

COMP90018 – MOBILE COMP

EDUARDO VELLOSO

*Welcome &*  
**INTRODUCTION**

2017

1995



phone

COMMUNICATIONS



phone



phone

e

phone

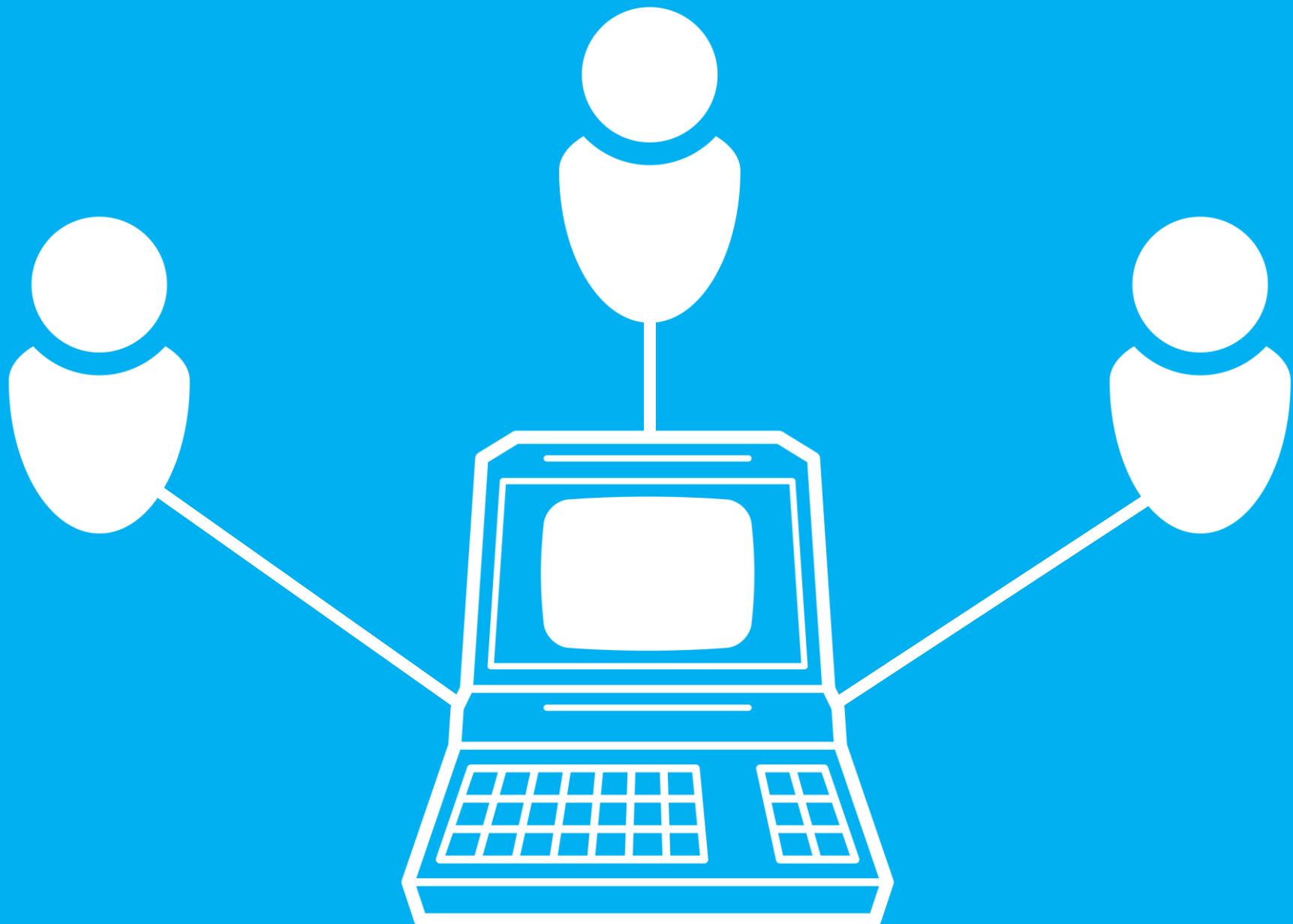
STOP

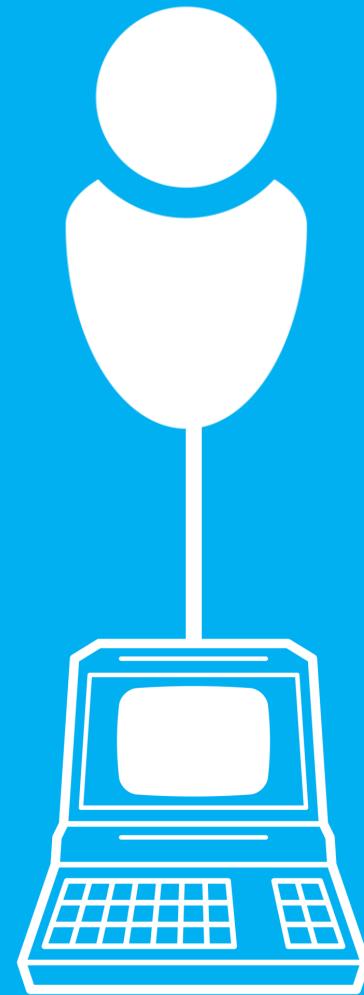
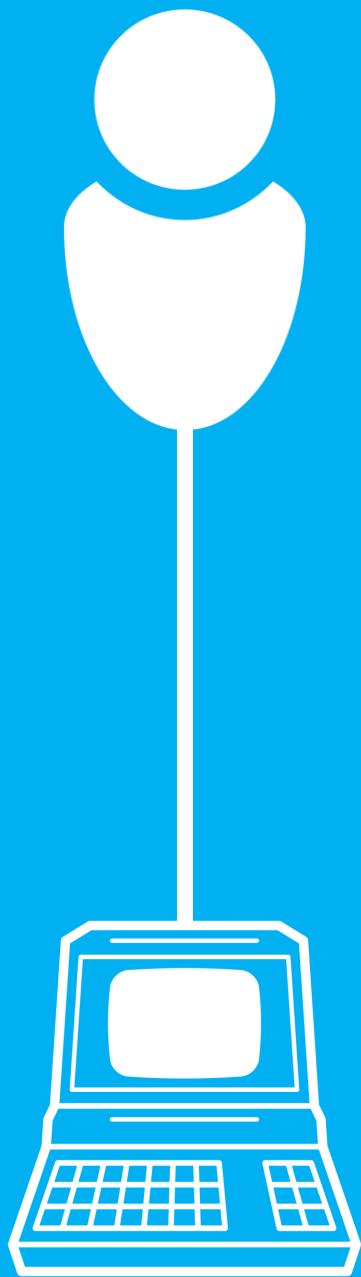
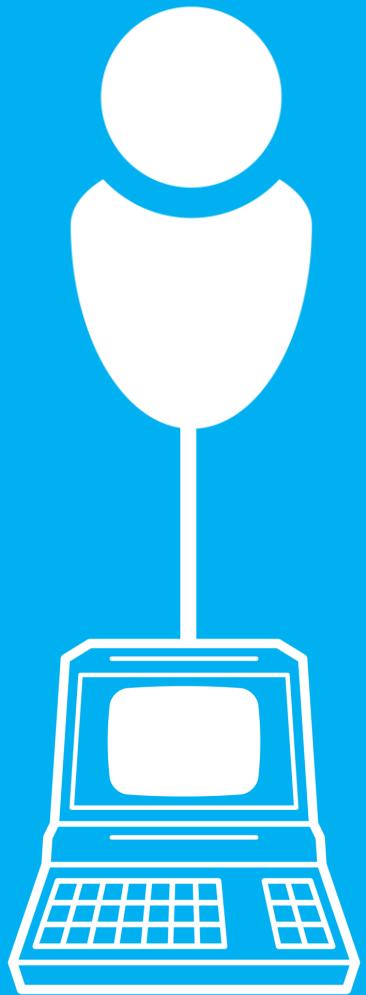


