

Human Computer Interaction

CS449 – CS549

Week 1-2

Introduction: What is HCI and why is it important?

KÜRSAT ÇAĞILTAY

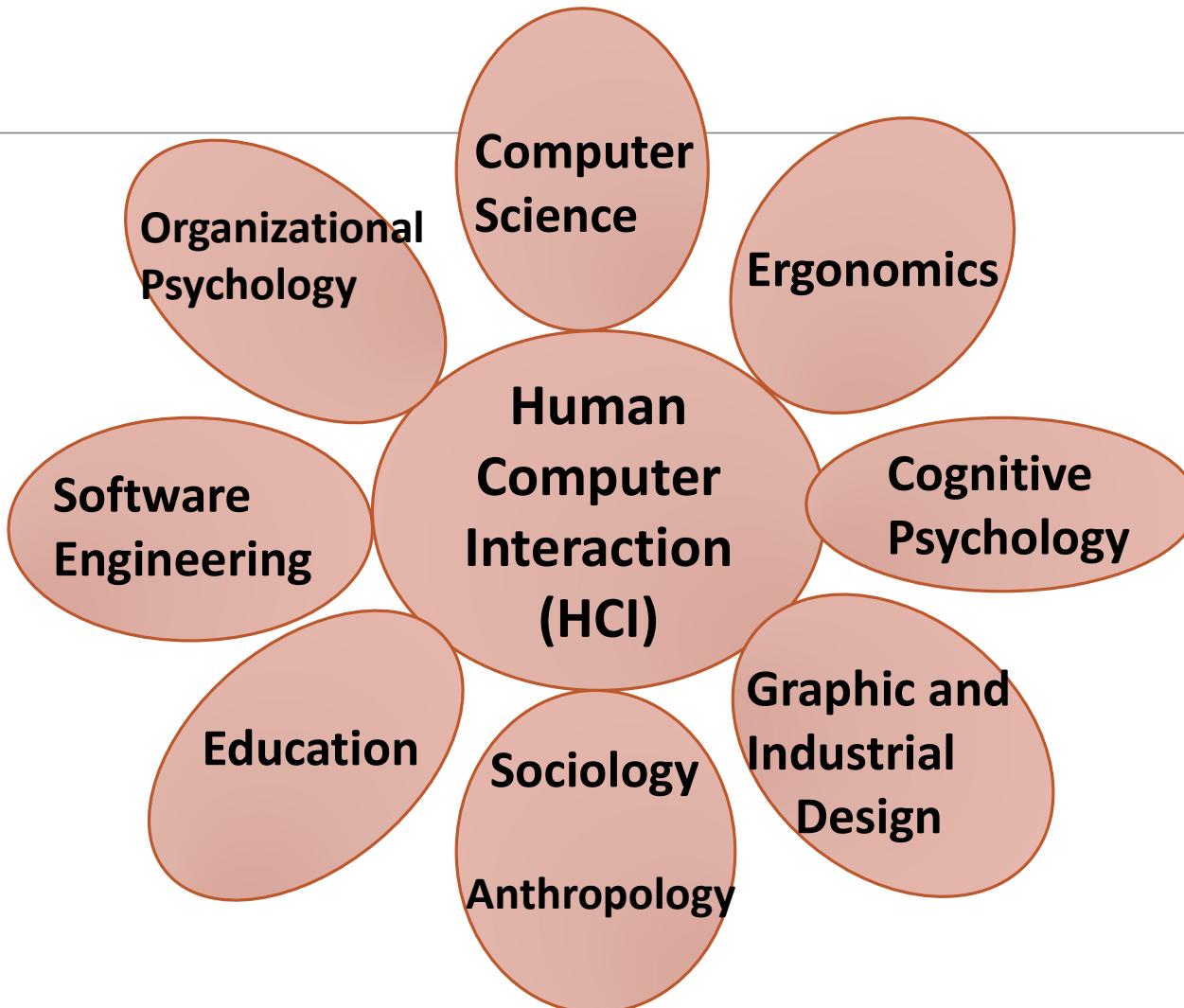
Assignments And Grades (Tentative)

- Assignment-1 Design diary report (with redesign –Figma) = 7 pts
- Assignment-2 Laws of HCI (Fitt's Law) = 5 pts
- Assignment-3 Heuristics Based Usability testing = 13 pts
- Assignment-4 End User Based Usability testing (Virtual Reality) = 20 pts
- Assignment-5 Cognitive Modeling Assignment = 10 pts (**This assignment requires CogTool cognitive modeling software, make sure it works on your own computer: <https://www.cogtool.org/>**)
- Final Project / Term Paper (Group) = 40 pts (5 pts draft paper, 35 points final paper)
- Peer evaluation = 2 pts
- Participation/Attendance (with mini quizzes) = 3 pts
- Bonus (or will be integrated to one of the assignments): Attending to an HCI conference 23-25 November - <https://iechci.info/> = 3 points

What is HCI?

- Inter/Transdisciplinary study of the design and use of interactive technologies,
- Aims to support the development of more usable and humanly acceptable systems
 - Interaction
 - Task based
 - User cognition
 - The nature and the process of design
 - The nature of use
 - Communication
 - Organizational/social impact (e.g. Computational social science)

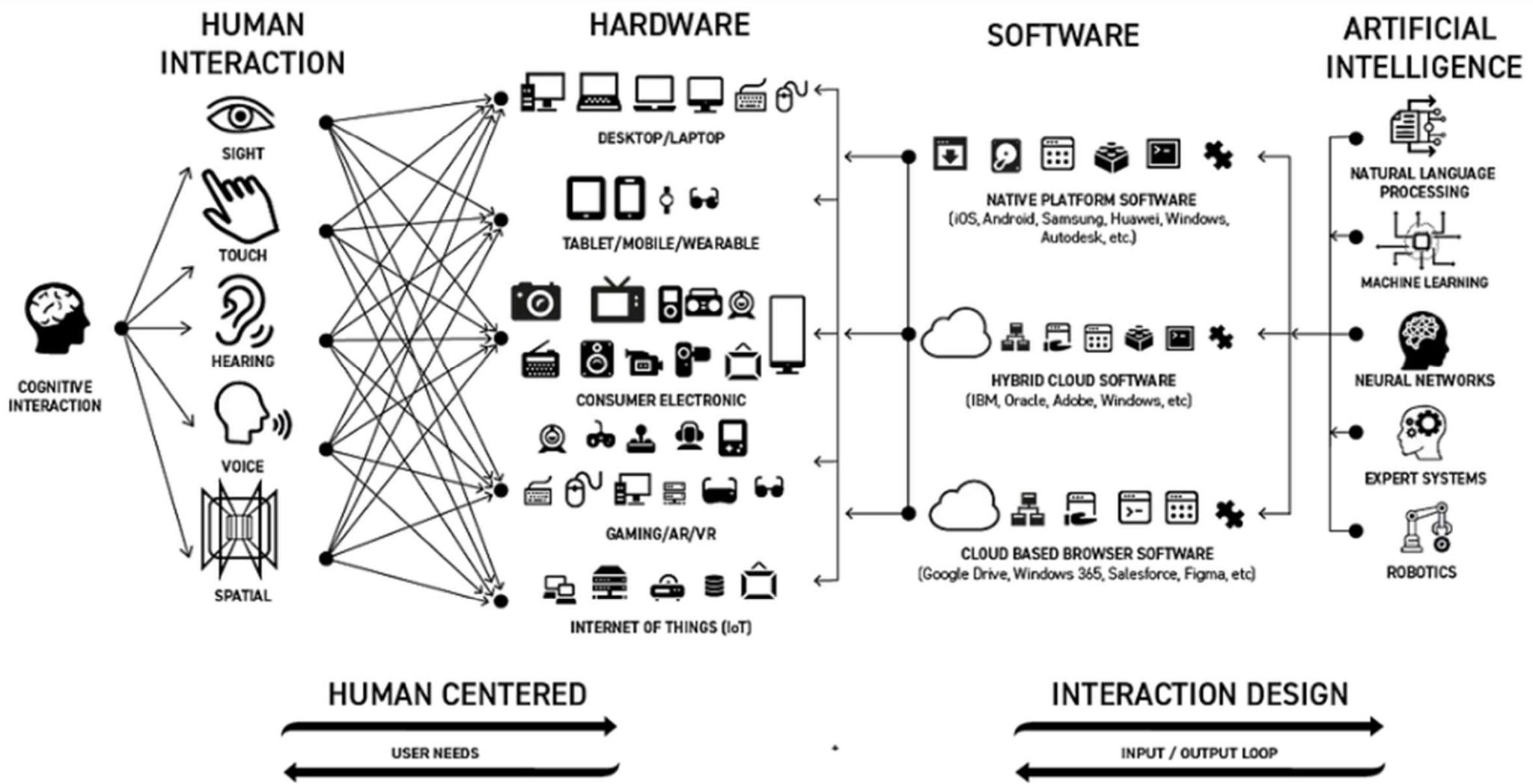
HCI is Inter/Transdisciplinary



HCI and SW Engineering

- 80% of total maintenance costs are related to user's problems with the system and not technical bugs. 64% are usability problems
- In developing interactive software, most software engineering methodologies do not propose mechanisms for:
 - explicitly and empirically identifying and specifying user needs and usability requirements, and
 - testing and validating requirements with end-users before, during, and after the development.
 - So, the developed systems generally meet all functional requirements, and yet are difficult to use with effectiveness, efficiency and satisfaction.

INTERACTION DESIGN PARADIGMS



HCI for All

- HCI for security
- HCI for health
- HCI for e-commerce
- HCI for computer games
- HCI for art
- HCI for education
- HCI for elderly
- HCI for robots
-

