Human-Centered Artificial Intelligence: Designing Next Generation User Experiences

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- Computer Science & Info Studies
- Psych, Socio, Educ, Jour & MITH

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vimeo.com/72440805
Designing the User Interface

Design Theories

Direct manipulation
Menus, speech, search
Social Media
Information Visualization

www.cs.umd.edu/hcil/DTUI6

Sixth Edition: 2016
The University of Maryland, College Park (often referred to as the University of Maryland, Maryland, UM, UMD, UMCP, or College Park) is a public research university located in the city of College Park in Prince George's County, Maryland, approximately 4 miles (6.4 km) from the northeast border of Washington, D.C. Founded in 1856, the university is the flagship institution of the University System of Maryland. With a fall 2010 enrollment of more than 37,000 students, over 100 undergraduate majors, and 120 graduate programs,
Rationalism vs Empiricism

**Rationalism**: logical perfectability of human endeavors

* Aristotle, Descartes, Spinoza & Kant

**Empiricism**: need to continuously refine our beliefs based on our experiences

* Leonardo, Galileo, Locke & Hume
Rationalism vs Empiricism

**Rationalism**: logical perfectability of human endeavors
   *Aristotle, Descartes, Spinoza & Kant ... Ronald Fisher*

**Empiricism**: need to continuously refine our beliefs based on our experiences
   *Leonardo, Galileo, Locke & Hume ... John Tukey*
Rationalism vs Empiricism

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   *Aristotle, Descartes, Spinoza & Kant ... AI*

**Empiricism**: need to continuously refine our beliefs based on our experiences
   *Leonardo, Galileo, Locke & Hume ... HCI*
Machines That Think
June 30, 1980

Can Machines Think?
March 25, 1996
WEAPONS OF MATH DESTRUCTION

How Big Data Increases Inequality and Threatens Democracy

CATHY O'NEIL

Harry Collins

Artifictional Intelligence

Against Humanity's Surrender to Computers

The AI Delusion

GARY SMITH
“so much of what we read about AI strikes us as pure fantasy, predicated on a confidence in AI’s imagined strengths that bears no relation to current technological capabilities”
HCI Pride: Serving 6 Billion Users

Mobile, desktop, web, cloud

Diverse users: include everyone
Diverse applications: real problems, users, data
Diverse interfaces: theories, principles, guidelines
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Apple Design Guidelines

User Control
… people - not apps - are in control

Flexibility
… (give) users complete, fine-grained control over their work
AI design principles, which I want to change

- Humanoid robots
- Excessive automation
- Insufficient feedback
- Hidden features
- Restrictions on creativity
- Limits on collaboration
- Missing audit trails
What I want to achieve

Amplify, Augment, Enhance & Empower People
What I want to achieve

Amplify, Augment, Enhance & Empower People

→ 1000-fold improvements in capabilities

Information     Photography
Search          Navigation
Email & Text    Business Formation
What I want to achieve

Amplify, Augment, Enhance & Empower People
→ 1000-fold improvements in capabilities

Information          Photography
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→ TRS: Trusted, Reliable & Safe
What I want to achieve

Amplify, Augment, Enhance & Empower People

→ 1000-fold improvements in capabilities
  Information          Photography
  Search               Navigation
  Email & Text         Business Formation

→ TRS: Trusted, Reliable & Safe
→ More people, more creative, more often
What I want to achieve

Amplify, Augment, Enhance & Empower People

→ 1000-fold improvements in capabilities

  Information
  Search
  Email & Text

  Photography
  Navigation
  Business Formation

→ TRS: Trusted, Reliable & Safe
→ More people, more creative, more often
→ Self-efficacy & societal benefits
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
Designing the User Interface

Ensuring human control while increasing automation
Designing the User Interface

Ensuring human control while increasing automation

Computer

Low

Automation

Control

Human

High

Sixth Edition: 2016
Designing the User Interface

Ensuring human control while increasing automation

Human

Control

Computer

Low Automation High

Sixth Edition: 2016
Landscape of Automation

Human

Control

Computer

Low

Automation

High

Rapid Action

Airbag
Landscape of Automation

- Human
- Bicycle
- Piano
- Computer
- Control

Rapid Action
Airbag
Human Success

Low Automation
High Automation
Landscape of Automation

Human

Control

Computer

Low

Automation

High

TRS Car

Self-driving Car

Airbag

Rapid Action

Human Success

Bicycle

Piano

Car
Take Away Message

Goal: High level of human control & automation

→ TRS: Trusted, Reliable & Safe

→ Comprehensible, predictable & controllable
→ Continuous display of status
→ Informative feedback
Design Principles for Powerful Tools