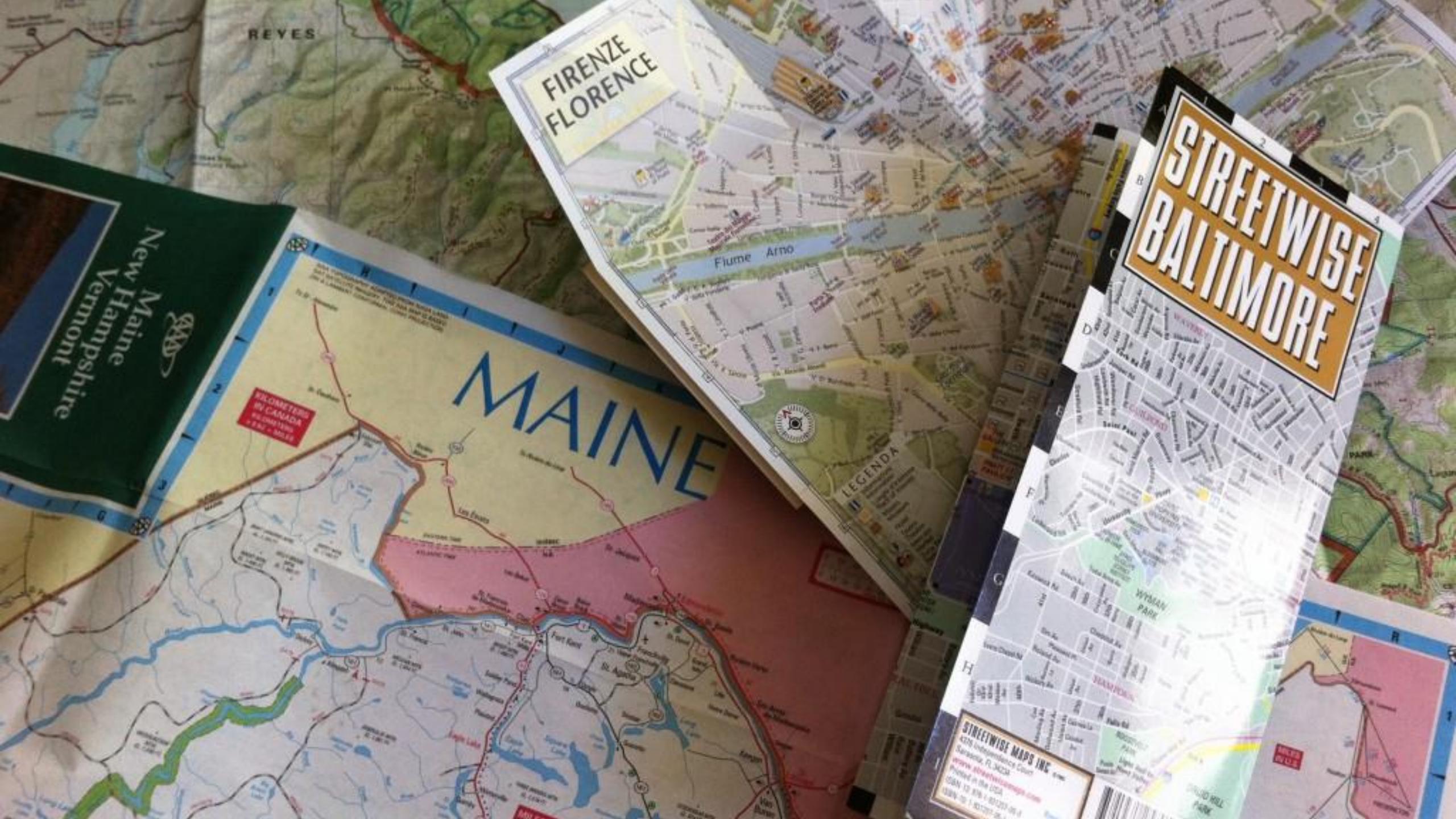










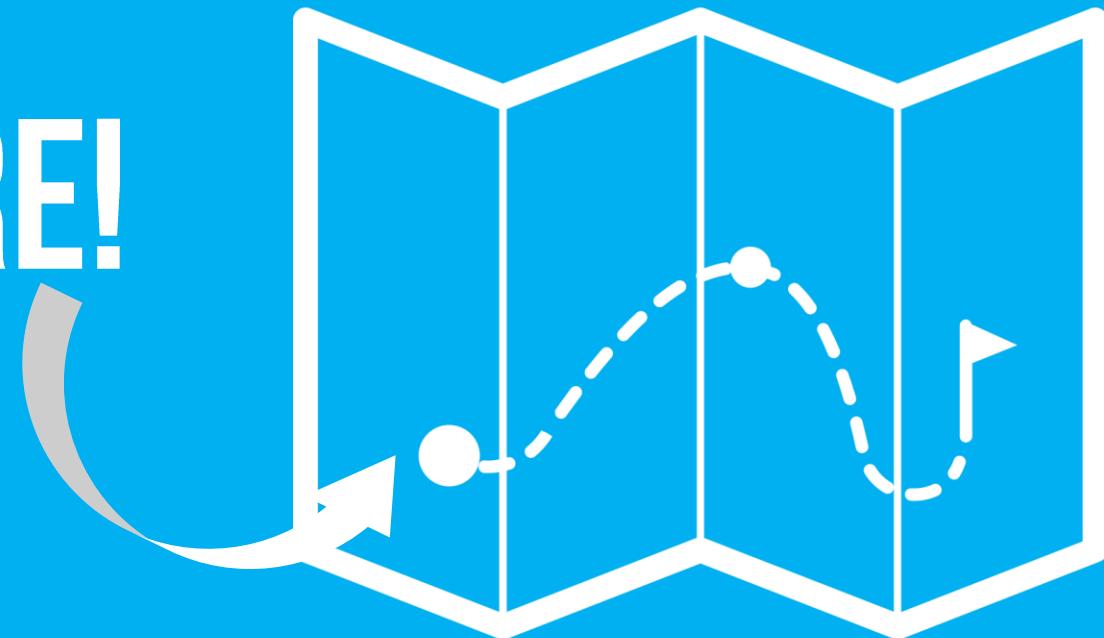


# *Navigation*



# *Navigation*

**YOU ARE HERE!**



# *Localisation*

HANIMEX



FOCUS FREE



Motor



SHP.013 DUVAL DA BUTCHA



HF 60

TYPE I (NORMAL) POSITION  
NORMAL BIAS 120µs EO

SONY®











# EVOLUTION

*of phones*

# 1. *Voice*



# *2. Paging & Text*

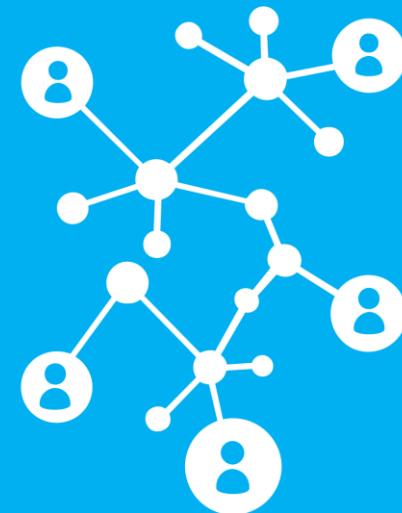
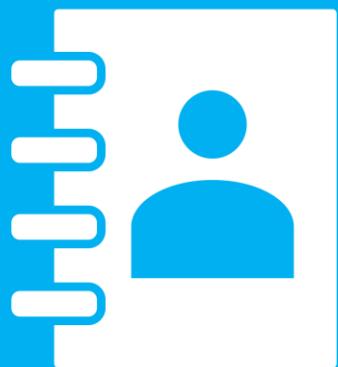
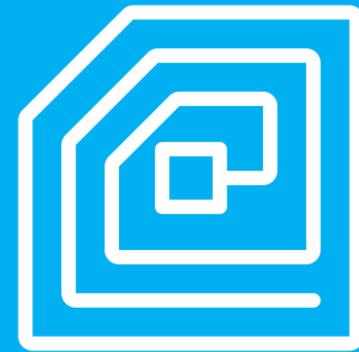
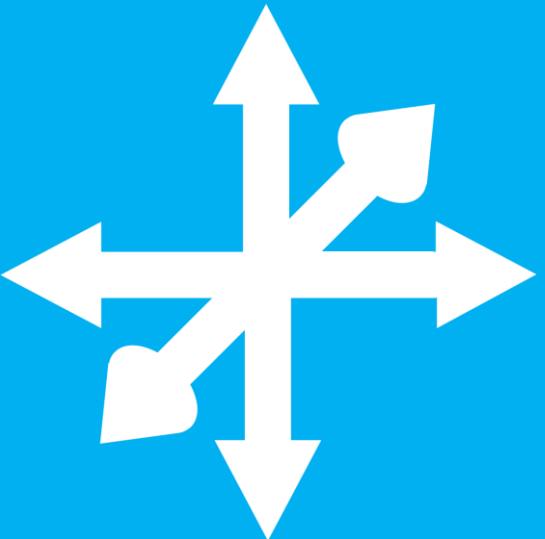