HCI for Defense – Eye tracking analysis of cockpit

Before Take Off

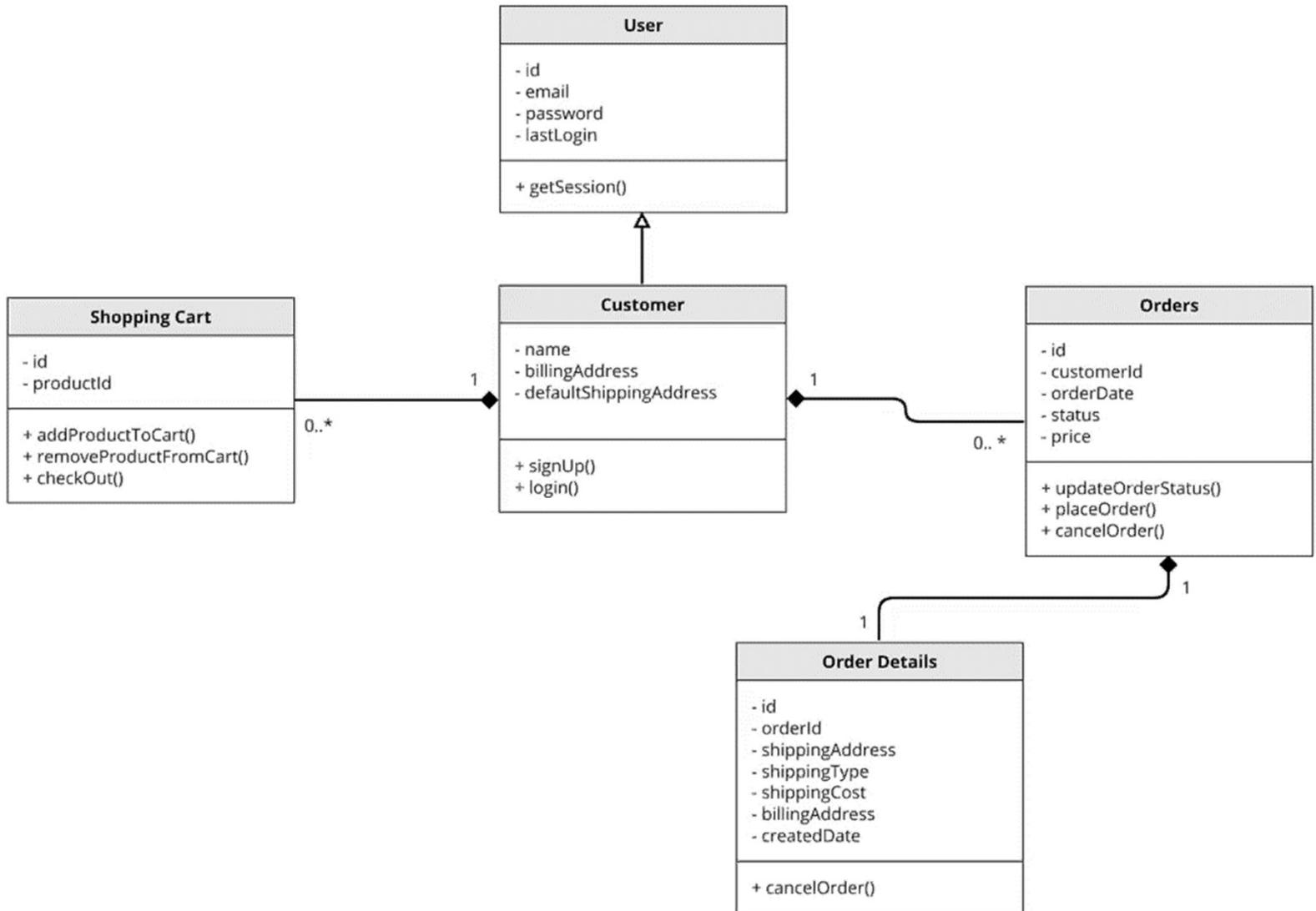


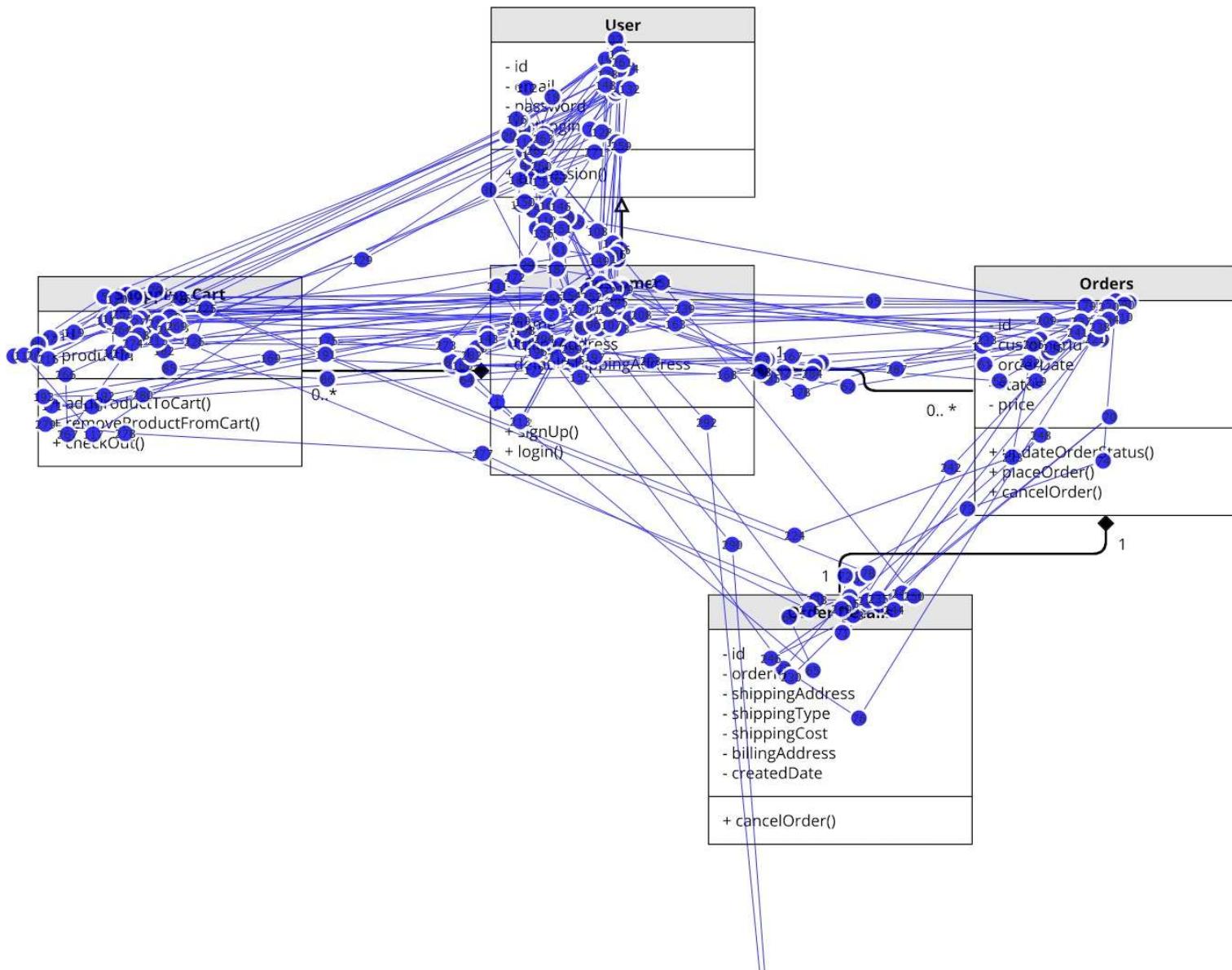
After Take Off



HCI & SW Eng.

UML





```
static void Main(string[] args)
{
    int pozitif = 0;
    int negatif = 0;
    int notr = 0;
    Random rnd = new Random();

    int[] sayilar = new int[20];

    for (int i = 0; i < 20; i++)
    {
        sayilar[i] = rnd.Next(-100, 100);
    }

    foreach (int sayi in sayilar)
    {
        Console.WriteLine(sayi);
        if (sayi > 0)
        {
            pozitif++;
        }
        else if (sayi < 0)
        {
            negatif++;
        }
        else
        {
            notr++;
        }
    }

    Console.WriteLine("Pozitif Sayı Adeti>>> " + pozitif);
    Console.WriteLine("Negatif Sayı Adeti>>> " + negatif);
    Console.WriteLine("İşretsiz Sayı Adeti>>> " + notr);
    Console.ReadKey();
}
```

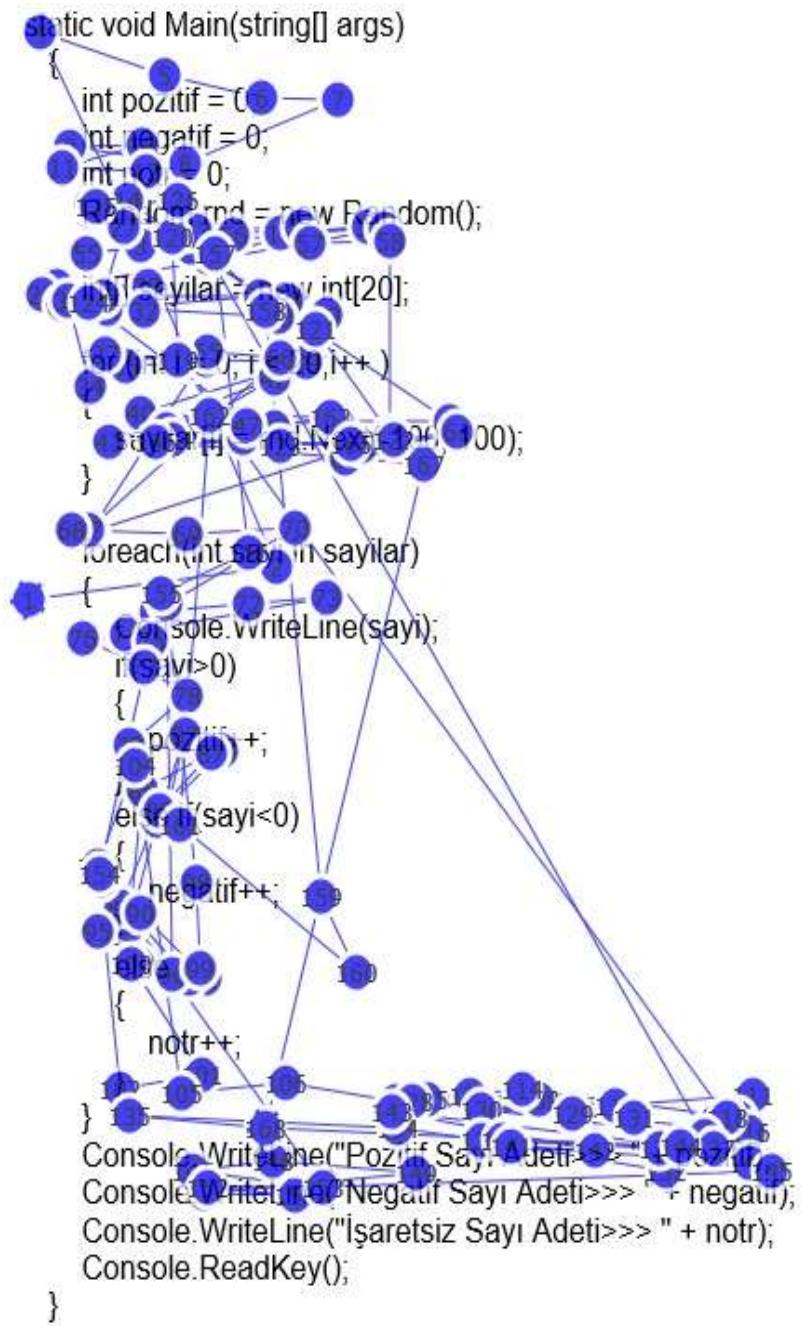
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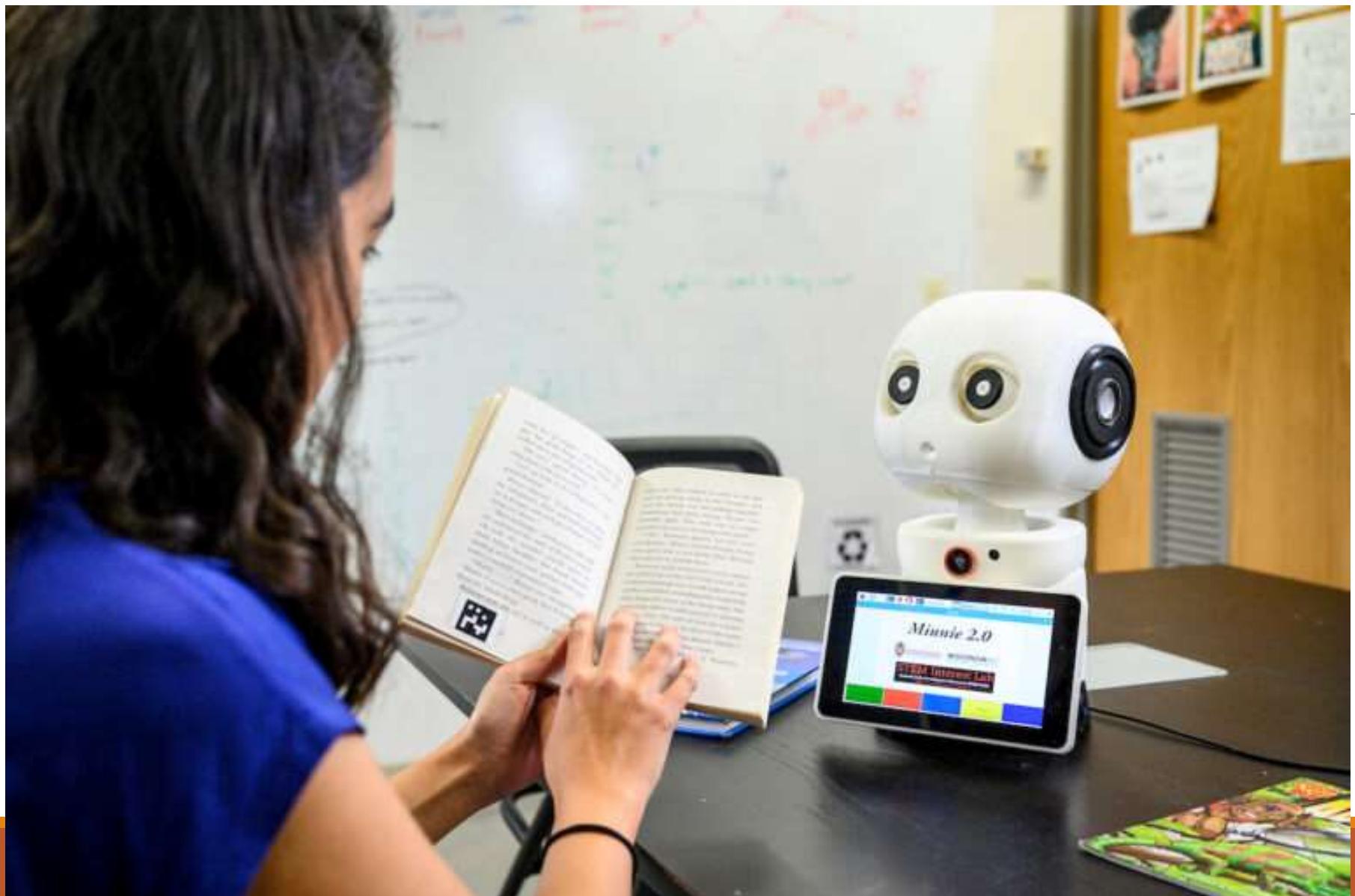
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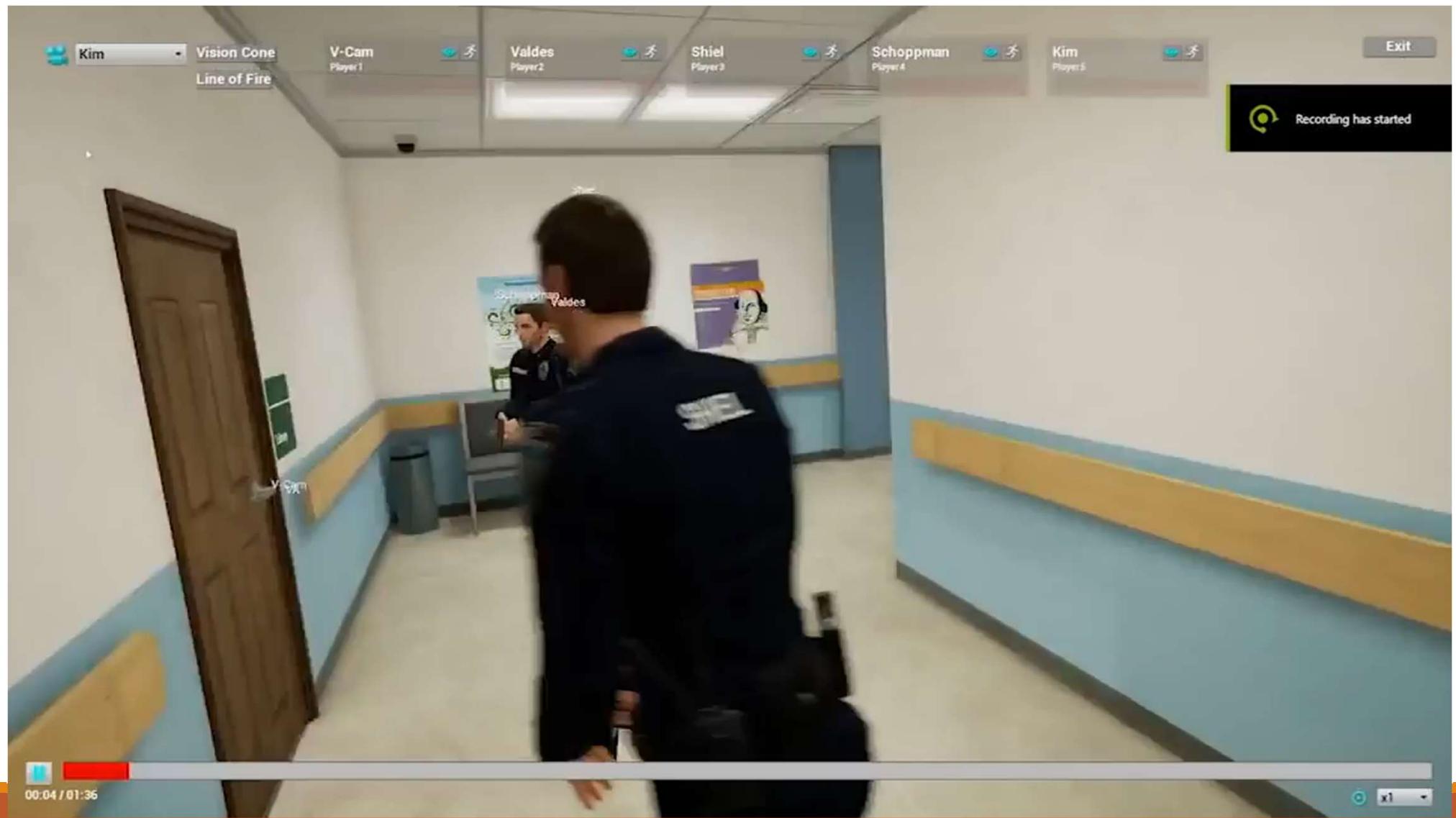
Human Robot Interaction



Human-Car Interaction



HCI for Security Training



HCI for e-commerce

Dosya Düzen Görünüm Geçmiş Yer İmleri Araçlar Yardım

elbil, kamera, oversetter, translatør, translator, dictionary, moped, el-moped, el-scooter, scooter, solcelle ryggsekk, el-sykkel, el-sykkel, elektrisk sykkel, elbil, rc helikopter, rc produkter, elbil, ATV, elektrisk bil, elkjøretøy, elkjøretøy, el...

http://arngren.net/ Google

elbil, kamera, oversetter, translatør, ...

www.ARNGREN.net

23 Butikker

Teknologi & Gadgets Index el-retur

7 9 9 8 9 dex

< Frithjof i sin Fly-Bil

Søk Arngren.net Slik Betaler du

Bygg ditt eget 2-seters Helikopter. kr. 398.000,-

Fjernstyrte Produkter

Forbruker Elektronikk Elektriske-Kjøretøy Disko-Lys Rakett-Fly Roboter Index

Elektronikk

Jagerfly Turbo-jet (6ch) Innfelsbare-Hjul kr. 1999,-

131 cm lang

Micro-Projektor (35 lum) m/Digital-avspiller & HD TILBUD !

