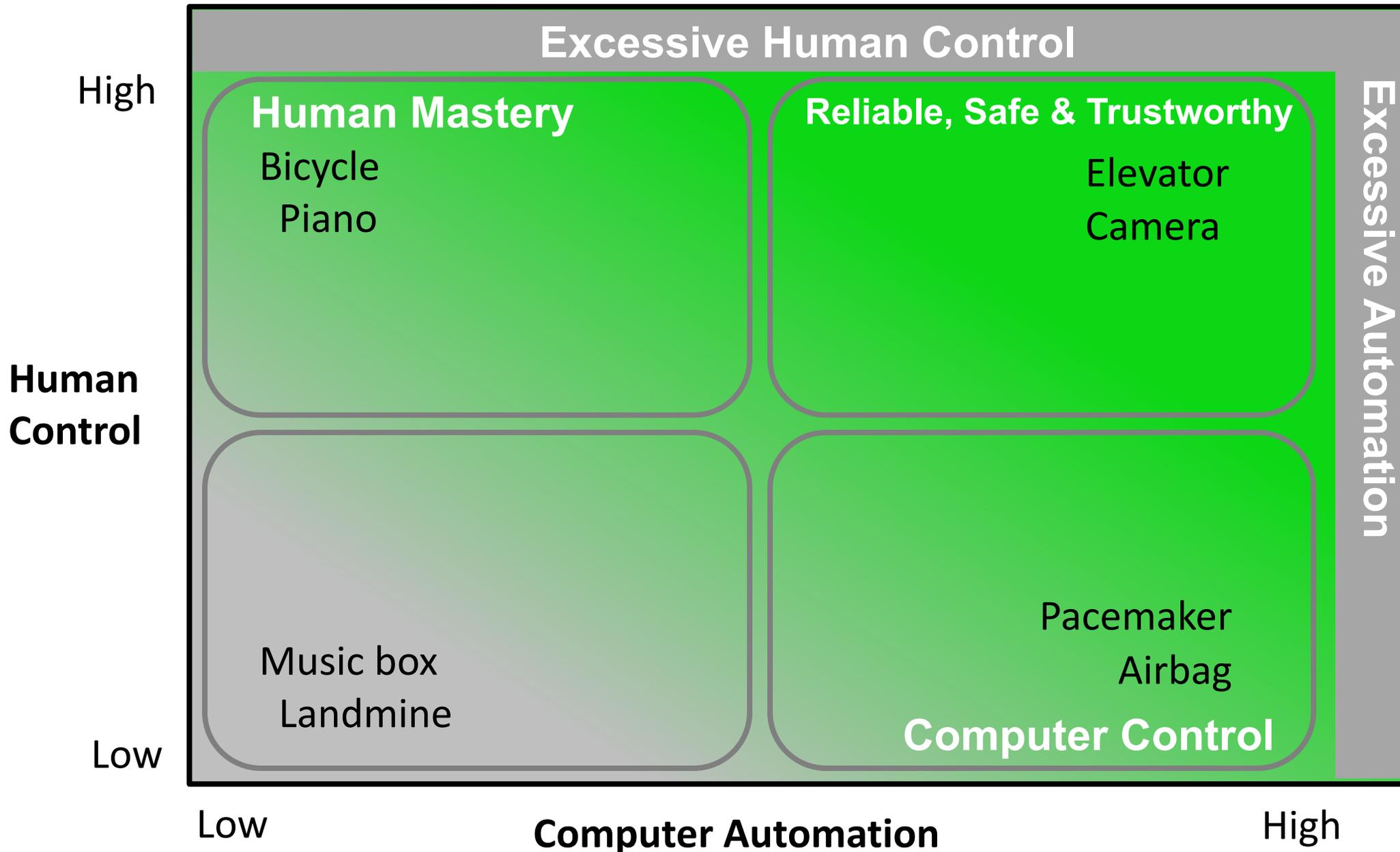
Human-Centered AI



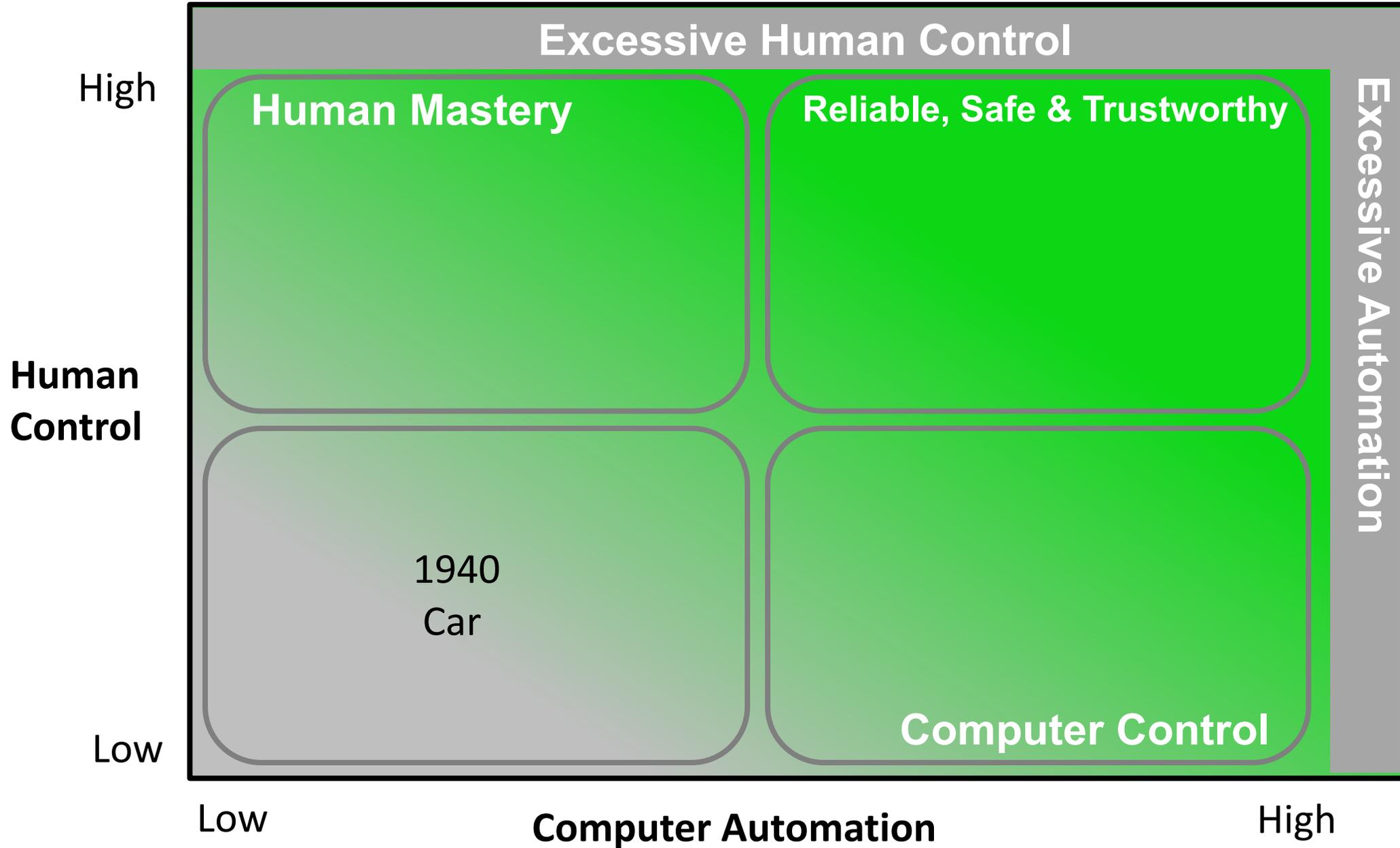
Human-Centered AI



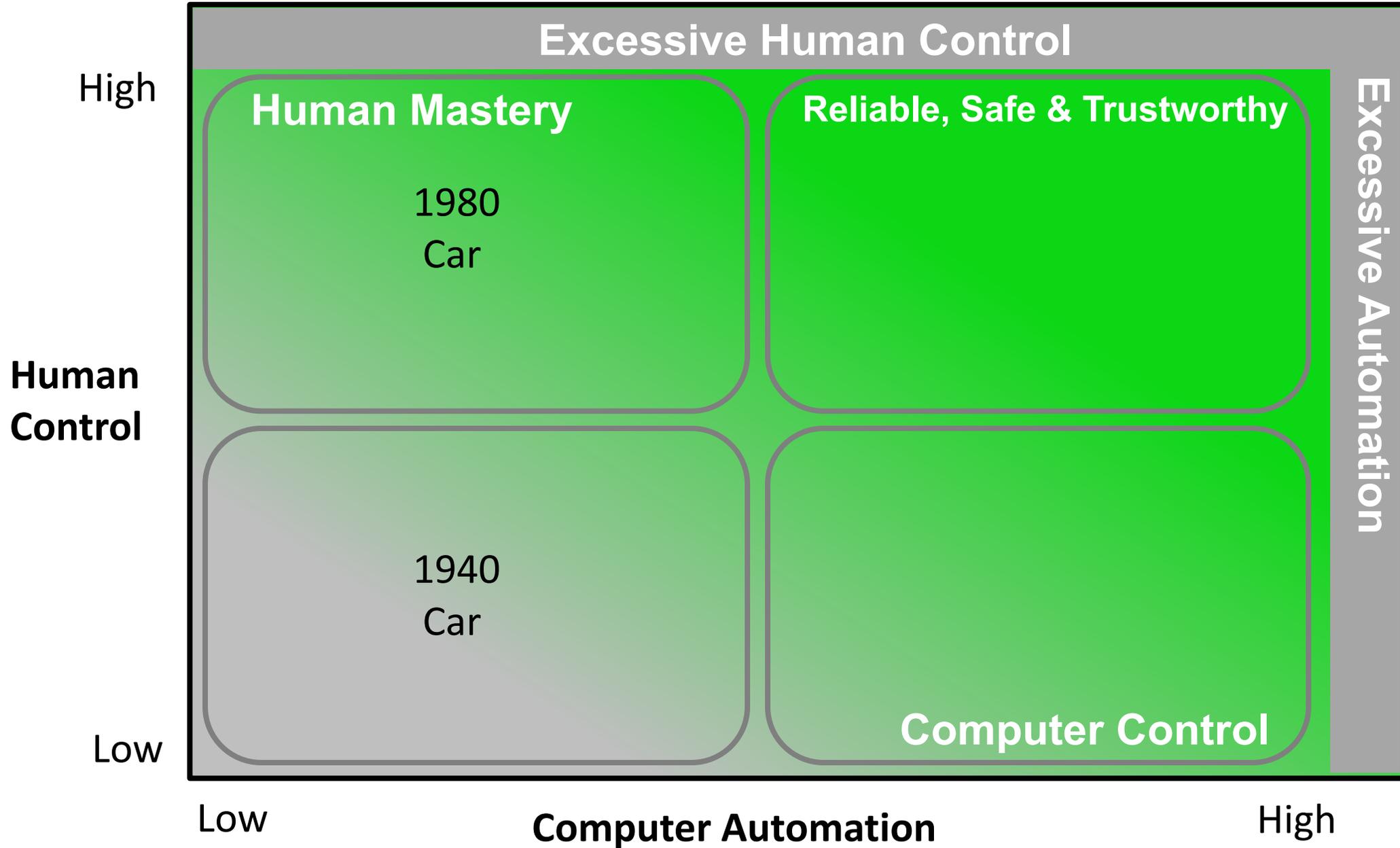
Human-Centered AI



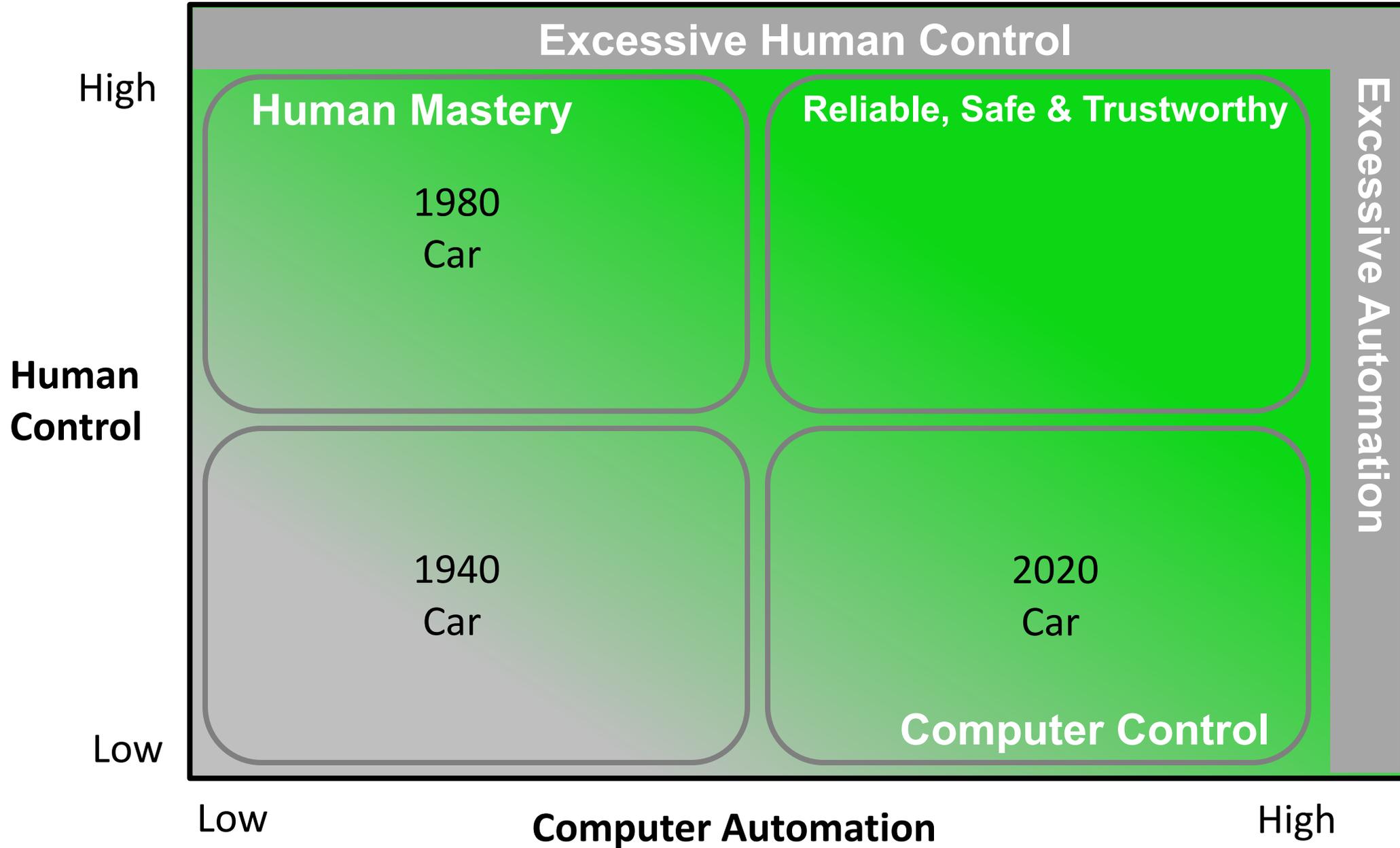