# *3. Pervasive Network Connectivity*



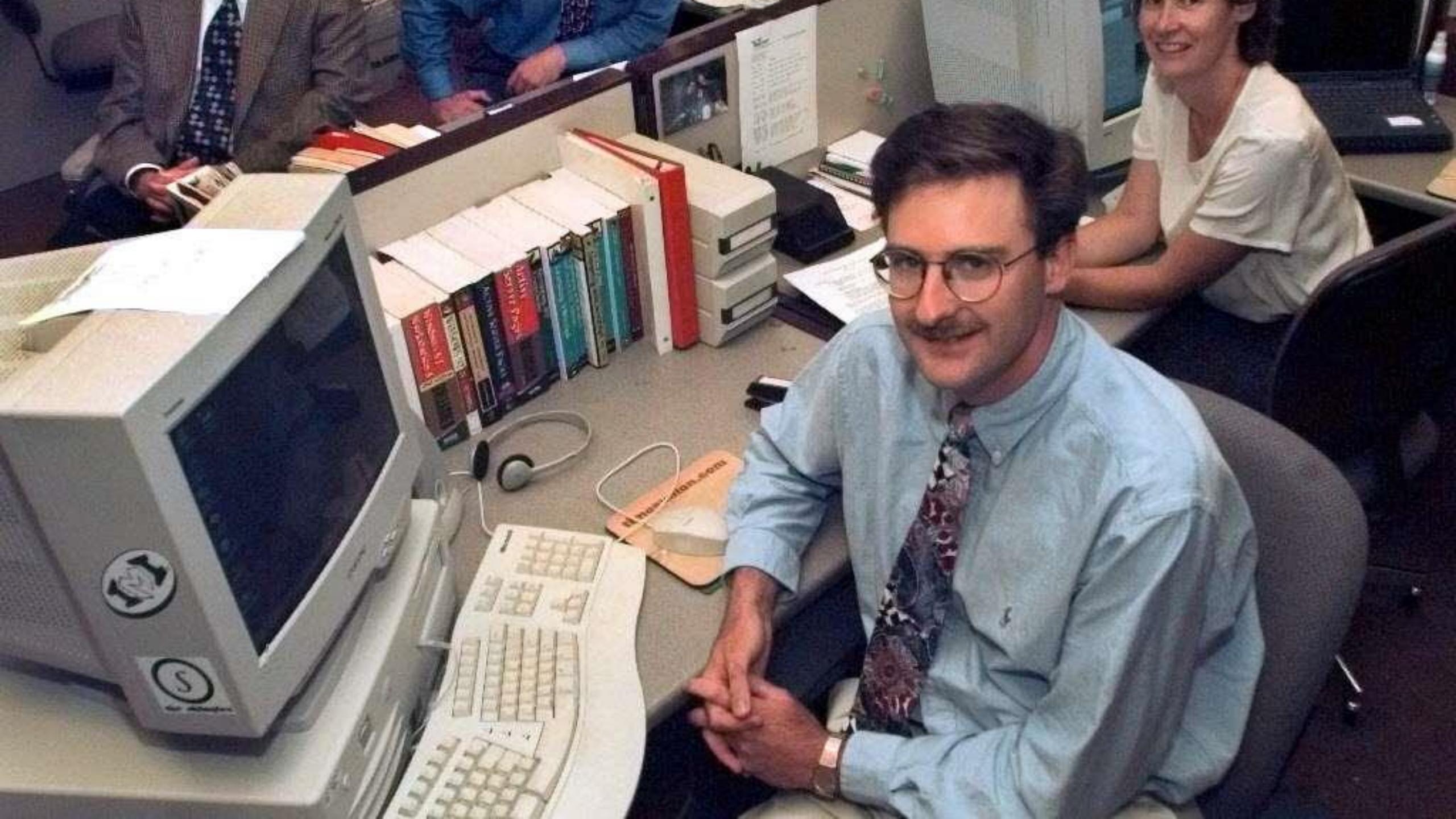
# *4. General Purpose Devices*





*Mobility changes*  
**EVERYTHING!**

# CONTEXT











# SOCIAL IMPLICATIONS





ion Voters

Cell  
s, or  
ervices  
oting



By Election Commission Officials

Absolutely NO Cell  
phones, Cameras, or  
any recording devices  
allowed in the voting  
booths.



# Keep your personal music player personal

Out of courtesy to your fellow rockers, wear headphones when listening to music on the bus or train, and keep the volume low enough that others can't hear it. We know you have great taste in music, but you're not the CTA's DJ.







SUNDAY

16°C  
MIN 8°Currently 12°  
Feels like 10°  
Detail ▾

Just In

Australia

World

Business

Sport

Science

Arts

Analysis

Fact Check

Programs

More



Print



Email



Facebook



Twitter



More

# University of Melbourne defends wi-fi tracking of students as planning move amid privacy concerns

The World Today

Updated 12 Aug 2016, 1:52pm

**The University of Melbourne has moved to allay privacy concerns amid revelations it is tracking students through their wi-fi usage.**

The university said the practice, which looked at where people were moving around campus, helped institutions improve retention rates and the experience of students.

Privacy groups expressed concern about the practice, which is also in place at some institutions around the country.

The head of services at the University of Melbourne Paul Duldig said there was no way of identifying students.

"[We're] simply looking at where the people's phones are on campus and seeing whether they're in particular rooms or walking across campus at particular times so we can plan better," he told 774 ABC Melbourne.

The university is trying to work out where people move across the campus to help with planning the new Metro Rail project, which will run through the middle of the campus.

Mr Duldig said they were "not tracking people" but rather "simply looking at movements of essentially dots on the page".



PHOTO: The university said it was only able to track student movements, not individuals. (ABC News)

MAP: Parkville 3052

## TOP STORIES

- Trump fires off volley of tweets on Russia probe, claims 'power to pardon'
- Melbourne could run out of water within a decade: report
- Clean-up underway across New Zealand's storm-battered South Island
- Meet the woman who feeds her family for \$40 a week
- John Heard, Home Alone actor, dies aged 72
- Trump promised he'd save Carrier jobs, but they're headed to Mexico
- Ice-cool Froome on brink of fourth Tour triumph
- The workers who pay the price for Australia's fast fashion addiction
- Ballarat man to compete for Australia in gold panning 'Olympics'
- 'A poor look for the game': Soliola not sent off despite sickening hit on Slater
- Coalition infighting damaging Government, says longtime Abbott supporter Abetz
- Science proves it: first impressions last
- Great Ocean Road suffers landslips as new wildlife centre plans revealed
- The NT crocodile handler who takes on the world's most terrifying reptiles
- Bi-partisan call for Government to ramp up anti-human trafficking measures
- Swans sue top four as Hawks

*What a strange practice it is... that a man should sit down to his breakfast table and, instead of conversing with his wife, and children, hold before his face a sort of screen on which is inscribed a world-wide gossip*

*Charles Cooley (1909)*



**MONROVIA COLLEGE**

**MONROVIA  
COLLEGE**



# TECHNICAL CONSTRAINTS

*Disconnections*  
*Bandwidth*  
*Latency*  
*Network heterogeneity*  
*Security*