2999,-

3 - 120" TV/ Video-skjerm

LAND&AIR Spion-Kamera fra kr. 499,-

RC Flybil VTOL(3ch) fra kr. 249,-

Alle Produktene på denne siden lagerføres hos ARNGREN i Oslo. Se Lagerkoden etter Prisene (lev. 2 - 5 dager): er på Lager kommer før 3 uker lengre enn 3 uker

RC Produkter

120cm langt, Computer-stytt

JOHN DEERE Elektrisk-ATV fra kr. 3999,-

1398,- kr. 4.998,-

Stor EI-ATV 6.998,-

Elektrisk-ATV fra kr. 3999,-

1200,-

Elektriske-Biler til Barn, Ungdom & Voksne

Tau & Brann-Båt. kr. 598,-

60cm lang

Golf-biler (m/skilt)

Hobby & RC Hoverpod HP-Måler (Bil)

Isbitmaskin Kamera (drålest)

Kino (bærbar)

Kompass (Bil/Båt)

Laser-Jamer (Bil)

Luft-Jekk

Lykt (oppladbar)

Mobil-telpon-1, 2

Motorsykkel-Mini Omformer (110V)

Oversetter (44 sprk)

PC-mini (9"), 2

Oppladbar-Lykt (15mill.)

Verdens Sterkeste kr. 798,-

Laser-Show fra kr. 599,-

Disko-Lys

4 mp

Kikkert med Digital-Kamera & LCD skjerm kr. 1598,-

Tank

72 cm Lang kr. 998,-

Rakett-Fly

Nyhet!

RC 4ch Helikopter fra kr. 798,-

Rakett-Fly

Video-1

Video-2

Hummer el-Bil

Robot-Arm

Avatar-Gunship

498,-

Elektrisk Hummer-H2 til barn & Ungdom fra 3.998,-

Tilbu

Elektronikk

El-bil til Posten

79.998,-

El-bil

Forbruker Elektronikk

Tilbud !

100km/t

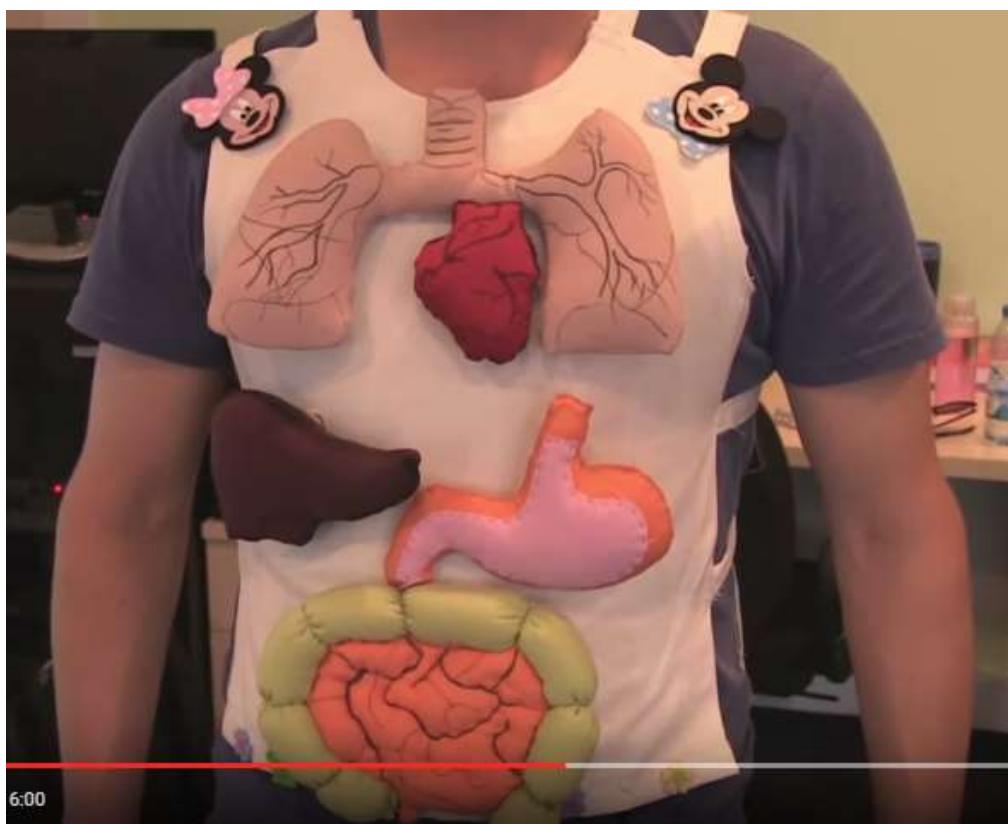
Gratist Mobiltelefonspill

Video

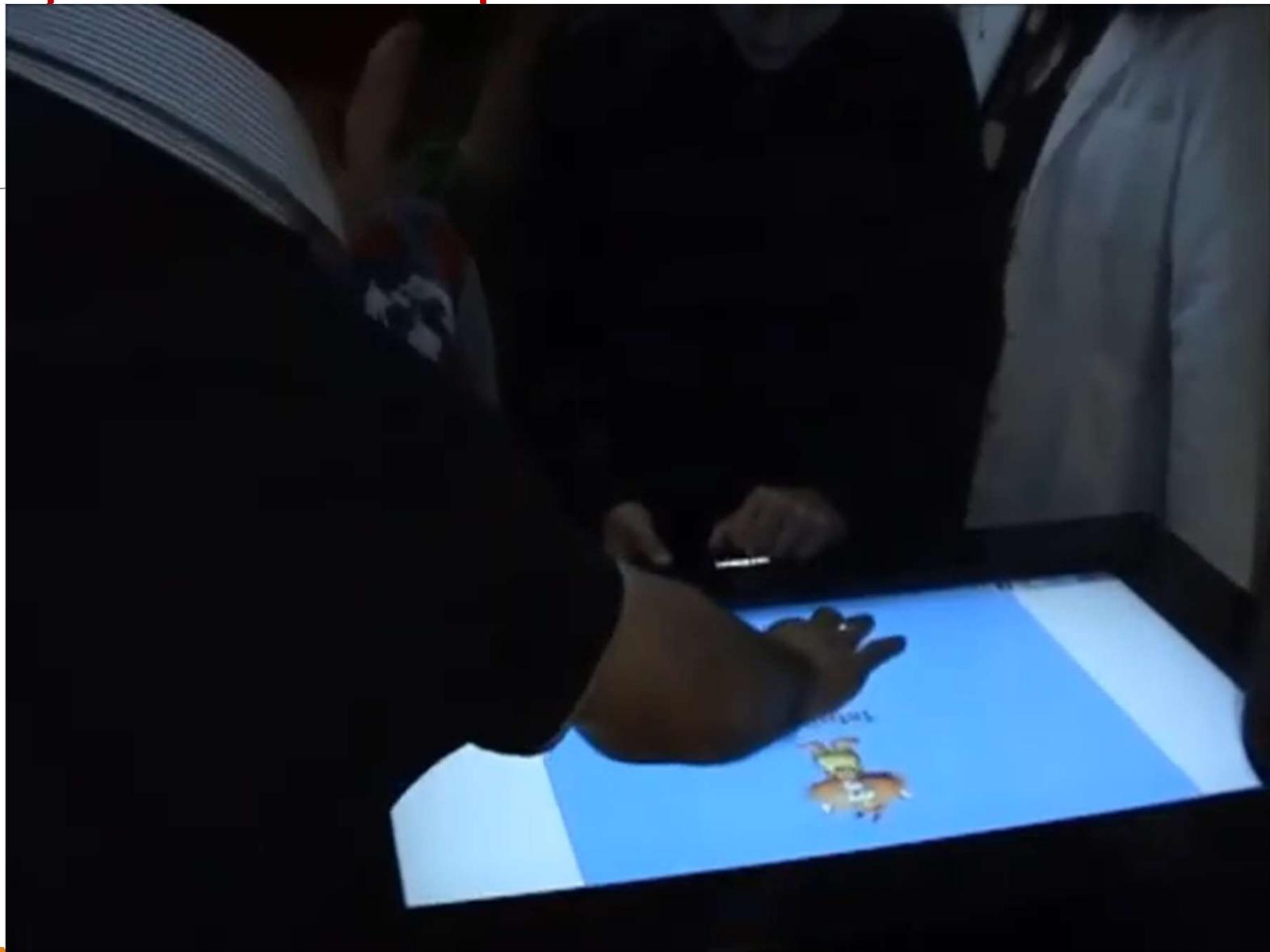
Merket stabil

Bitti

HCI for Education



HCI for Special People



HCI for Health Systems

- Therac-25
- Massive overdoses, 5 killed, several injured
- Technical design – UX design

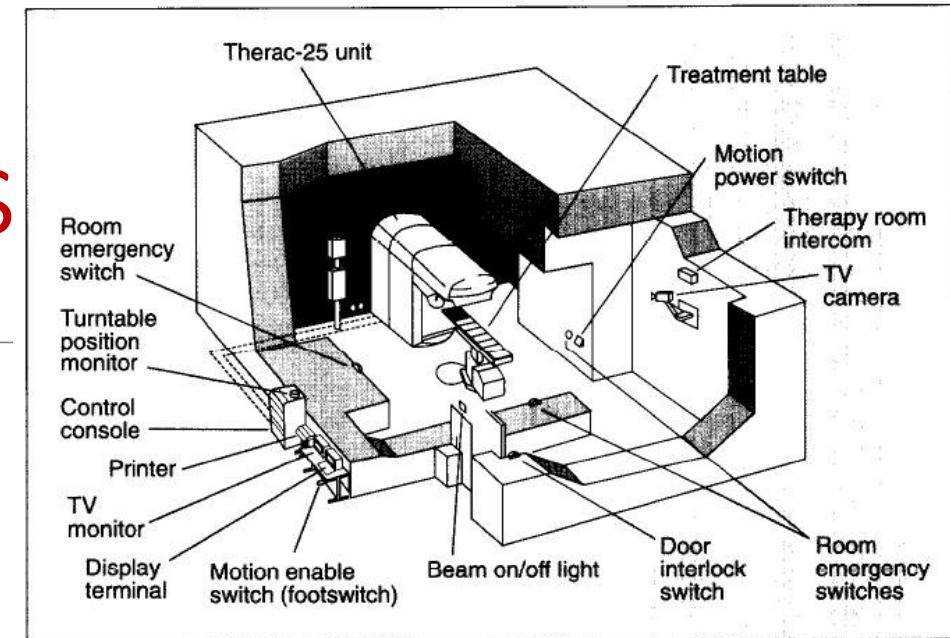
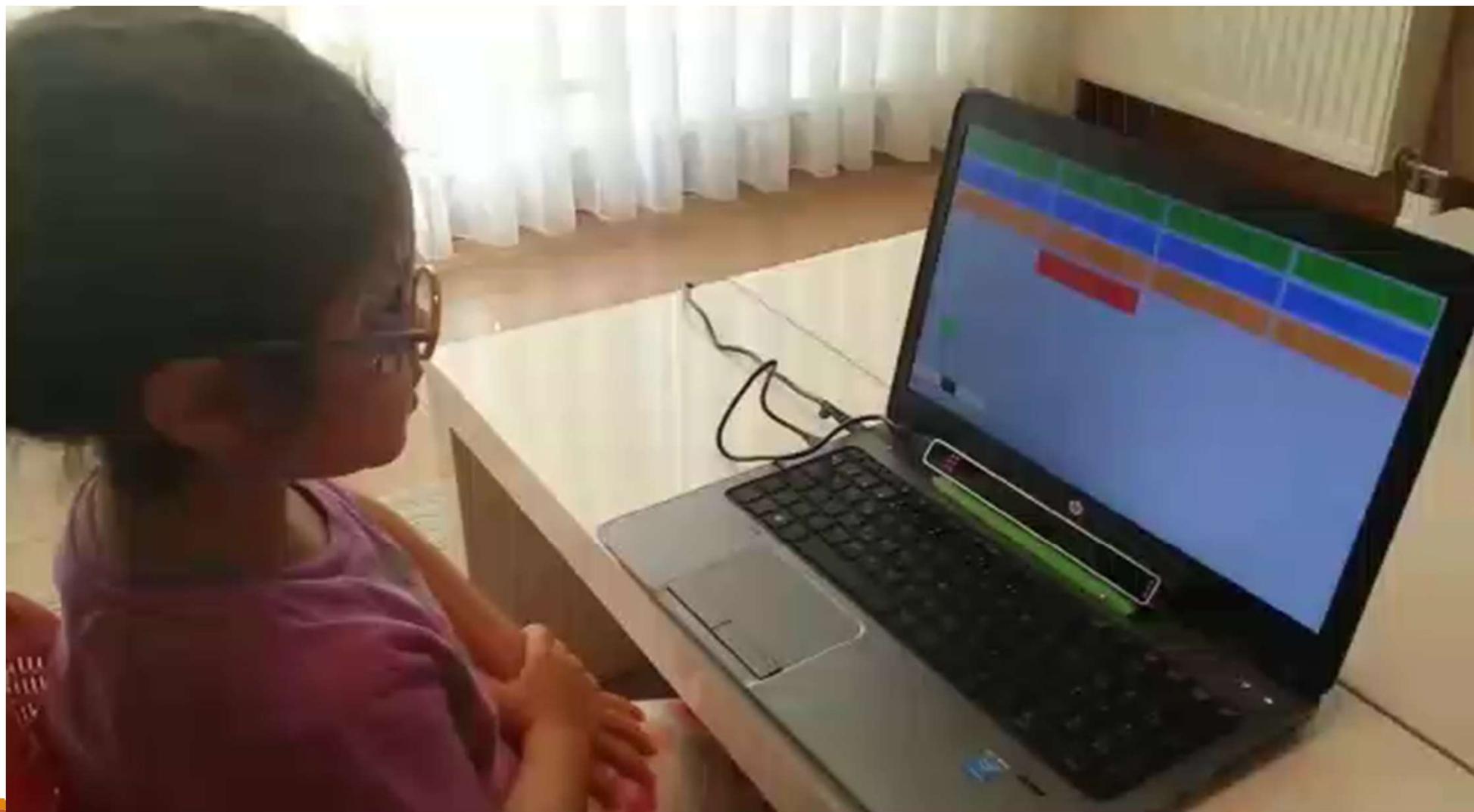


Figure 1. Typical Therac-25 facility.