Car Control Designs



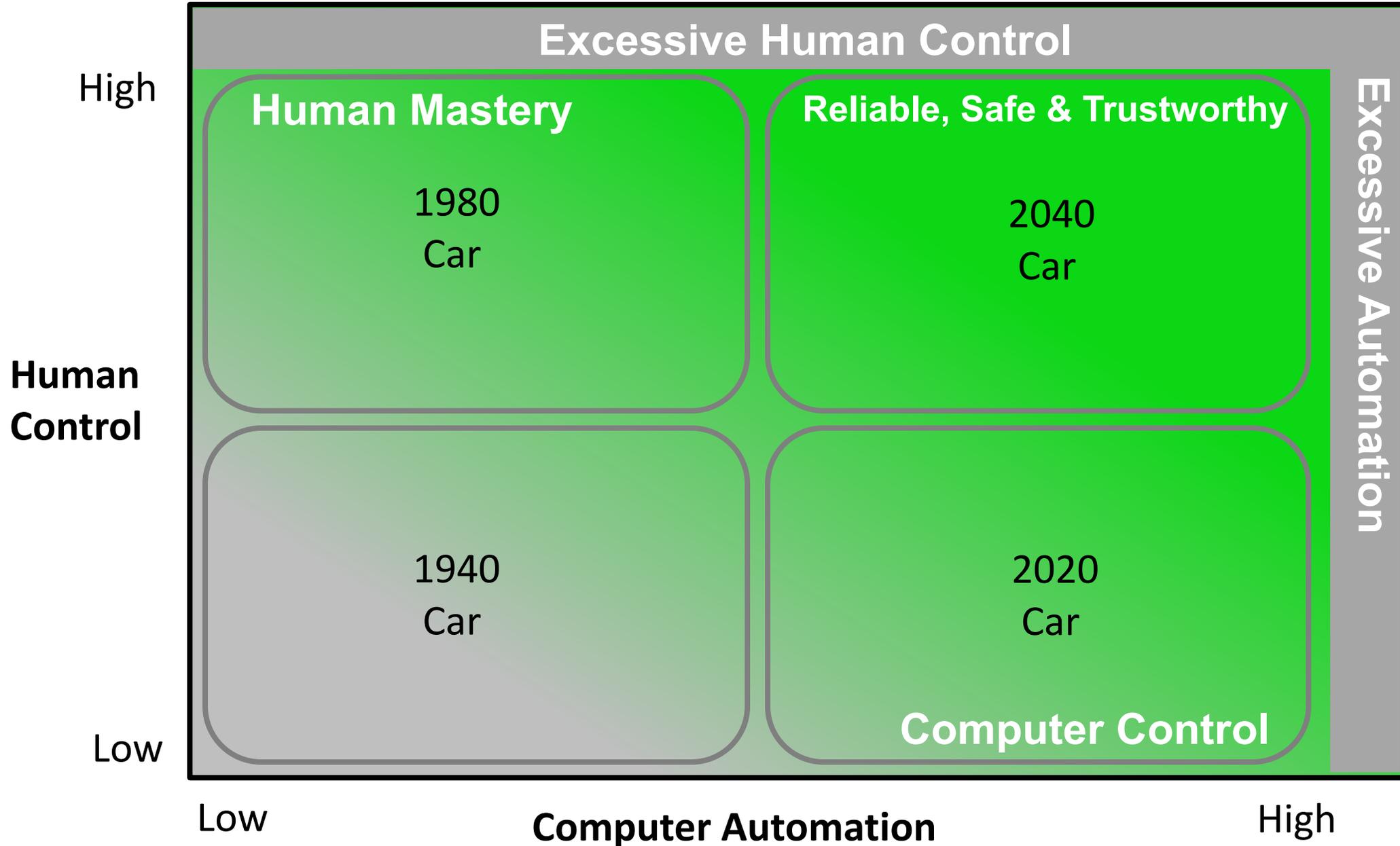
Car Control Designs



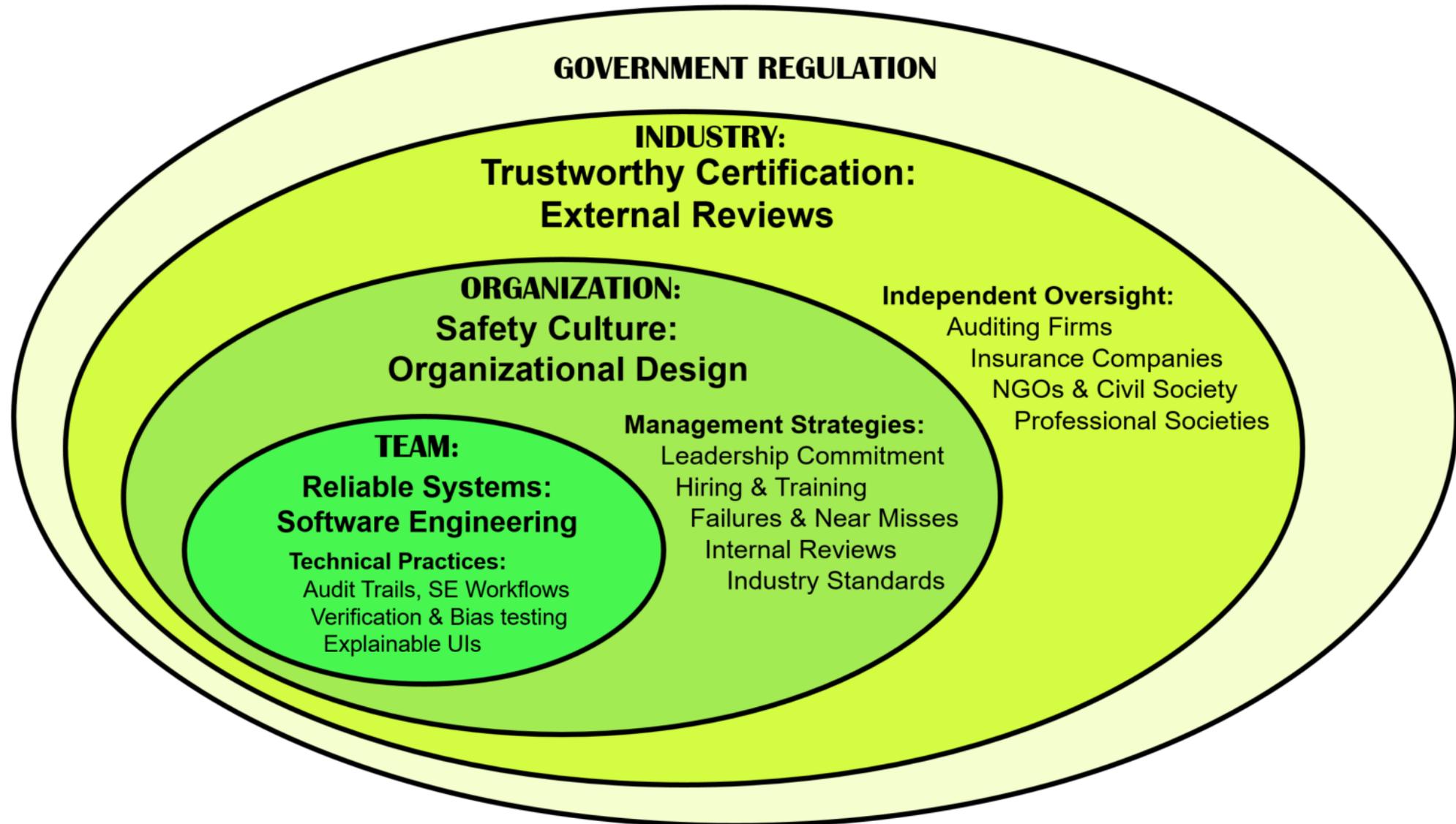
Car Control Designs



Car Control Designs



Governance Structures for Human-Centered AI