*Energy Usage*

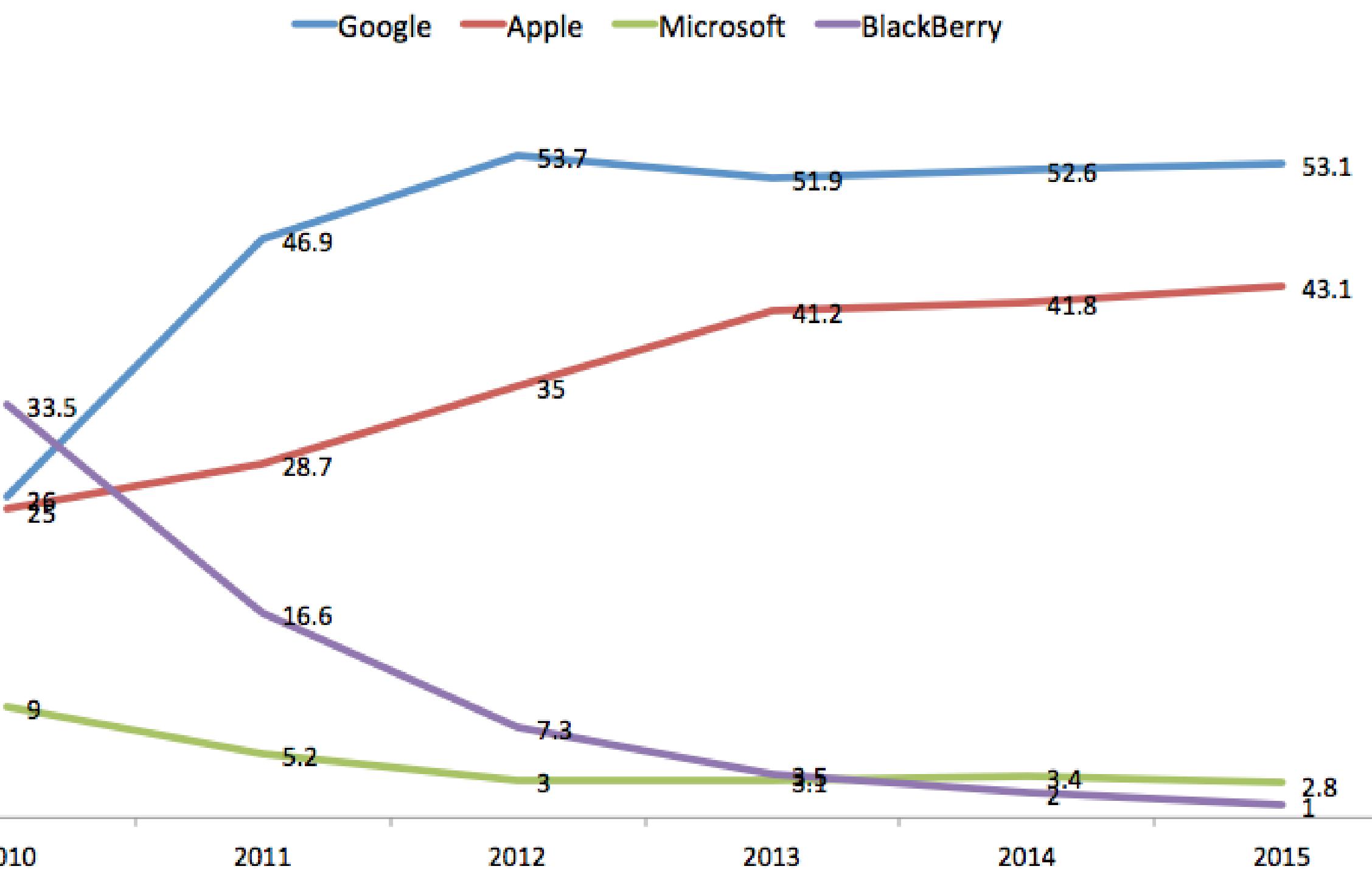
*Risk to data*

*Memory*

*Processing power*

*Input/Output*

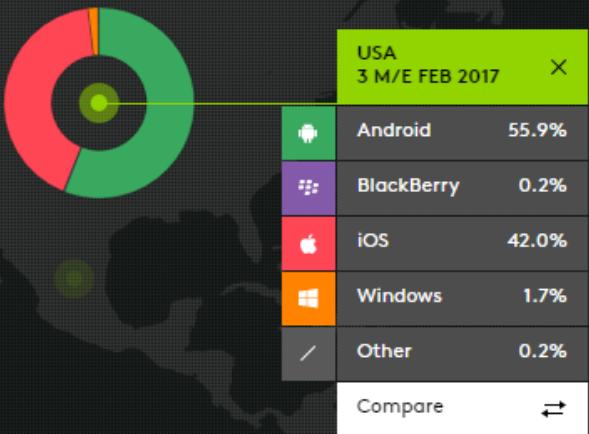
# OPERATING SYSTEMS

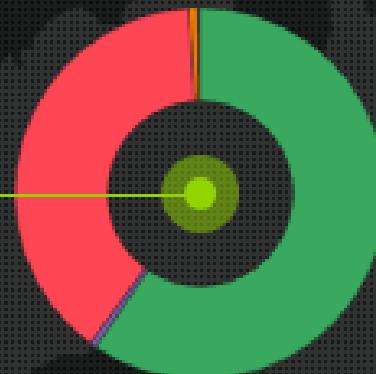
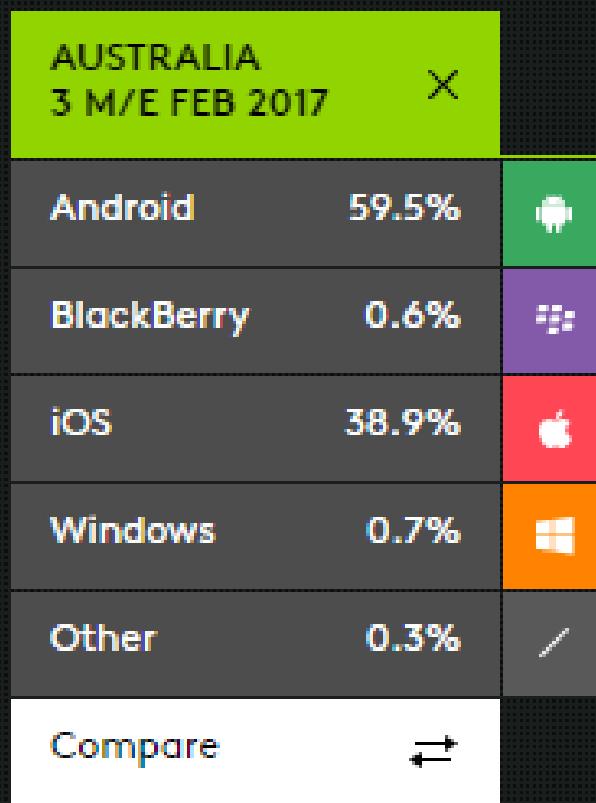


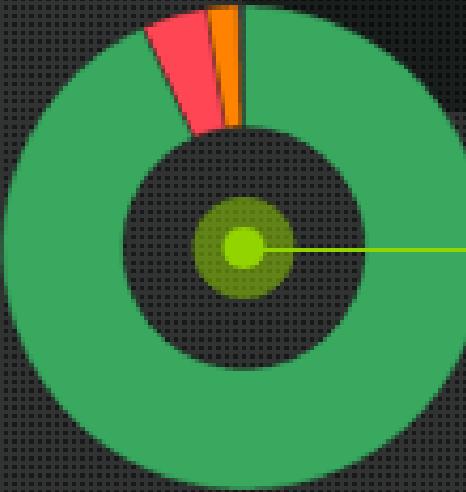
## Smartphone OS sales market share

Read our expert's latest commentary

iOS and Android push towards a Two-OS world







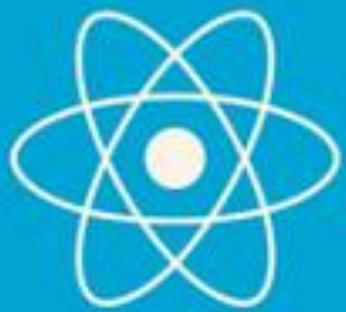
BRAZIL  
3 M/E FEB 2017

	Android	93.2%
	BlackBerry	0.0%
	iOS	4.4%
	Windows	2.1%
/	Other	0.4%

Compare







# React Native



Xamarin



**NATIVE  
WEB  
HYBRID**

# NATIVE WEB HYBRID

*Speed  
Sensors  
Dev Resources  
Dev Speed  
UX/UI  
Data transfer  
Updating  
Offline  
Monetisation*

BUILD AN APP?