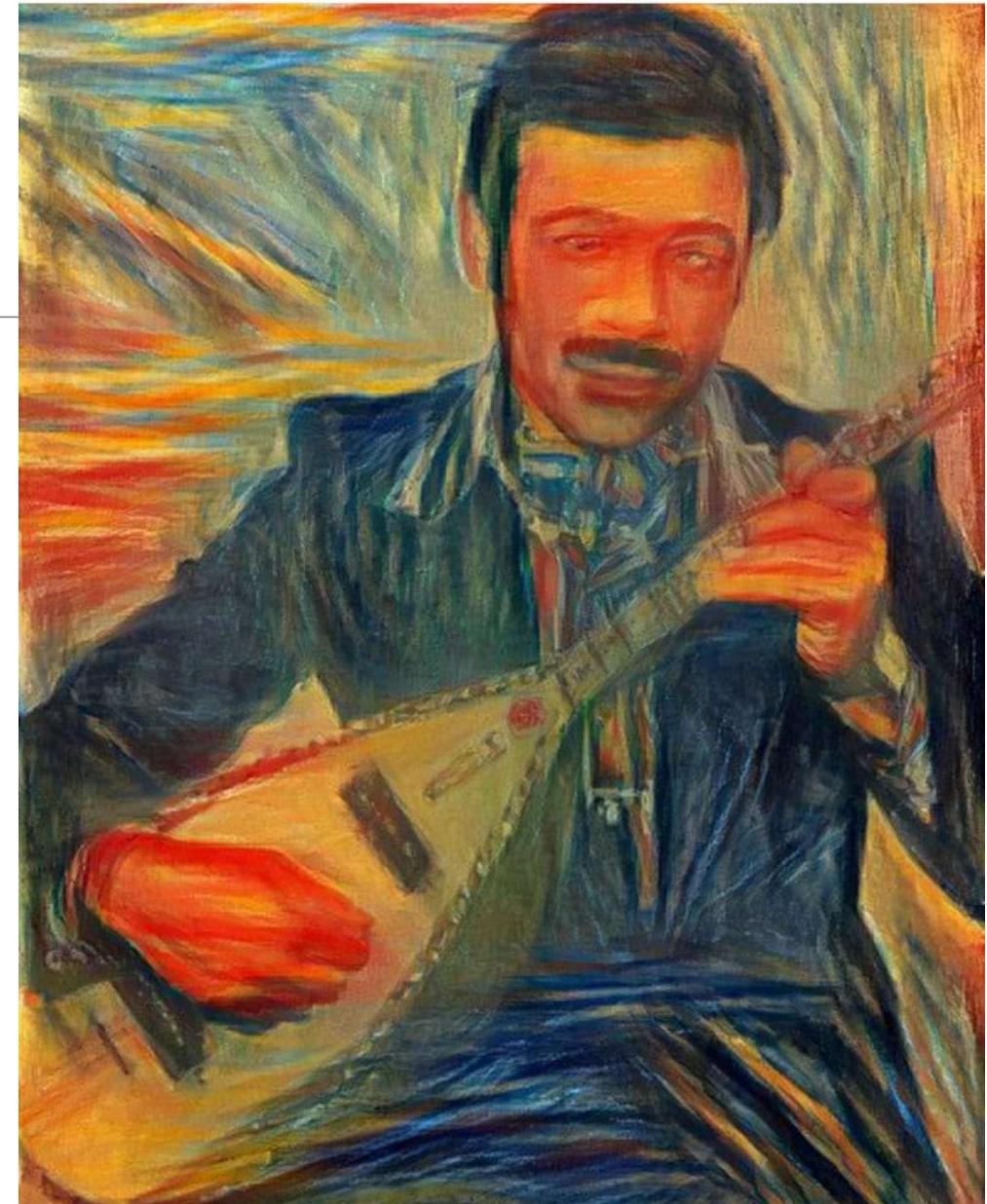


HCI for Games for Rehabilitation



HCI for Art

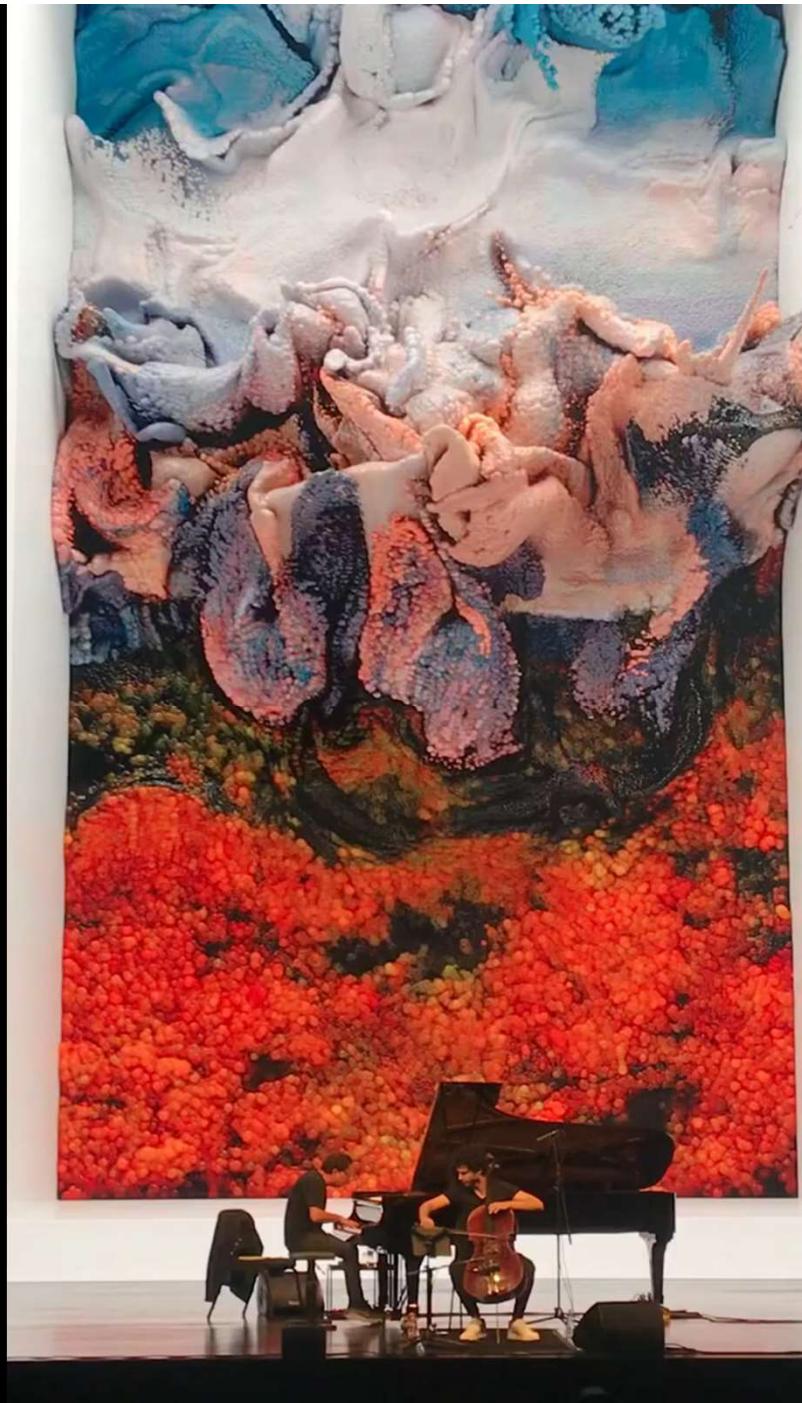
- Painter?
- <https://openai.com/dall-e-2/>



Fazıl Say

Refik Anadol

Jamal Aliyev



New Interfaces and Interaction



New Interfaces and Interaction



Where do HCI People Work?

At Google, we follow a simple but vital premise: "Focus on the user and all else will follow." User Experience Researchers (UXRs) make this possible.

 Senior UX Researcher, Google Cloud
Google
United States (Remote)

Senior UX Researcher, Google Cloud

Google · United States (Remote) 1 day ago · 10 applicants

 \$152,000/yr - \$163,000/yr (LinkedIn est.) · Full-time · Mid-Senior level

 10,001+ employees · Technology, Information and Internet

 17 connections · 15 company alumni · 454 school alumni

 See how you compare to 31 applicants. [Try Premium for free](#)

 Actively recruiting

[Apply ↗](#) [Save](#)



Principal UX Researcher

Microsoft

Washington, DC (Remote)

Principal UX Researcher

Microsoft · Washington, DC (Remote) 1 week ago · 42 applicants



Full-time · Associate



10,001+ employees · Software Development



17 connections · 7 company alumni · 463 school alumni



See how you compare to 42 applicants. [Try Premium for free](#)



Actively recruiting

you will work across products,
disciplines, and organizations
to establish a deep
understanding of our
customer challenges and
opportunities to create a new
set of experiential patterns
within the M365 product suite



Vision Pro



AR/VR User Experience Researcher

Apple

Cupertino, CA

AR/VR User Experience Researcher

Apple · Cupertino, CA 1 week ago · Over 200 applicants

Full-time

10,001+ employees · Computers and Electronics Manufacturing

As a member of our organization, you will drive exploration of future products that will delight, inspire, and empower millions of people.

- Design, plan and conduct user research, employing methods such as usability studies, Information Architecture (IA) studies, field studies, competitive evaluations, heuristic evaluations, surveys, and other relevant approaches



Senior User Experience Researcher
Hepsiburada (NASDAQ: HEPS)
Istanbul, Turkey (Hybrid)

Senior User Experience Researcher

Hepsiburada (NASDAQ: HEPS) · Istanbul, Turkey (Hybrid) 3 weeks ago · 90 applicants

 Full-time · Mid-Senior level

 1,001-5,000 employees · Technology, Information and Internet

ebebek 
Kullanıcı Deneyimi ve Tasarım Müdürü
ebebek
Bostancı, Istanbul, Turkey (Hybrid)
1 company alumnus works here



User Experience Researcher
n11
Istanbul, Turkey (Remote)

 Your profile matches this job

2 days ago ·  Easy Apply

*Technology
should be as
simple as the
box it comes in*
- PHILIPS

Easy to say,
Hard to Realize



**Technology should be as simple
as the box it comes in.**

Life is complicated enough. Technology shouldn't add to the problem. So Philips is committed to making technology that makes sense. Technology that's easy to use. Technology designed around the way you live and work. In other words, technology that's pure simplicity.

Join us on our journey at www.philips.com/simplicity

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sense and simplicity

Readings for this week

- **week-1-1** Introduction to HCI
 - Dix et.al. (2004). Human Computer Interaction. Introduction. pp. 1-8
- **Week-1-2** Evolution of HCI (skim through)
 - Grudin, J. (2012). Introduction: A Moving Target: The Evolution of Human–Computer Interaction
- **week-1-3** HCI Research Themes and Trends of past 60 Years (read only Discussion section)
 - Fatih Gurcan, Nergiz Ercil Cagiltay & Kursat Cagiltay (2021)
- **week-1-4** Shneiderman - Ch-1 usability of interactive systems (skim through)
 - Shneiderman, B. et.al. (2016). Usability of interactive systems. pp. 25-54.
- **Optional**
 - (In Turkish) Dolmuşun Kapısı by Aziz Nesin. A story in İstanbul'un Halleri - Read for fun
 - (In Turkish) Read for fun-2 Bilim-Teknik-elektronik_beyin_insan_konusmasi-1968-Ekim

Readings

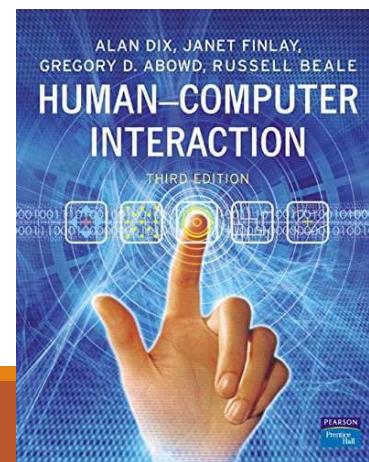
- History of the field. Reading #2
- Where do HCI go? Reading #3
- HCI basics. Reading #1&4

What is HCI? (ACM's defn)