- Comprehensible
- Predictable
- Controllable
- Direct Manipulation
- Trusted
- Reliable
- Safe
Design Principles for Powerful Tools

Comprehensible, Predictable, Controllable, Direct Manipulation, Trusted, Reliable, Safe

Responsibility
Comprehensible, Predictable, Controllable
Direct Manipulation
Trusted, Reliable, Safe
Design Principles for Powerful Tools

- Comprehensible
- Predictable
- Controllable

- RESPONSIBILITY
- Direct Manipulation

- Participation
- At Scale

- Trusted
- Reliable
- Safe
Design Principles for Powerful Tools

- **Responsibility**
  - Comprehensible
  - Predictable
  - Controllable

- **Participation At Scale**
  - Direct
  - Manipulation

- **Frontier Thinking**
  - Trusted
  - Reliable
  - Safe
Design Principles for Powerful Tools

More people, more creative, more often

- RESPONSIBILITY
  - Comprehensible
  - Predictable
  - Controllable

- Participation At Scale
  - Direct
  - Manipulation

- FRONTIER THINKING
  - Trusted
  - Reliable
  - Safe
Design Principles for Powerful Tools

Self efficacy & Societal benefits

More people, more creative, more often

RESPONSIBILITY
- Comprehensible
- Predictable
- Controllable

Participation At Scale
- Direct Manipulation

FRONTIER THINKING
- Trusted
- Reliable
- Safe
RESPONSIBILITY
Accountability, Liability, Fairness, Transparency, Explainability & Interpretability
RESPONSIBILITY

- Audit trails to review failures & near misses
- Benchmark tests for verification & validation
- Continuous improvement & process monitoring
- Data quality & bias testing
Seek culture of safety by independent oversight
- Government regulation
- Insurance companies require standards
- Accounting firms audit systems
- Voluntary industry plans: Partnership on AI
- Professional societies promote education & ethics
Participation At Scale
Participation
At Scale

Community, Cooperation, Collaboration, Contribution, Consensus & Consultation
Participation At Scale

Community, Cooperation, Collaboration, Contribution, Consensus & Consultation

Skype, Slack, Zoom, Webex,...    Dropbox, Google Docs, Wikipedia, Intellipedia, PatientsLikeMe,...
Participation At Scale

Community, Cooperation, Collaboration, Contribution, Consensus & Consultation

Skype, Slack, Zoom, Webex,... Dropbox, Google Docs, Wikipedia, Intellipedia, PatientsLikeMe,... Innocentive, Kickstarter, GoFundMe, Open Science,... Citizen science, Community safety, Medical advice, ....
Human creativity pushes past the frontier
Steam Ship → Diesel Train → Gasoline Engine
→ Electric Cars → TRS Cars → ???
Computers → Local Area Networks → Internet
→ WWW → Social Media → ???
Mainframe Programs → Desktop Applications
→ Websites → Mobile Apps → ???
FRONTIER THINKING

Assembly Language → FORTRAN → C → C++
   → Java → Python → ???
Microscope → X-Ray → MRI → CAT Scan
   → Sonogram → PET Scan → ???
Daguerrotype → Tintype → Kodak Camera
   → Polaroid Camera → SLR → Digital Camera
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Next Generation User Experiences

- Humanoid robots fade as superior designs appear
- Excessive automation gives way to human control
Next Generation User Experiences

- Humanoid robots fade as superior designs appear
- Excessive automation gives way to human control

- Clarifying **Responsibility** accelerates quality
- **Participation at Scale** delivers beneficial outcomes
- **Frontier Thinking** enables breakthrough innovation
Design Principles for Powerful Tools

Self efficacy & Societal benefits

More people, more creative, more often

Responsibility
- Comprehensible
- Predictable
- Controllable

Participation At Scale
- Direct Manipulation

Frontier Thinking
- Trusted
- Reliable
- Safe
Landscape of Automation

- Bicycle
- Piano
- Car
- Drone
- Self-driving Car
- Pacemaker
- Roomba
- Digital Camera
- Elevator
- TRS Car
- Airbag

Human Success

Human
Control
Computer
Low
Automation

Thank You!
Design Principles for Powerful Tools

Self efficacy & Societal benefits

More people, more creative, more often

RESPONSIBILITY
Comprehensible Predictable Controllable

Participation At Scale
Direct Manipulation

FRONTIER THINKING
Trusted Reliable Safe

Thank You!