# CREATING NOVEL MOBILE EXPERIENCES

# MOBILE COMPUTING



# MOBILE COMPUTING

*Devices*  
*Users*  
*Agents*

*Luggable*



**MOBILE  
COMPUTING**

# *Luggable*



*Luggable*

MOBILE  
COMPUTING

*Portable*

# *Portable*





huc : 99

huc : 99

huc : 99

*Luggable*

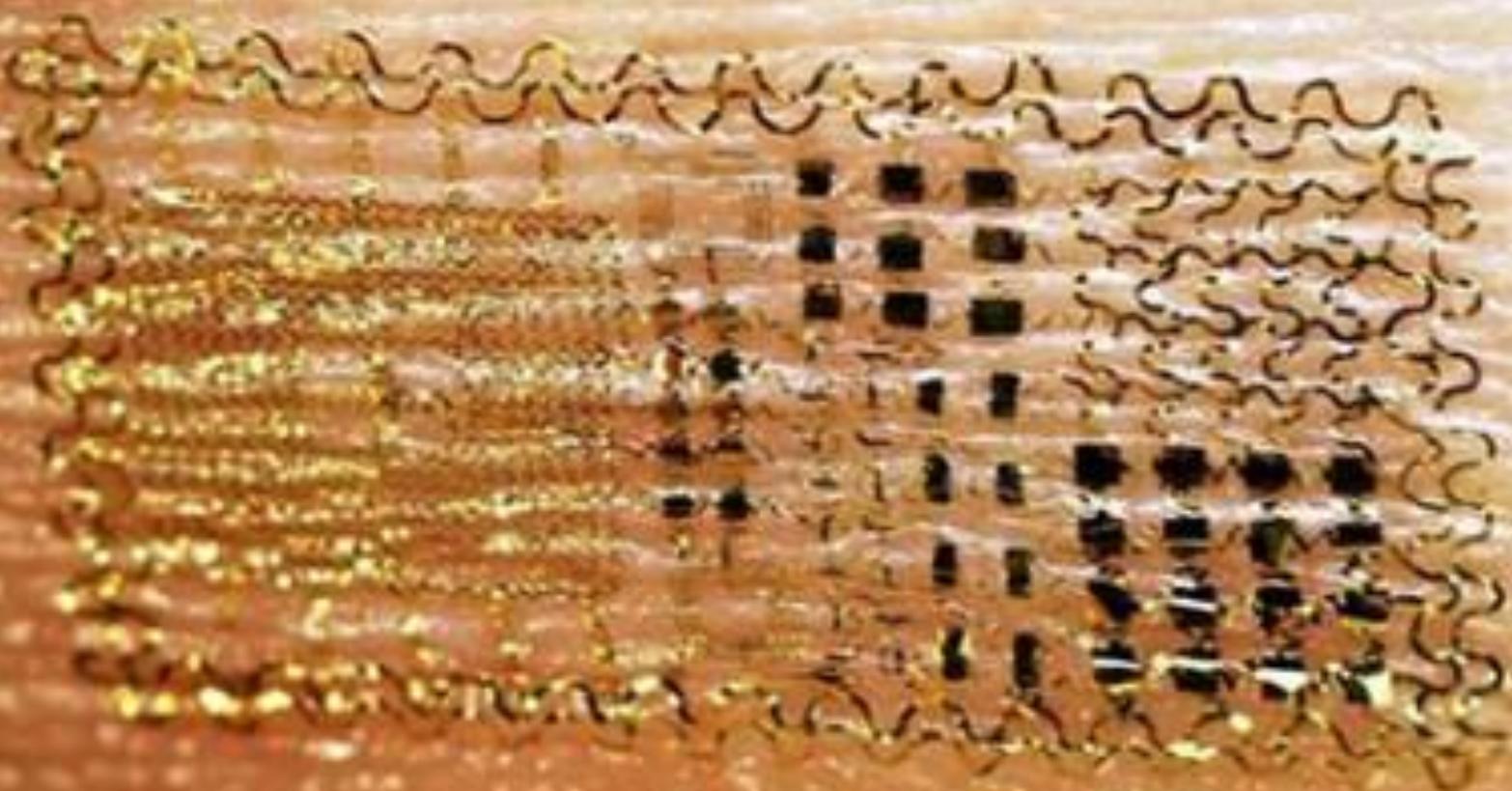
*Wearable*

**MOBILE  
COMPUTING**

*Portable*

# *Wearable*







*Luggable*

*Wearable*

# MOBILE COMPUTING

*Portable*

*Insertable*

# *Insertable*



*Luggable*

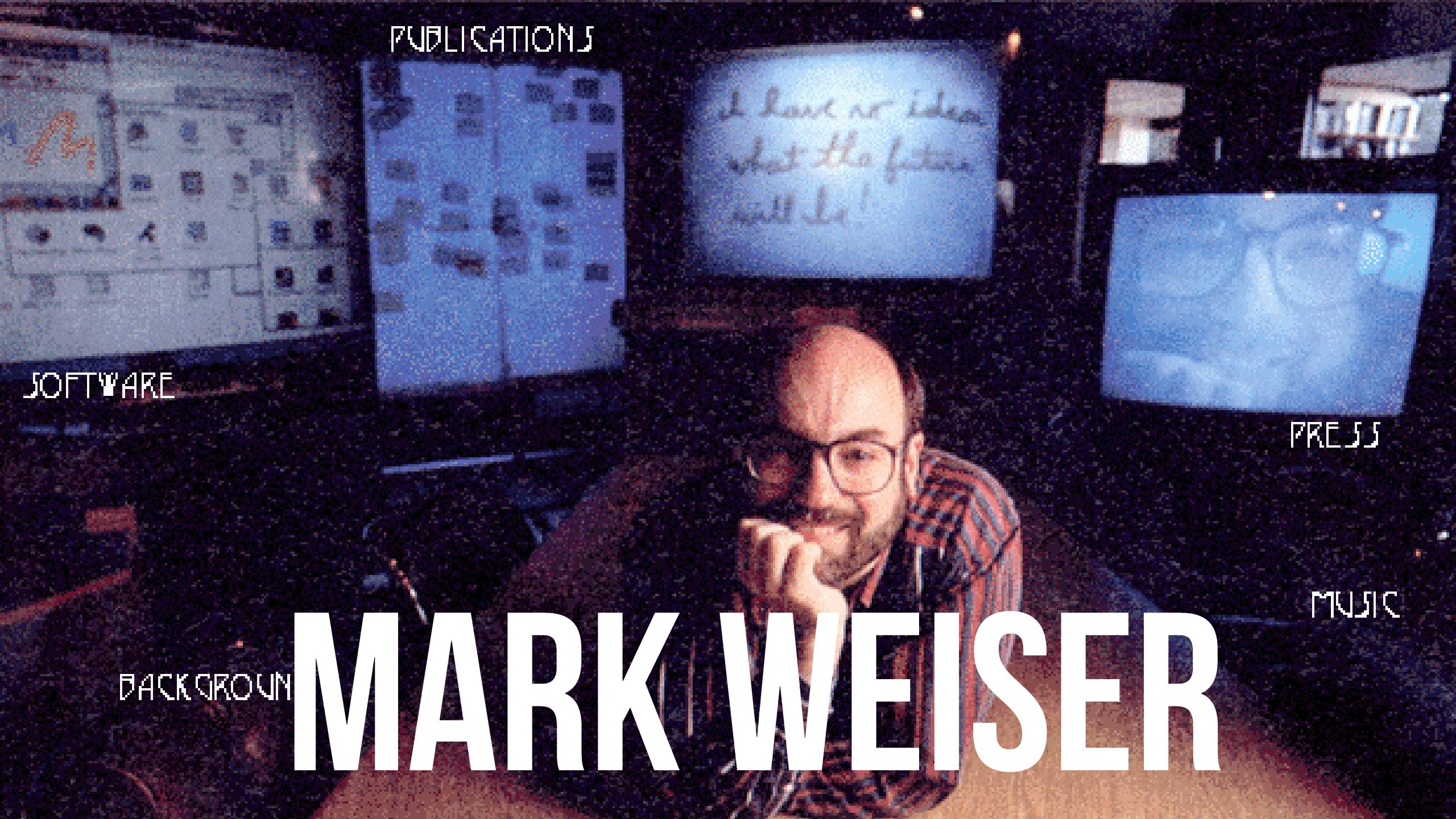
*Wearable*

# MOBILE COMPUTING

*Portable*

*Insertable*

# UBIQUITOUS *Computing*



PUBLICATIONS

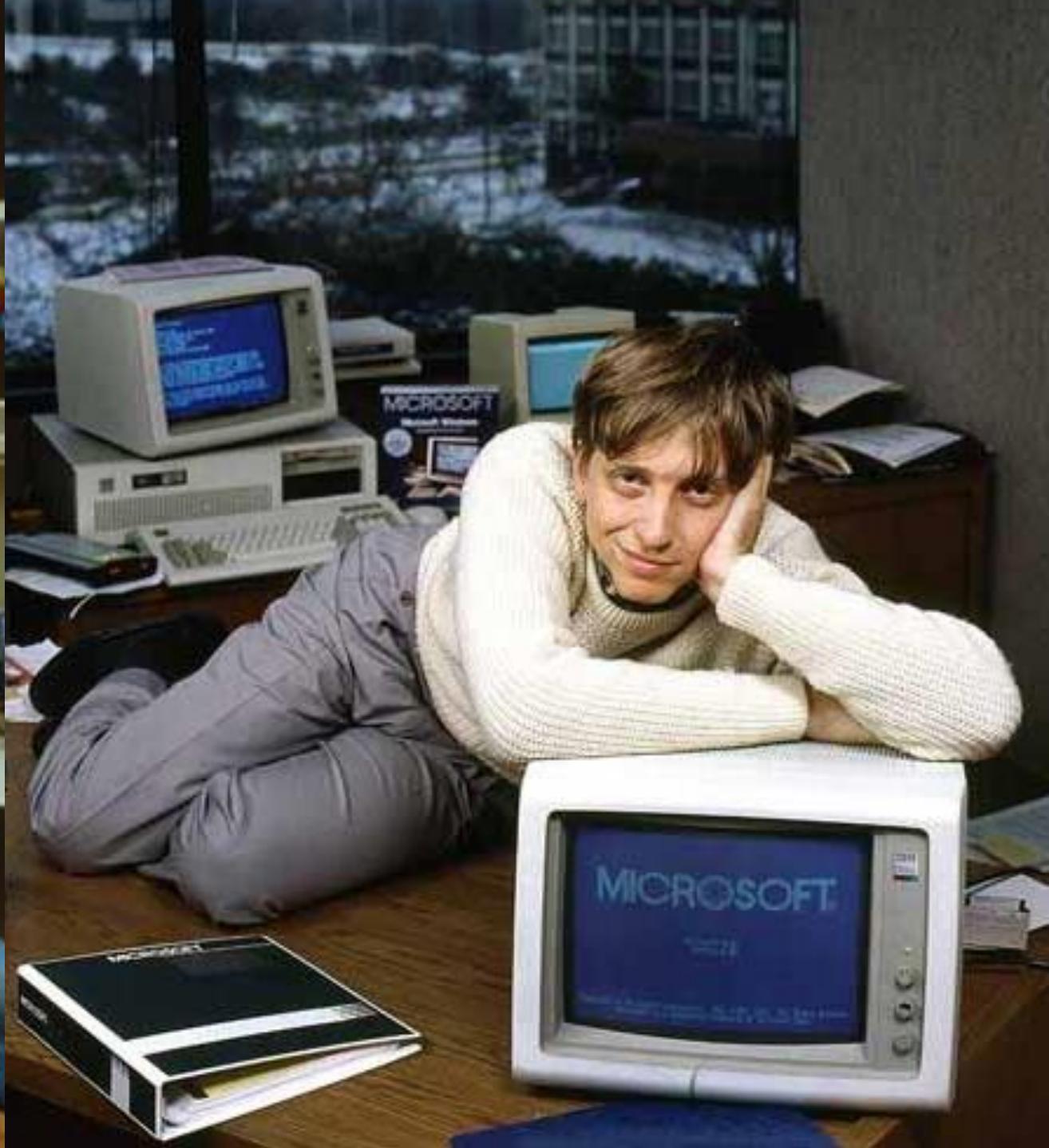