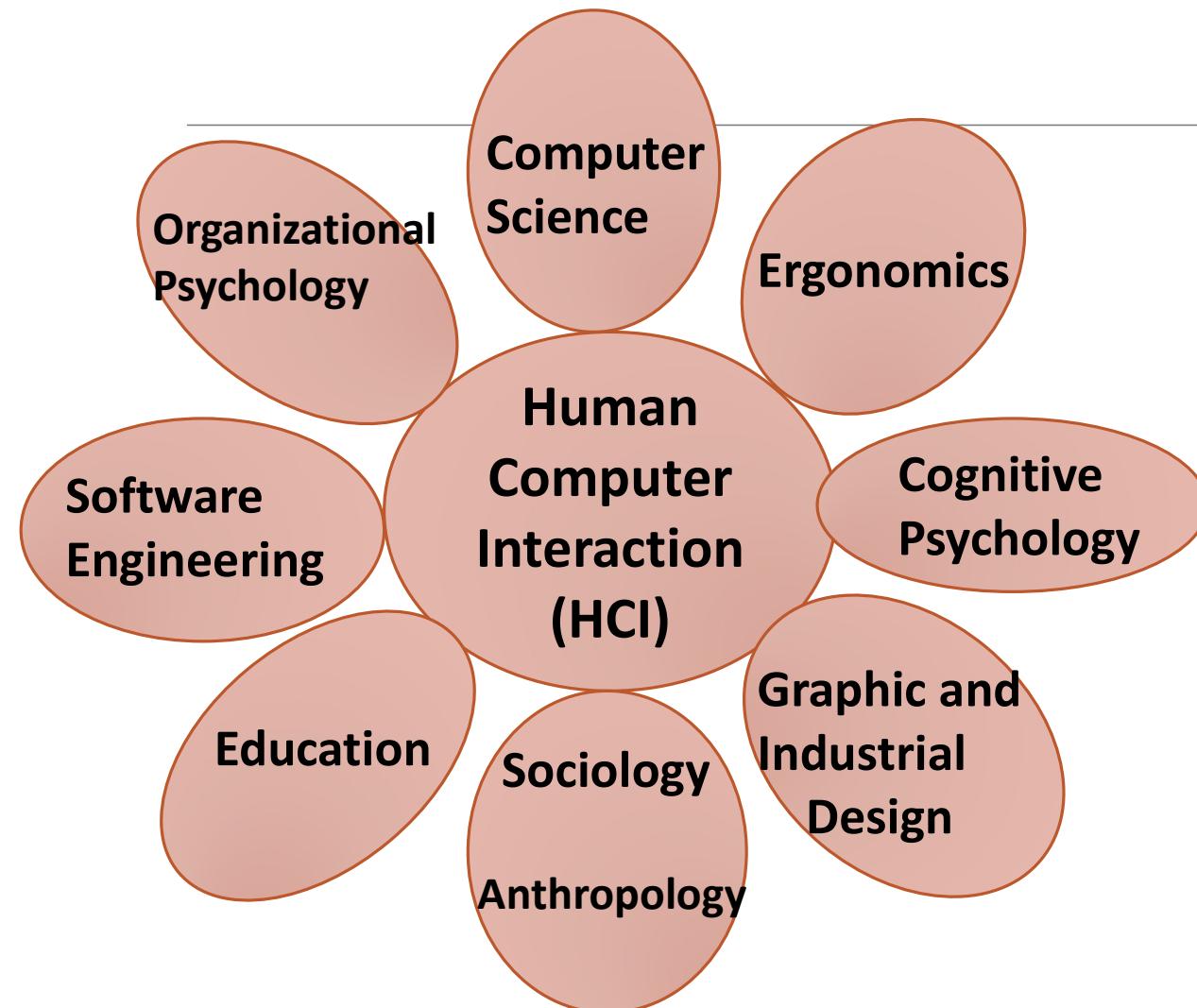
- Interdisciplinary study of the design and use of interactive technologies,
- Aims to support the development of more usable and humanly acceptable systems
 - Interaction
 - Task based
 - User cognition
 - Organizational/social impact
 - The nature and the process of design
 - The nature of use
 - Communication

What is HCI? (Alan Dix – Reading-1)

- HCI involves the
 - design, implementation and evaluation of
 - interactive systems (direct or indirect)
 - in the context of
 - the user's (individual, group, sequence, ...)
 - task and work.
- (Dix is from UK)



HCI is Inter/Transdisciplinary



Be pragmatists rather than theorists

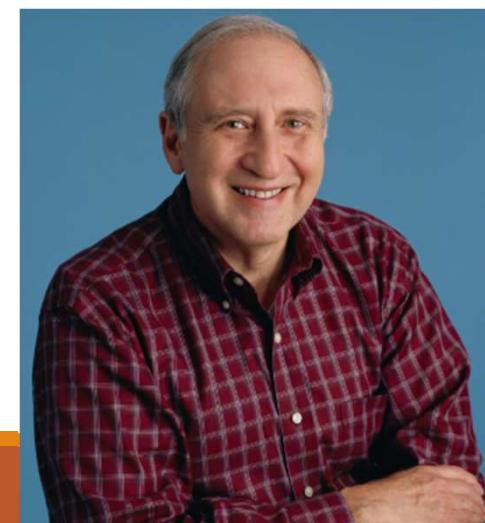
- We want to know how to apply the theory to the problem
- rather than just acquire a deep understanding of the theory.
- Be multi-disciplinary but practical.
- We concentrate particularly on computer science, psychology and cognitive science as core subjects, and on their application to design
- There is no general and unified theory of HCI



Usability of interactive systems:

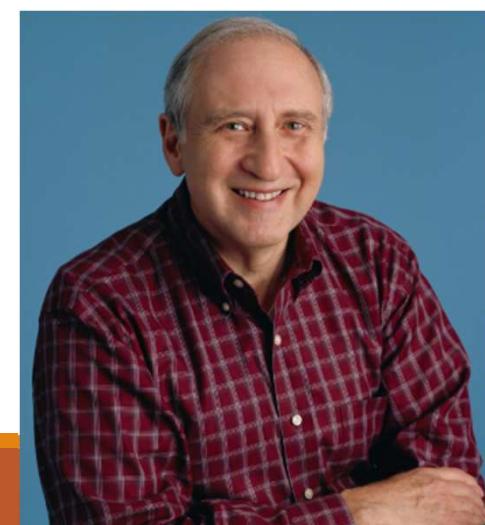
Ben Shneiderman. Reading-4

- Shneiderman is called as the father of HCI. University of Maryland Department of Computer Science
- interdisciplinary design science of human-computer interaction by applying the methods of experimental psychology to the powerful tools of computer science
- go beyond vague notions of “user friendliness,” “intuitive”
- study evidence-based guidelines



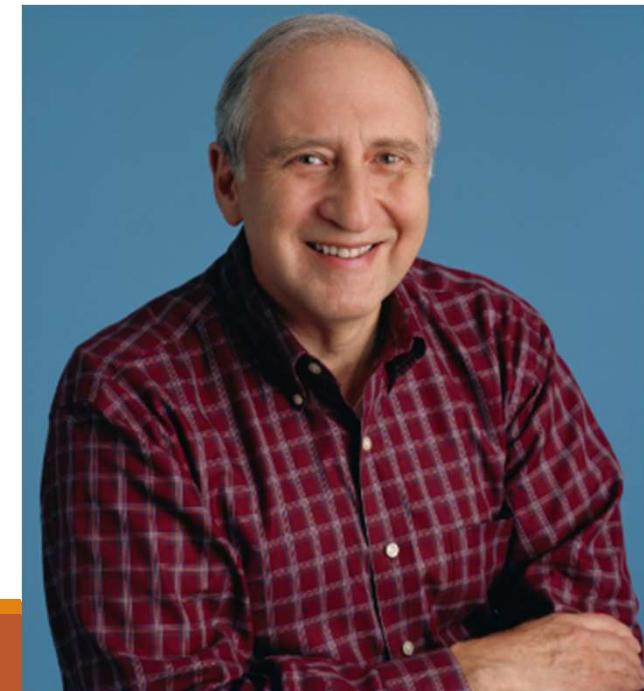
Usability of interactive systems: Ben Shneiderman. Reading-4 (for your 1st assignment)

- Interface almost disappears, enabling users to concentrate on their work, exploration, or pleasure.
- They are “in the flow”
- Usability Measures
 1. Time to learn
 2. Speed of performance
 3. Rate of errors by users
 4. Retention over time.
 5. Subjective satisfaction



HCI for All

- HCI for life critical systems
- HCI for social systems
- HCI for commercial uses
- HCI for home entertainment
- HCI for creativity, art
- HCI for education
- HCI for elderly, disabled, children
- HCI for robots
-



Human-Bathroom-Interaction

Interaction design
problems are in
everywhere



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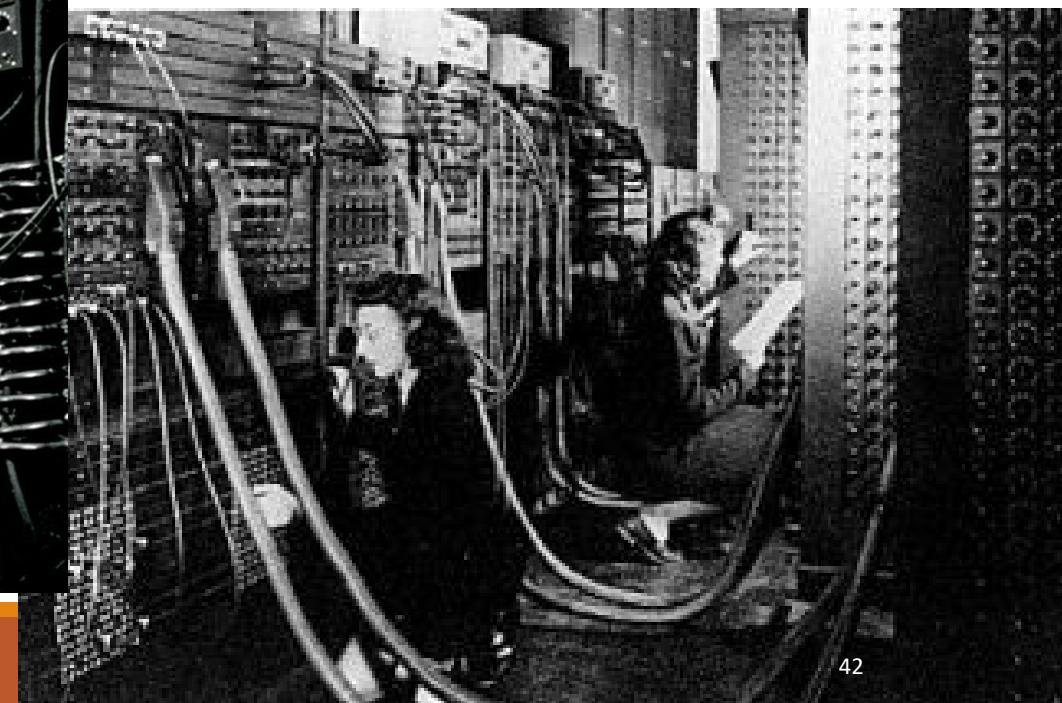
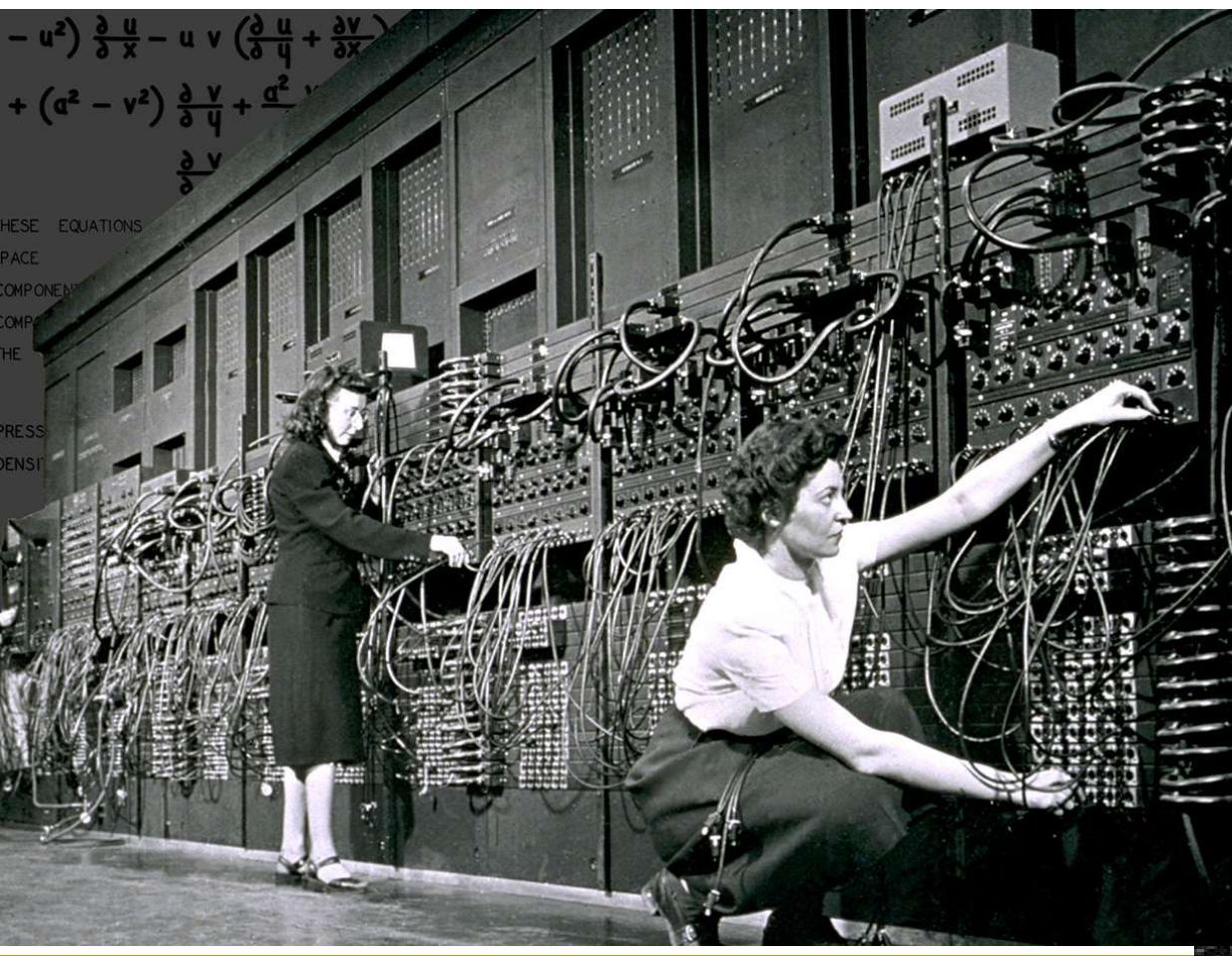
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sense and simplicity