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

Technology

DEALBOOK | MARKETS | ECONOMY | ENERGY | MEDIA | **TECHNOLOGY** | PERSONAL TECH | ENTREPRENEURSHIP | YOUR MONEY

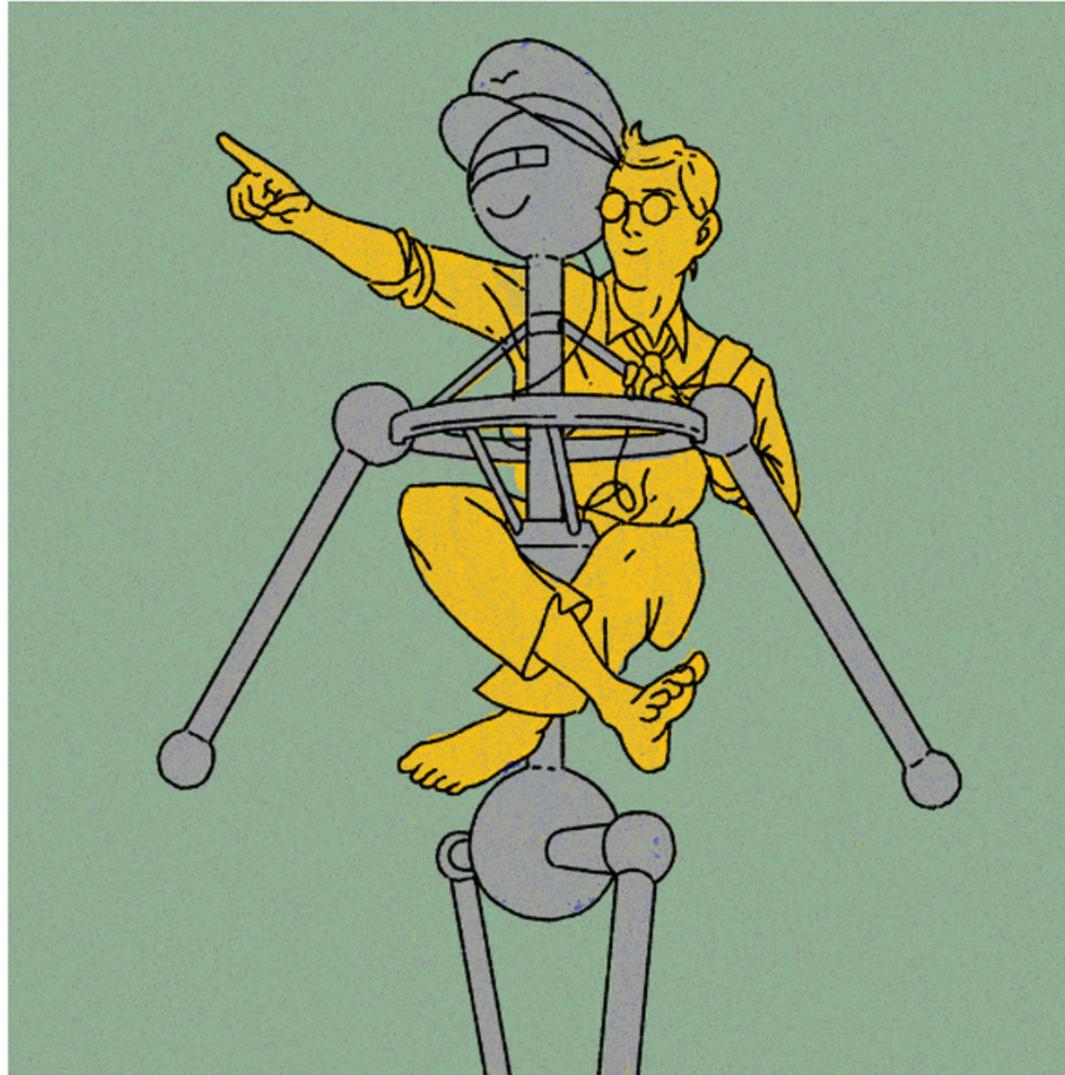
A Case for Cooperation Between Machines and Humans

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



Human-Centered Artificial Intelligence: Reliable, safe & trustworthy, *International Journal of Human-Computer Interaction* 36, 6 (March 2020). <https://doi.org/10.1080/10447318.2020.1741118>

Design lessons from AI's two grand goals: Human emulation and useful applications, *IEEE Transactions on Technology & Society* 1, 2 (June 2020). <https://ieeexplore.ieee.org/document/9088114>

Bridging the gap between ethics and practice: Guidelines for reliable, safe, and trustworthy Human-Centered AI systems, *ACM Trans. on Interactive Intelligent Systems* 10, 4 (Oct 2020). <https://dl.acm.org/doi/10.1145/3419764>

Human-Centered Artificial Intelligence: Three fresh ideas, *AIS Trans. on Human-Computer Interaction* 12, 3 (Oct 2020). <https://aisel.aisnet.org/thci/vol12/iss3/1/>

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