# MARK WEISER

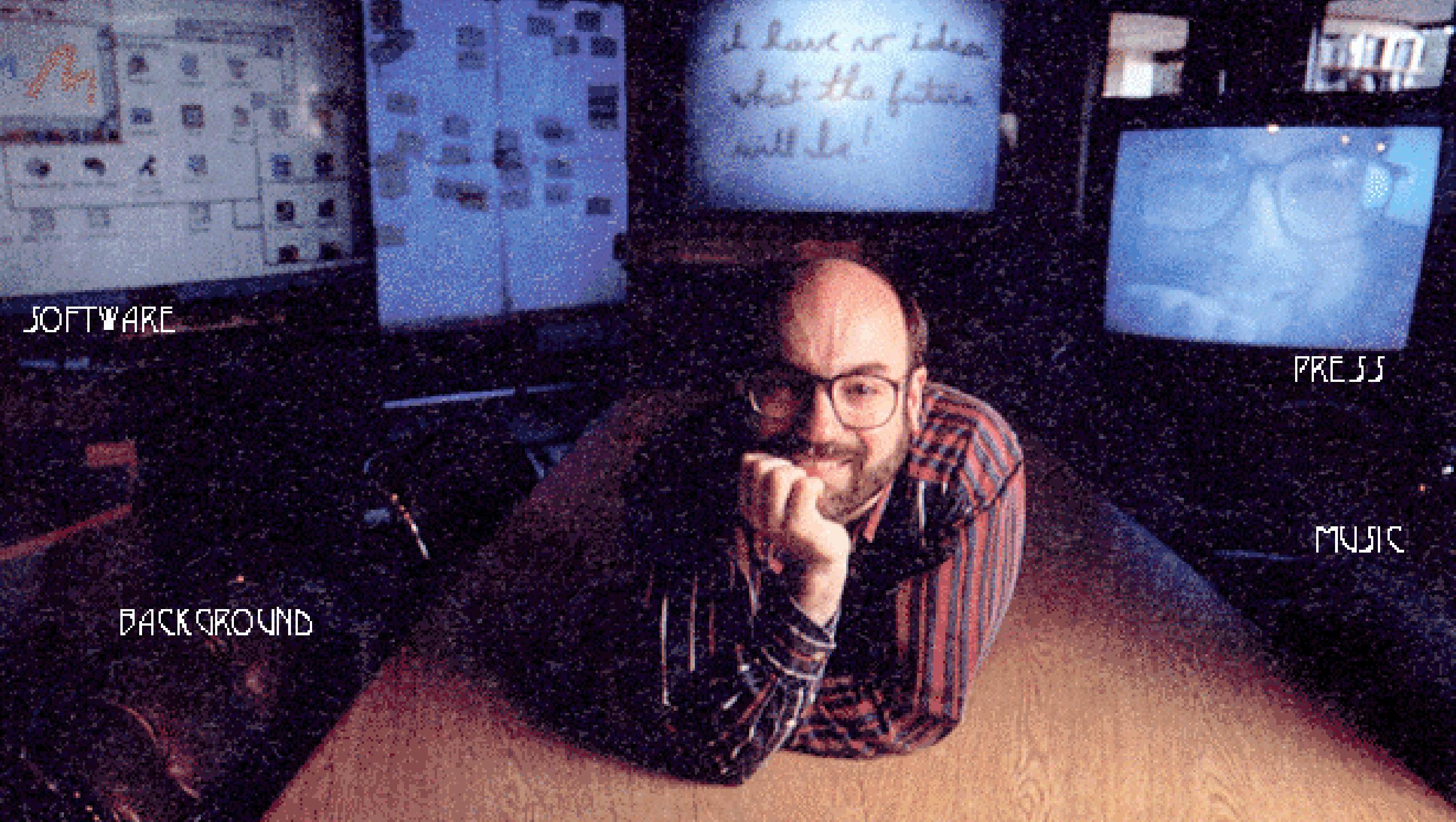
BACKGROUND

SOFTWARE

PRESS

MUSIC



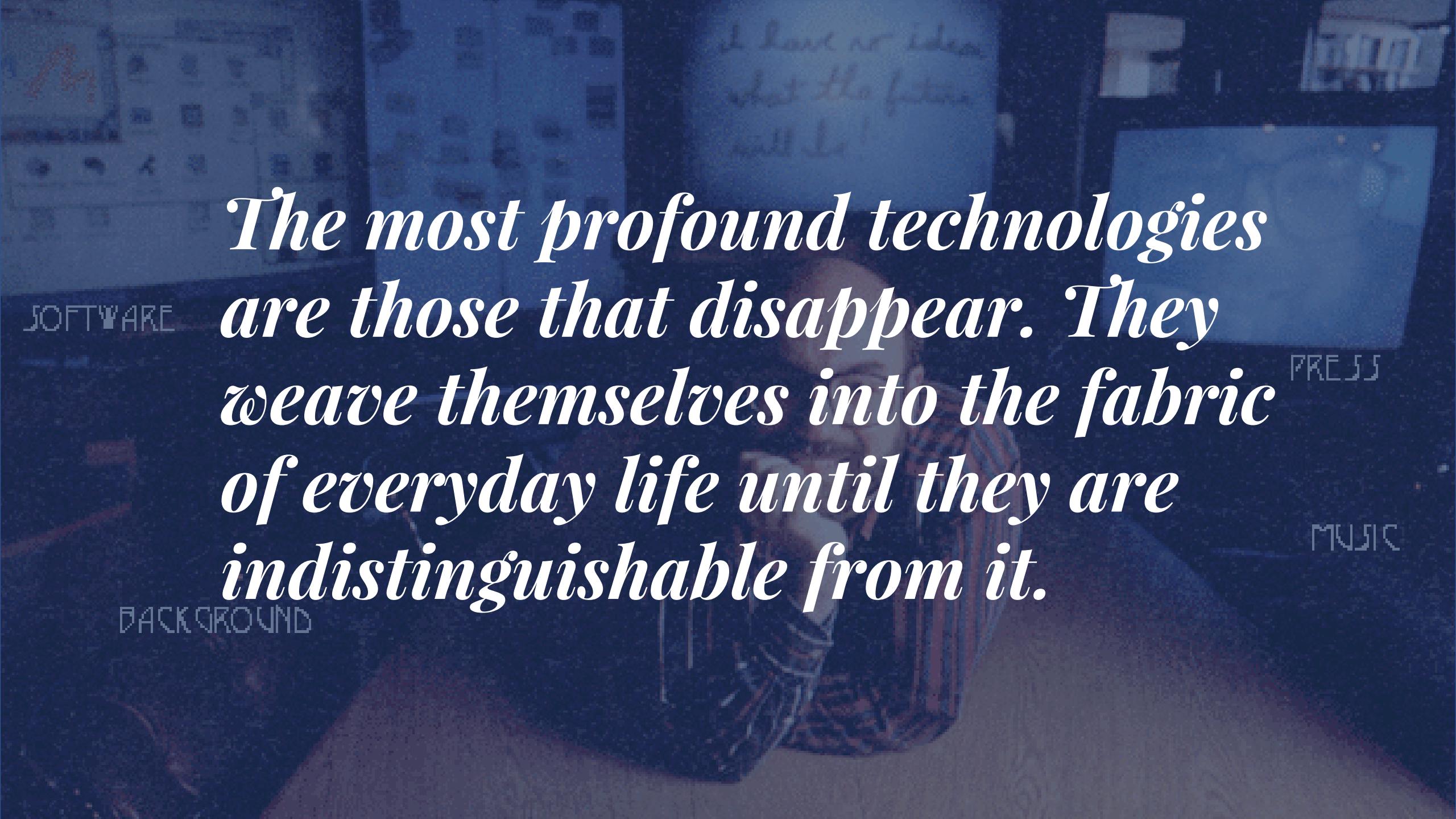


SOFTWARE

PRESS

MUSIC

BACKGROUND



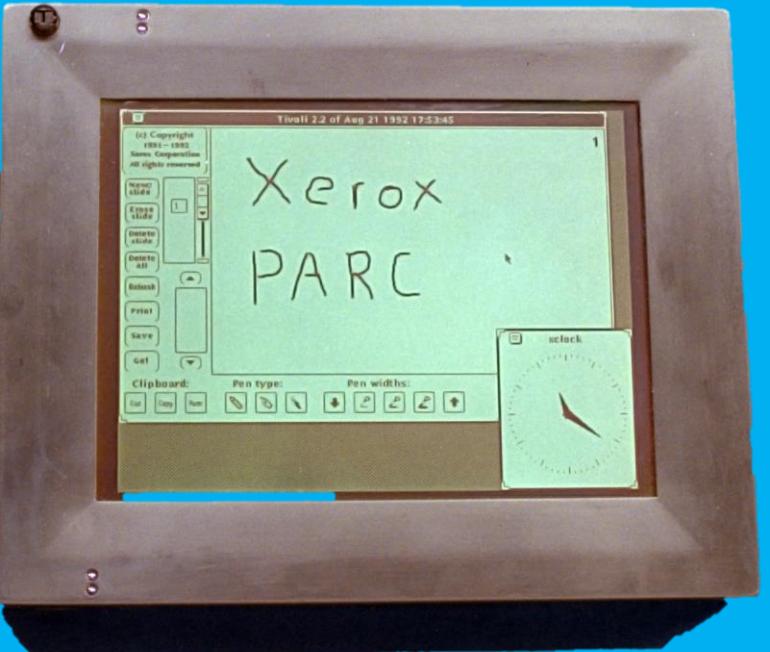
*The most profound technologies  
are those that disappear. They  
weave themselves into the fabric  
of everyday life until they are  
indistinguishable from it.*

SOFTWARE

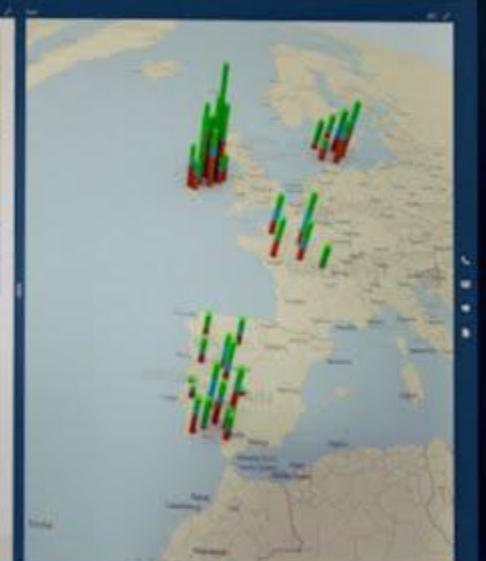
PRESS

BACKGROUND

MUSIC







*Mobile Computing  
goes beyond phones*

TECH INSIDER

# Mark Zuckerberg just signed the death warrant for the smartphone

MATT WEINBERGER

APR 19, 2017, 9:07 AM



FACEBOOK



TWITTER



REDDIT



LINKEDIN



EMAIL



Facebook founder and CEO Mark Zuckerberg. Photo: Justin Sullivan/ Getty Images.

It's no secret that Mark Zuckerberg is pinning Facebook's future prospects on augmented reality — technology that overlays digital imagery onto the real world, like Snapchat's signature camera filters.

At this year's F8 conference, taking place this week, [Zuckerberg doubled down on the company's ambitious 10-year master plan](#), which was first revealed in 2016. On this timeline, Facebook

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This Device Lets You Watch Anything On Your TV

TVFrog



Two Sisters. Two DNA Tests. Two Different Results.