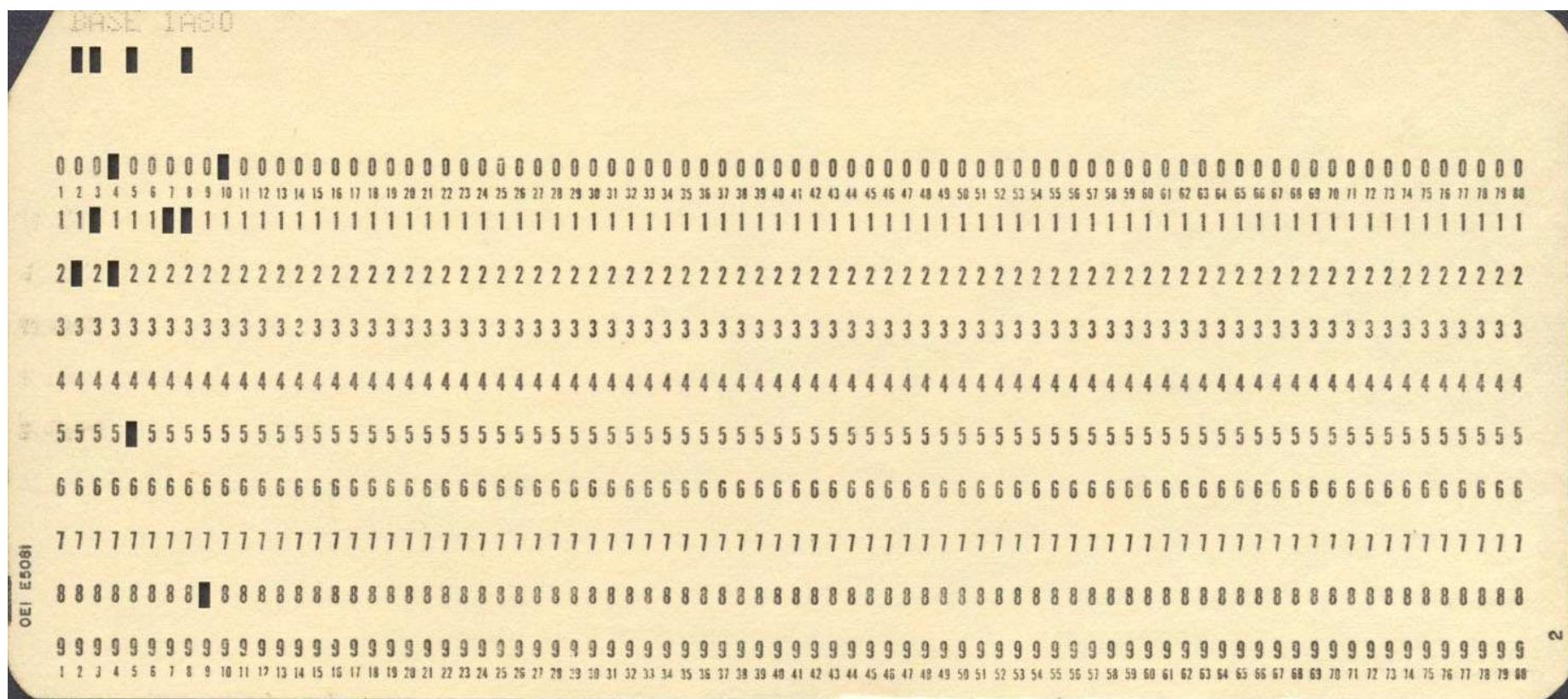
History



1946: ENIAC – Programming by women Interaction by cables



What is this?



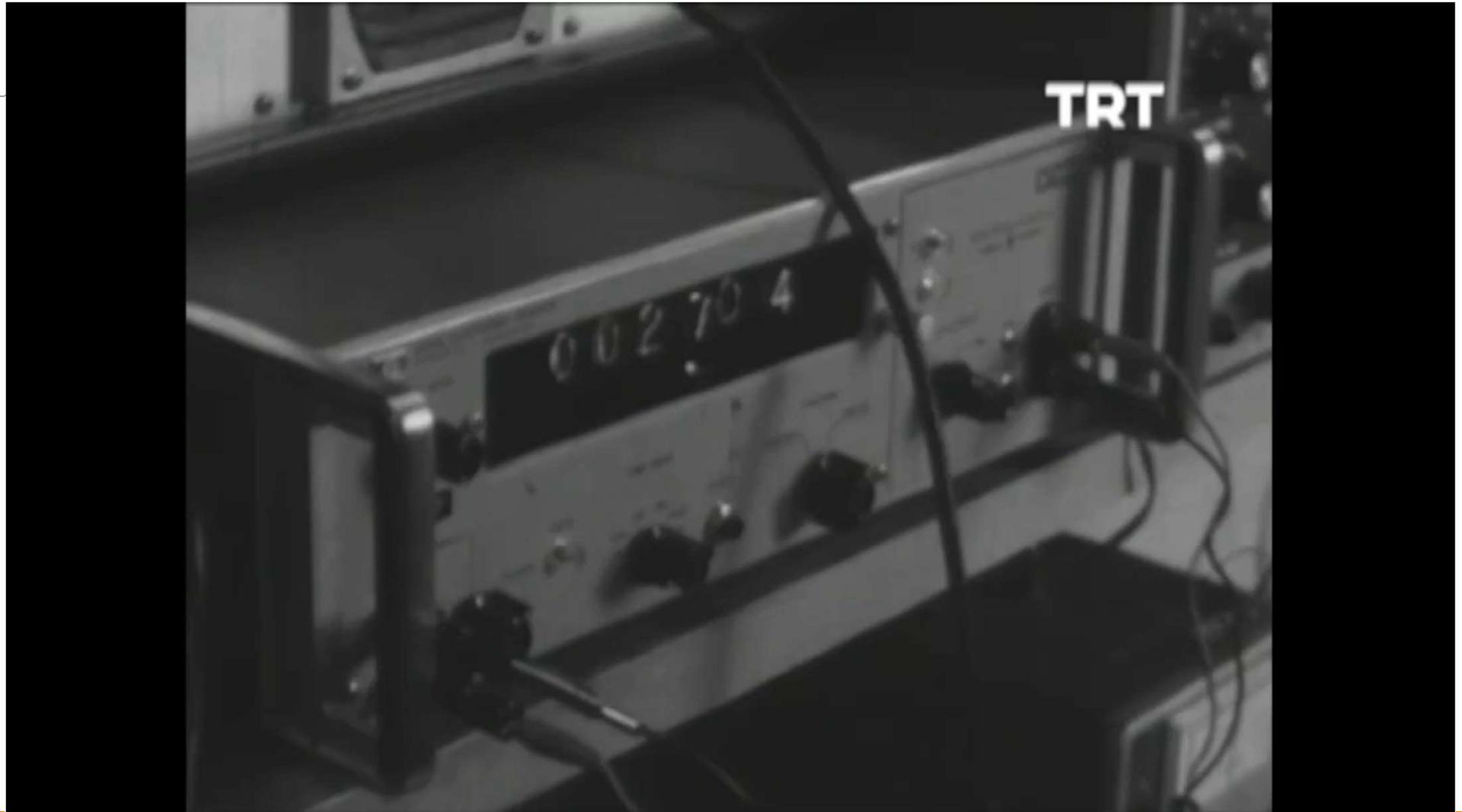
How many lines of code did you write?

01	02	11	1902566	N-D	28633	A	035	CABLE ASSY W-40	3
TYPE DOC.	FRM. NO.	NO. FRM.	DOCUMENTS	SHEET NO.	REV. LTR	TDRR NO.	TOTAL SHEET	TITLE	
1 2 3 4 5 6 7 8 9 0 1 2 3	1 2 3 4 5 6 7 8 9 0 1 2 3	1 2 3 4 5 6 7 8 9 0 1 2 3 4	1 2 3 4 5 6 7 8 9 0 1 2 3 4	1 2 3 4 5 6 7 8 9 0 1 2 3 4	1 2 3 4 5 6 7 8 9 0 1 2 3 4	1 2 3 4 5 6 7 8 9 0 1 2 3 4	1 2 3 4 5 6 7 8 9 0 1 2 3 4	1 2 3 4 5 6 7 8 9 0 1 2 3 4	1 2 3 4 5 6 7 8 9 0 1 2 3 4
 apollo MIT INSTRUMENTATION LABORATORY									
TYPE DOC.	FRAME NO.	NO. OF FRM.	DRAWING NUMBER	REVISION LETTER	TDRR	REL. CLASS	SHEETS	TOTAL	PAGES
1 2 3 4 5 6 7 8 0			1	2 2 0 2	3 3 3	3 3	3 3	3 3	3 3
1 2 3 4 5 6 7 8 0				2 4 5 7	1 3 6	7 9	INTERPRETER BARS		
DUPLICARD									
MMI 2076 FILMORT® BRAND APERTURE CARD PRODUCT OF 3M CO. ST. PAUL, MINNESOTA 55119 U.S. PAT. NO. 2,512,106 2,561,020 PRINTED IN U.S.A.									
SEQ. NUMBER	0	0	0	0	0	0	0	0	0
STATUS CODE	0	0	0	0	0	0	0	0	0
WESCO	0	0	0	0	0	0	0	0	0
MC-T 1268	0	0	0	0	0	0	0	0	0





- Komutlara program vermenin ilk adımı kart delme işlemidir ! (1973)
- The first step in programming a computer is card punching.



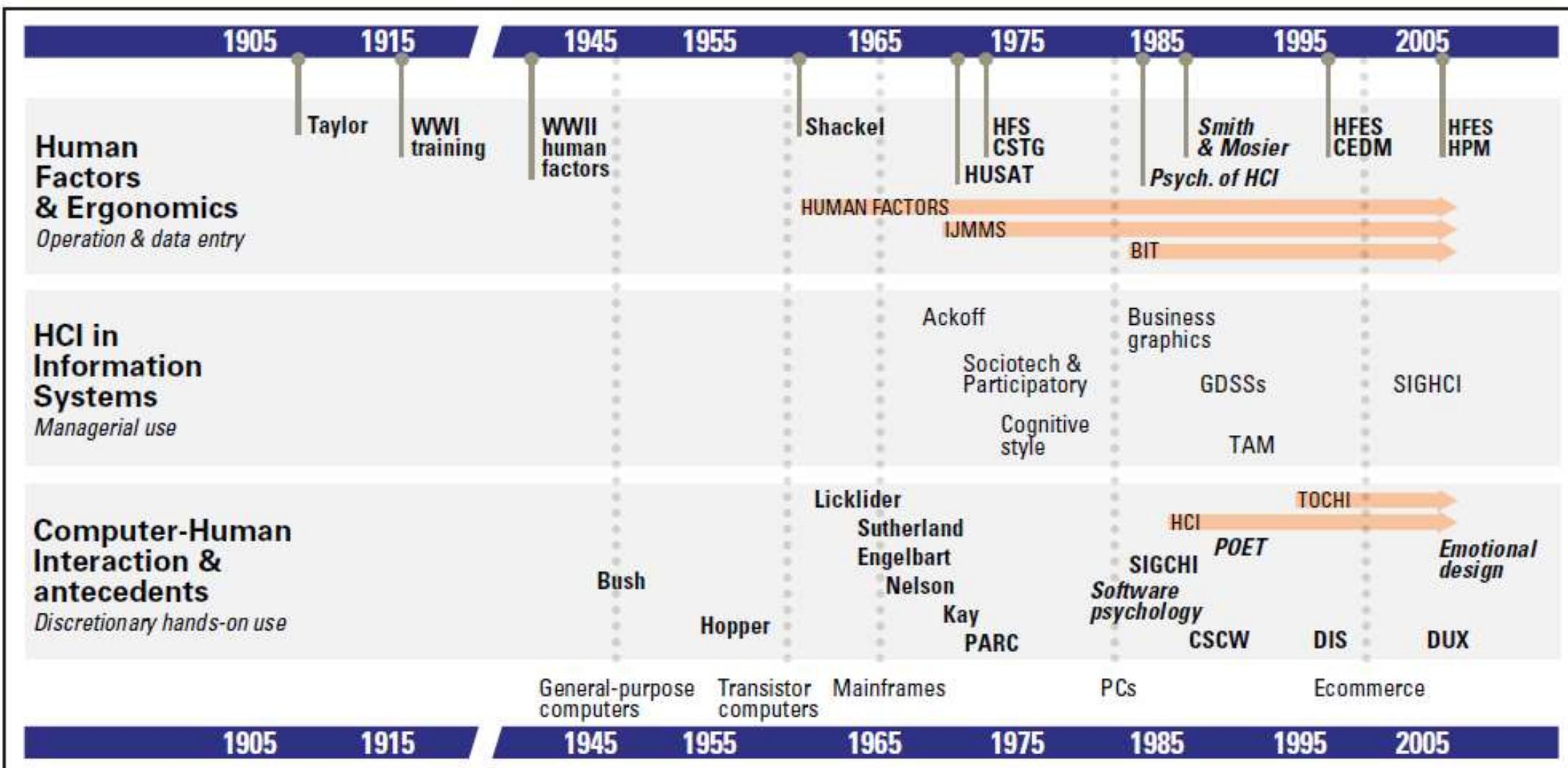


Figure 1. Three threads of HCI research and application

Historical Events- 1

1945

- Bush ve MEMEX

1959

- Shackel, Ergonomics for a computer

1960

- Licklider, Man Computer Symbiosis

1965

- Engelbart, Mouse and Interaction

1969

- ARPANET - International Journal of Man Machine Studies

1970

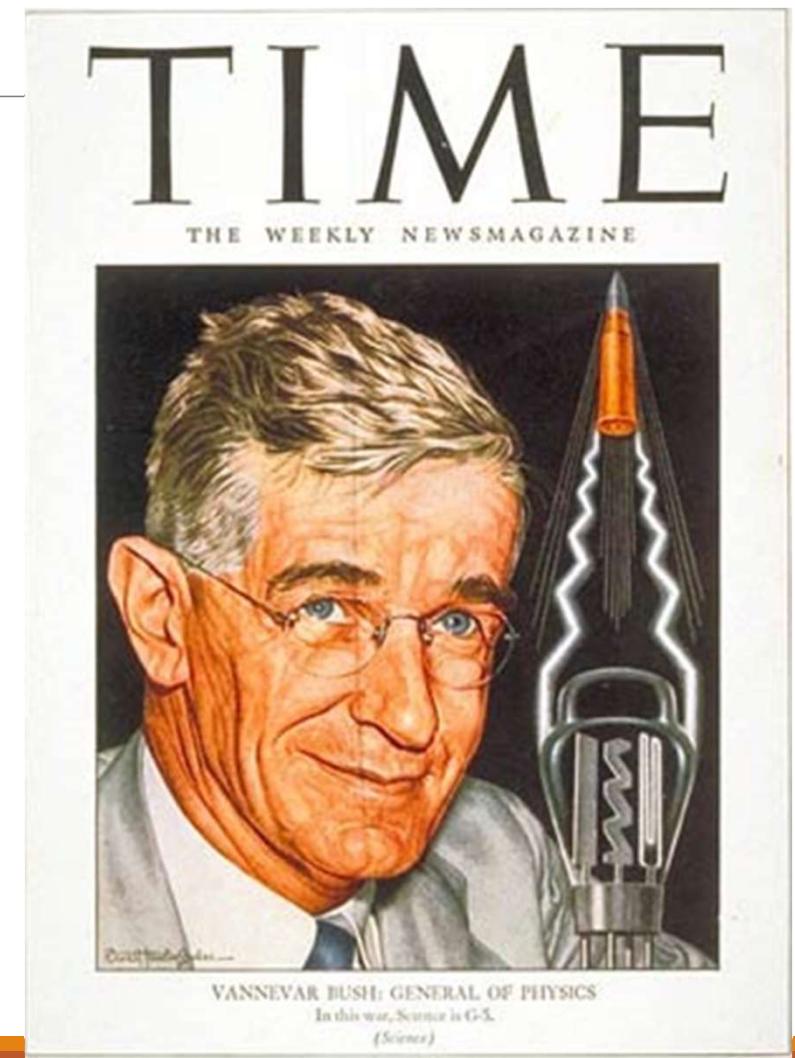
- England HUSAT, USA XEROX PARC

1971

- Weinberg, The Psychology of Computer Programming

As we may think – Memex (Bush 1945)

- Vannevar Bush, visionary article,
- PC, Internet, HCI
- First reference to Turks in IT literature
- «Memex is an enlarged intimate supplement to one's memory»



As we may think, The Atlantic Monthly, July 1945
<http://www.theatlantic.com/doc/194507/bush>

As we may think: MEMEX (July 1945)

- “Consider a future device ...
- in which an individual stores all his books, records, and communications, and which is mechanized so that
- it may be consulted with exceeding speed and flexibility.
- It is an enlarged intimate supplement to his memory.”



<http://www.theatlantic.com/doc/194507/bush>

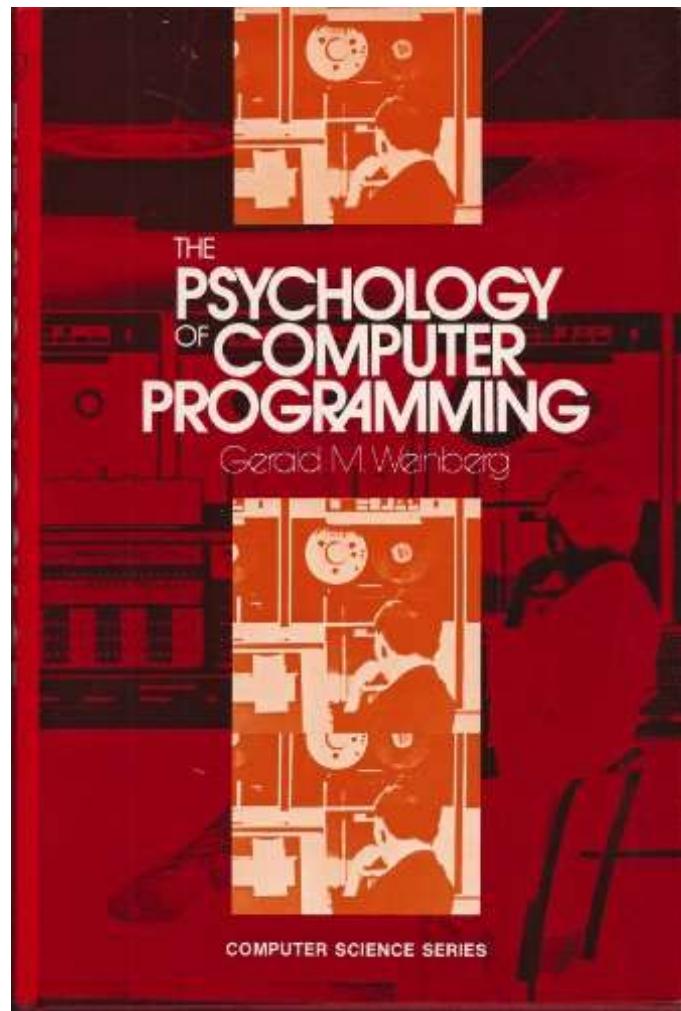
Memex

Licklider (1960)

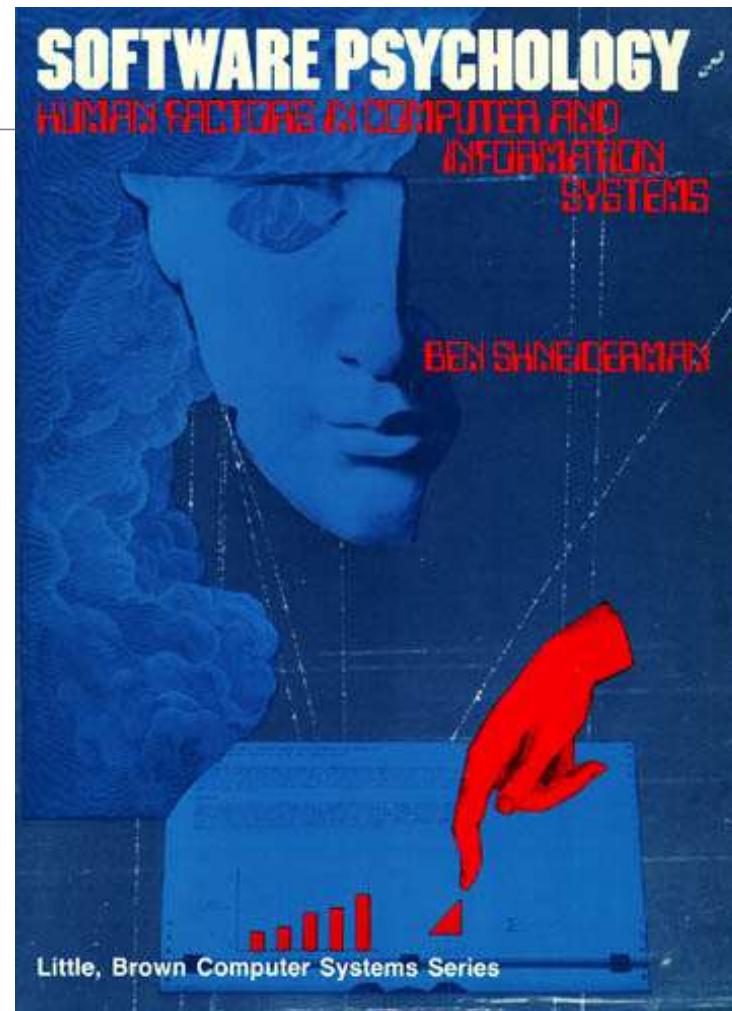
(The aim is) “to bring computing machines effectively into processes of thinking that must go on in ‘real-time’. To think in interaction with a computer in the same way that you think with a colleague whose competence supplements your own will require much tighter coupling between man and machine than is possible today”

<https://groups.csail.mit.edu/medg/people/psz/Licklider.html>

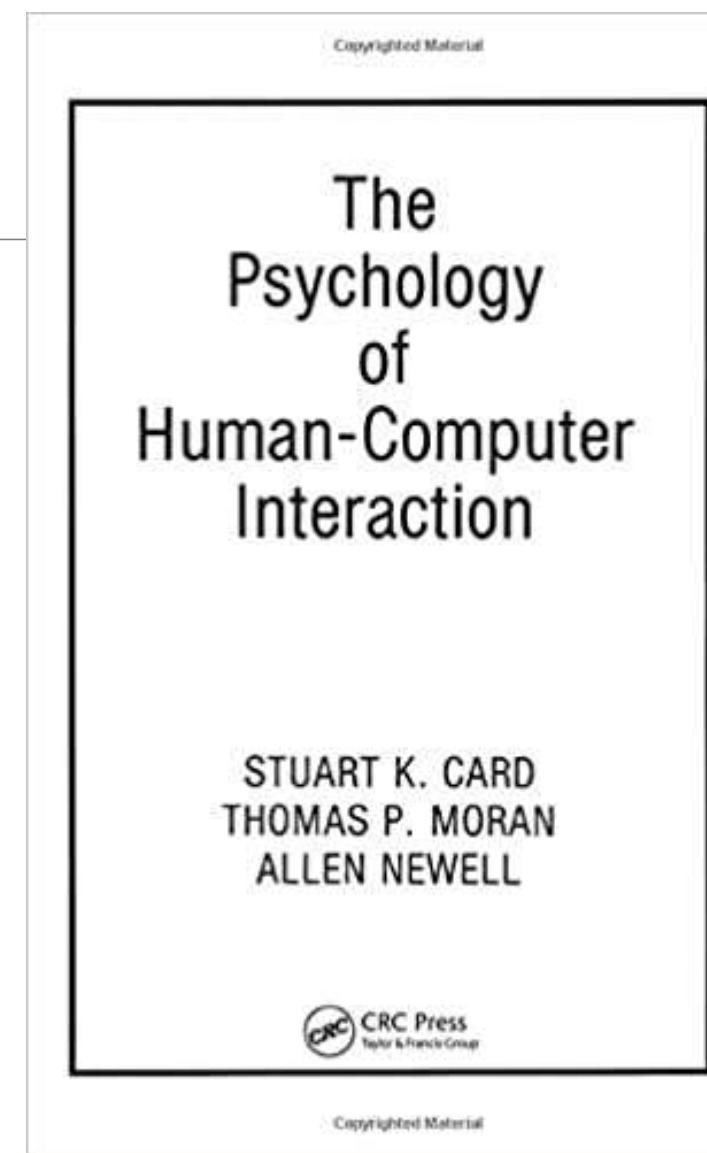
1971



1980



1986



Engelbart and the Dawn of Interactive Computing: SRI's 1968 Demo



Control Devices

- <https://www.scribd.com/doc/141240237/Engelbart-Demo-1968>

Historical Events- 2

1976

- NATO Workshop Human Computer Interaction

1970s

- Concept of «user friendliness» emerged

1980

- Shneiderman, Software Psychology

1982

- Behavior and Information Technology journal

1982

- ACM SIGCHI and CHI conferences

1985

- Hypertext systems

End of 1980's

- 4 new HCI journals, Usability labs
- Mainframes to mini systems, PCs

Univac 1100 – Boğaziçi University



• 1980



Burroughs B6930 - 1984



- 12 MB memory
- 400 MB Disk
- 20 Terminal
- EARN/BITNET



IBM 3090 – 22 October 1990

-
- Super Computer
 - 128 MB memory,
 - 22.5 GB disk (4000kg)
 - 150 Terminal
 - First Fiber Optic campus network
 - No Internet Yet



<https://www.youtube.com/watch?v=iVPAwHKEglc>

IBM 3090 – 22 October 1990

- Computer networks are important
- Turkey needs to connect to the Internet
- Computers and Internet will change everything



<https://www.youtube.com/watch?v=iVPAwHKEglc>

Internet – 12 April 1993



<https://youtu.be/NJ2QULmhAYU>

Türkiye'de Internet: Dünü, Bugünü, Yarını

Attila Özgit

ozgit@metu.edu.tr

Kürşat Çağiltay

kursat@metu.edu.tr



25. Yıl İçin Gözden Geçirilmiş Basım

https://www.researchgate.net/publication/326191266_Turkiye'de_Internet_Dunu_Bugunu_Yarini

Historical Events- 3

1990s

- Internet & WWW

Late
1990s

- Formal university HCI degree programs – e.g.CMU

2000

- mobile technologies
- Social networks
- VR and AR
- Wearable technologies
- Affective interaction

2015

- Brain Computer Interaction

TÜBİTAK Vision 2023 Report

- **1. Kullanımı eğitim gerektirmeyen bilgisayarların geliştirilmesi.**
- “İnsanlar bilgisayara ayak uyduracağına, bilgisayarlar insanlara ayak uydurmmalı; bir başka deyişle, “insan okur-yazarlığı” olan bilgisayarlar yapılmalı”. (Sayfa 73)
- **1. Development of computers that do not require training to use**
- Instead of humans keeping up with computers, computers must keep up with humans; in other words, computers with “human literacy” should be built
- http://vizyon2023.tubitak.gov.tr/Strateji_Belgesi-V211.pdf

Research themes and trends (Reading-3)



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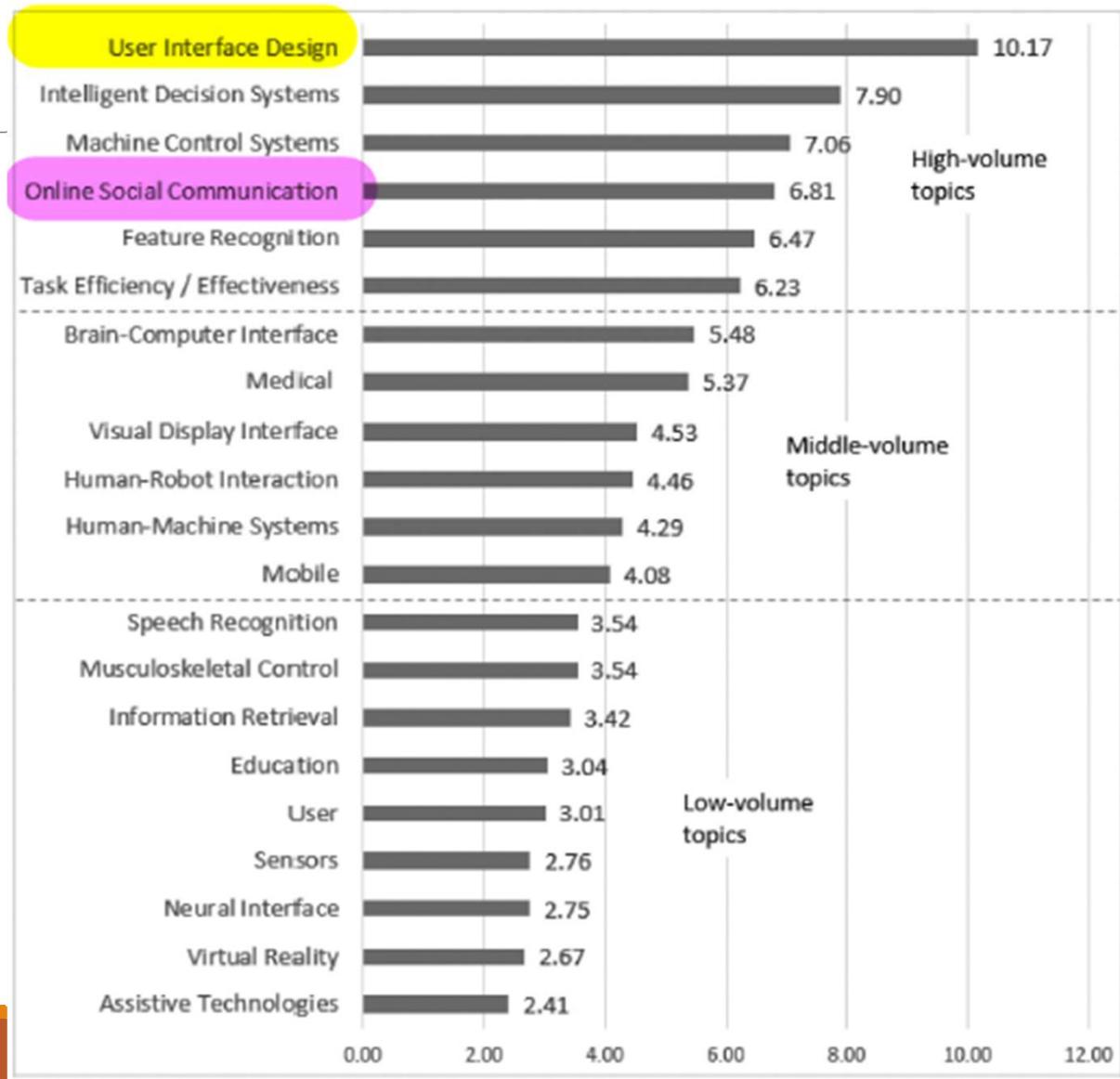
Mapping Human-Computer Interaction Research Themes and Trends from Its Existence to Today: A Topic Modeling-Based Review of past 60 Years

Fatih Gurcan, Nergiz Ercil Cagiltay & Kursat Cagiltay

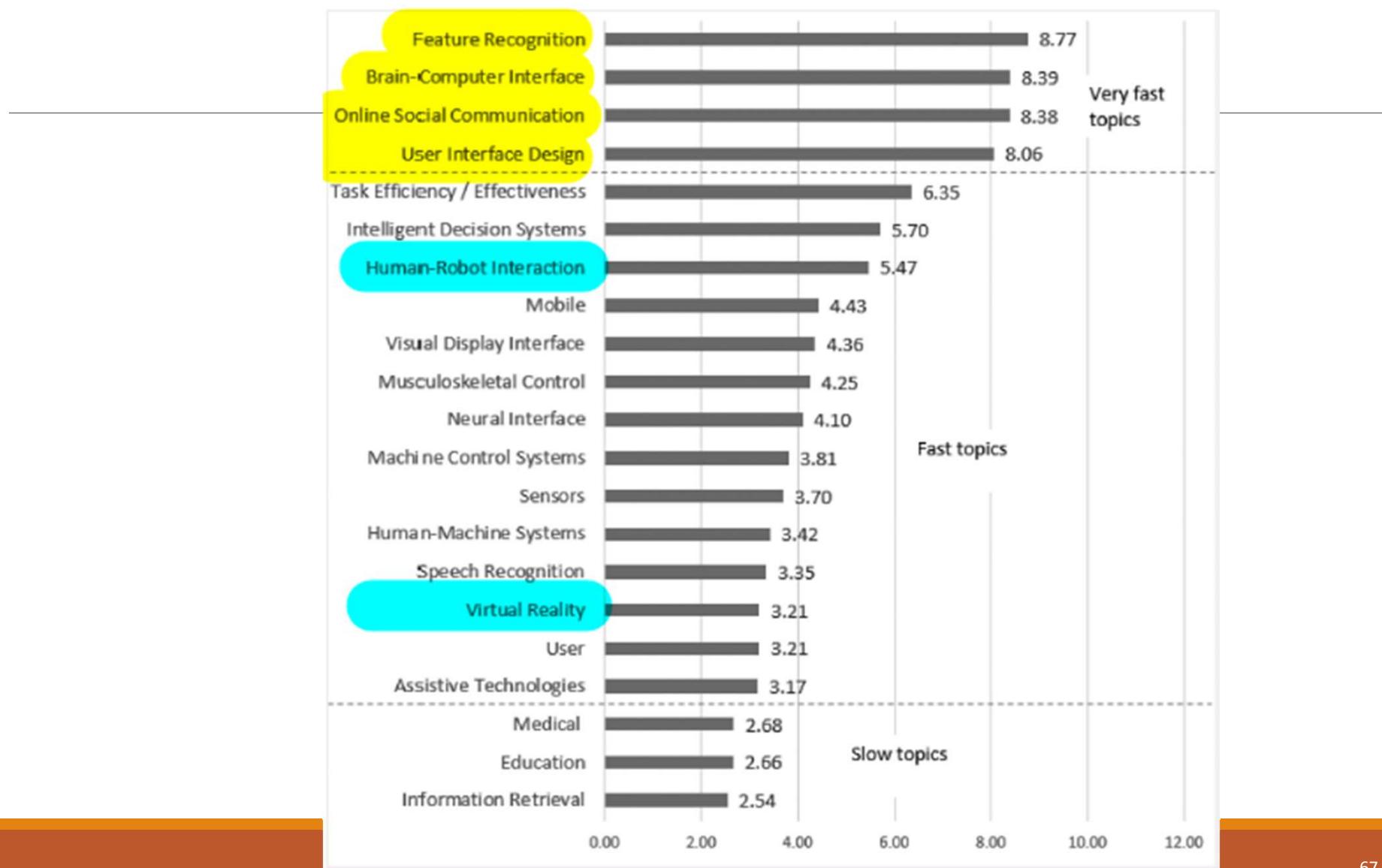
Topic Trends by Decades

Decade	Top Five Highest Mean Topics
1959–1968	Human-Machine Systems, Machine Control Systems, Task Efficiency/Effectiveness, Intelligent Decision Systems, User Interface Design
1969–1978	Machine Control Systems, Intelligent Decision Systems, Human-Machine Systems, Task Efficiency/Effectiveness, User Interface Design
1979–1988	Machine Control Systems, Intelligent Decision Systems, User Interface Design, Human-Machine Systems, Task Efficiency/Effectiveness
1989–1998	User Interface Design, Machine Control Systems, Intelligent Decision Systems, Medical, Task Efficiency/Effectiveness
1999–2008	User Interface Design, Medical, Intelligent Decision Systems, Machine Control Systems, Online Social Communication
2009–2018	Feature Recognition, Brain-Computer Interface, Online Social Communication, User Interface Design, Task Efficiency/Effectiveness

Number of Publications



Speed of Topics



Result

- 41,720 HCI related journal articles between 1957 and 2018
- transition of HCI studies from machine-oriented systems to
 - human-oriented systems indicates its future direction toward
 - context-aware adaptive systems

New interfaces

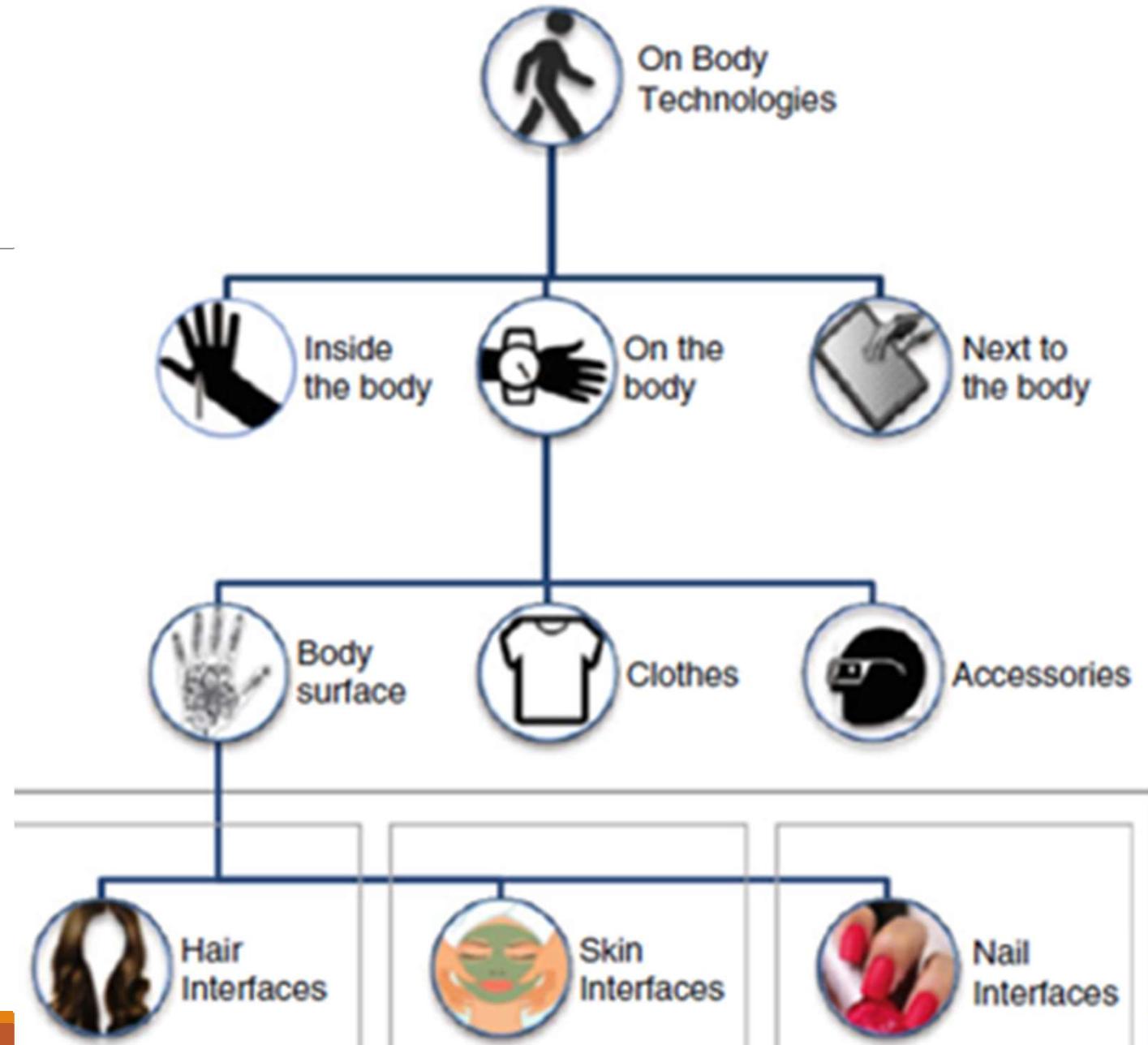
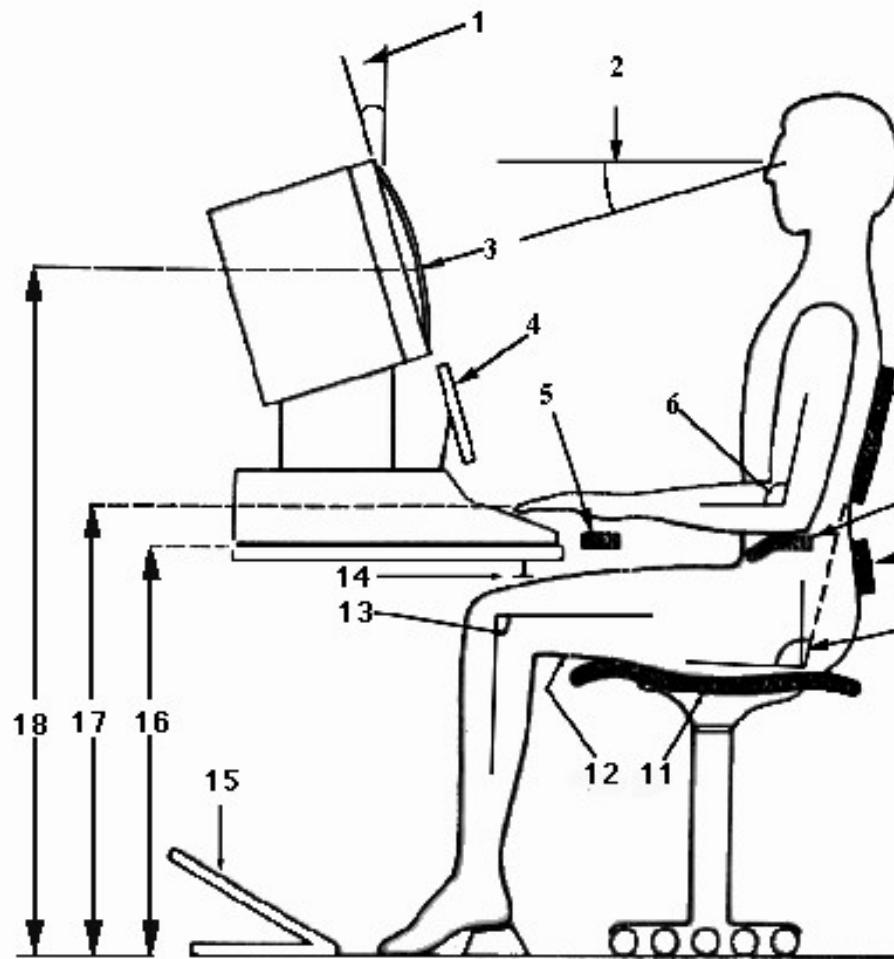




Fig. 4.12 Winkymote usage. (a) placing sensors on skin, (b) connecting the remote control. (c) first time Felipe turn on the TV by himself after 13 years. Image reproduced with permission from Felipe Esteves

Physical Interaction?



1. Screen tilt angle
2. Visual angle between the horizon and the center of the display
3. Eye-screen distance
4. Document holder and source document
5. Wrist rest
6. Elbow angle
7. Backrest
8. Elbow rest
9. Lumbar support
10. Seat back angle (from horizontal)
11. Seat pan angle (from horizontal)
12. Clearance between leg and seat
13. Knee angle
14. Clearance between leg and table
15. Footrest
16. Table height
17. Home row (middle row height)
18. Screen height to center of screen

Week-2 Readings



Week-2 Shneiderman-ch3 Guidelines Principles and Theories

Shneiderman, B. et.al. (2016). Guidelines, Principles and Theories. pp. 81-120. Designing the User Interface: Strategies for Effective Human-Computer Interaction, 6th Edition



Week-2 Norman - Design of everyday things Ch2

Norman, D. (2013). The psychology of everyday actions, Ch.2 pp. 37-122. The design of everyday things. Basic Books.



Week-2 Landauer_Trouble_with_computers Ch4 (Skim Through)

Landauer (1995) Excuses, Ch4, pp. 83-113. Trouble with computers: Usefulness, Usability, and Productivity. MIT Press