AncestryDNA®

by Taboola ▶

**Business Insider Video**

# COURSE OVERVIEW

# LECTURERS



*Eduardo  
Velloso*



*Anthony  
Quattrone*

# OFFICE HOURS

*Doug McDonell, Room 5.14*

*Thursdays 12-13*

*(immediately after the lecture)*

# WHO AM I?

*Eduardo Velloso*  
*Lecturer@CIS*



# COMPUTER ENGINEERING

*Rio de Janeiro, Brazil*

# PHD COMPUTER SCIENCE

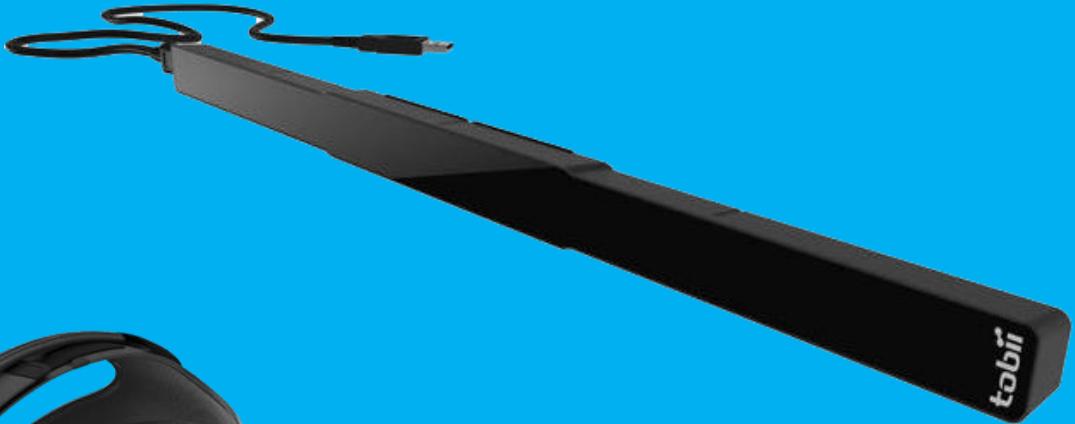
*Lancaster, UK*

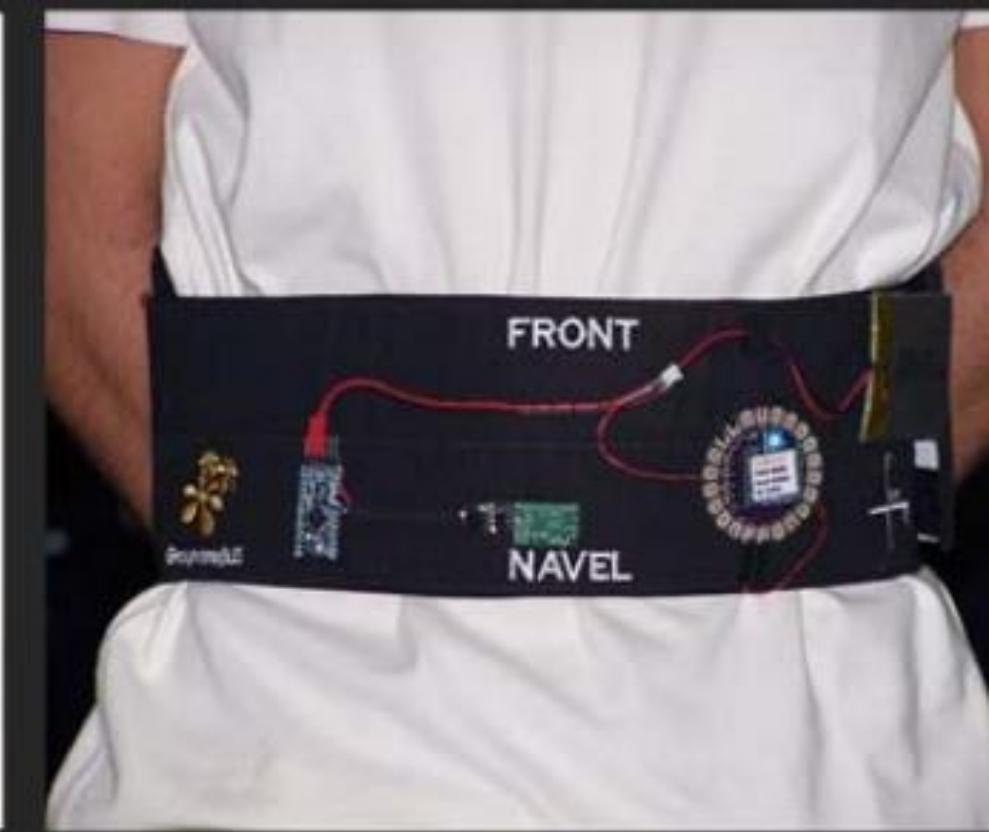
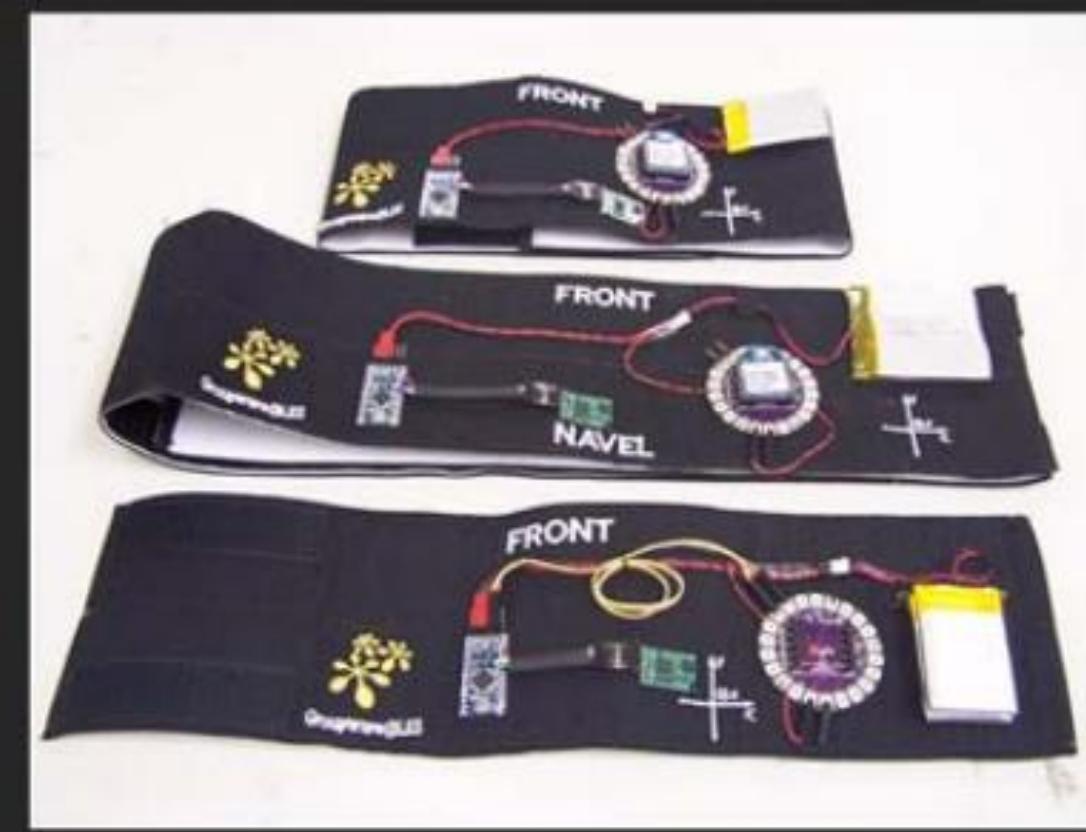


# MICROSOFT SOCIAL NUI RESEARCH FELLOW

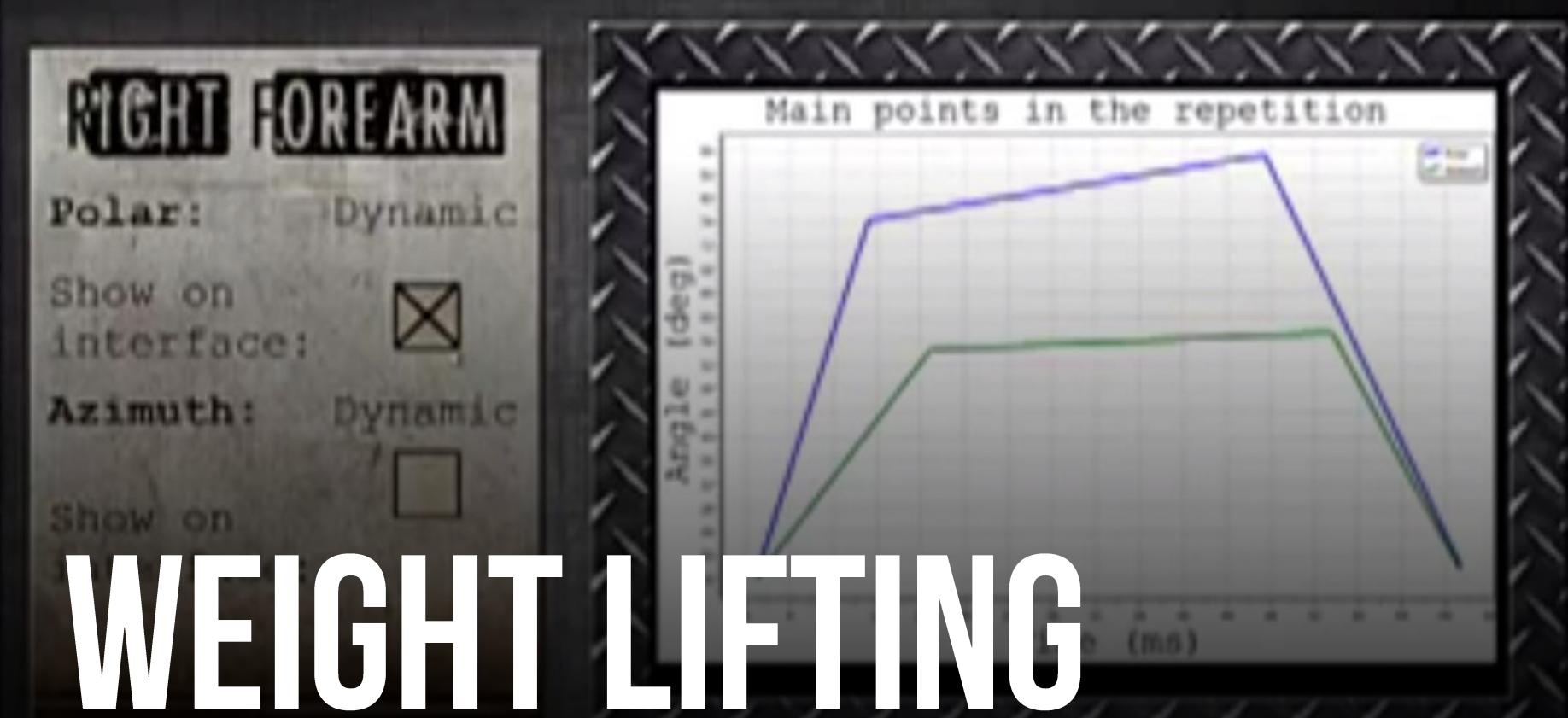
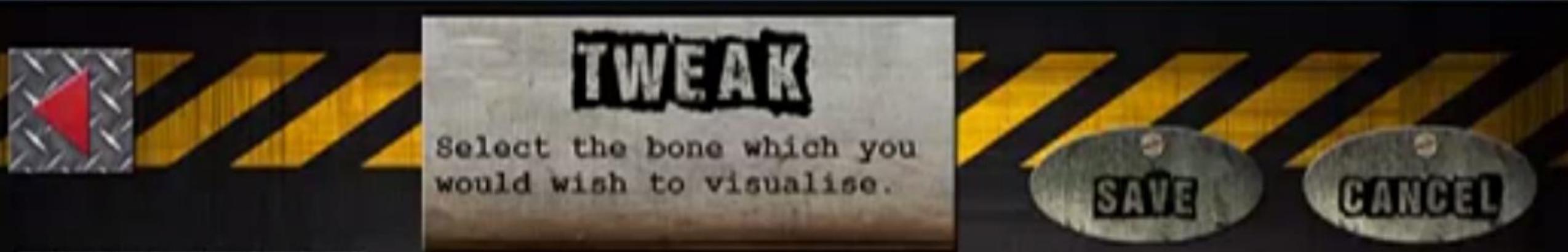
*Melbourne,  
Australia*







# WEARABLE COMPUTING



A close-up photograph of a person's hands interacting with a tablet. The person is using a stylus to draw a simple line-art icon of a hand pointing upwards on the tablet's screen. The tablet is held in landscape mode. The background is blurred, showing what appears to be a wooden surface.

# TOUCH INTERACTION



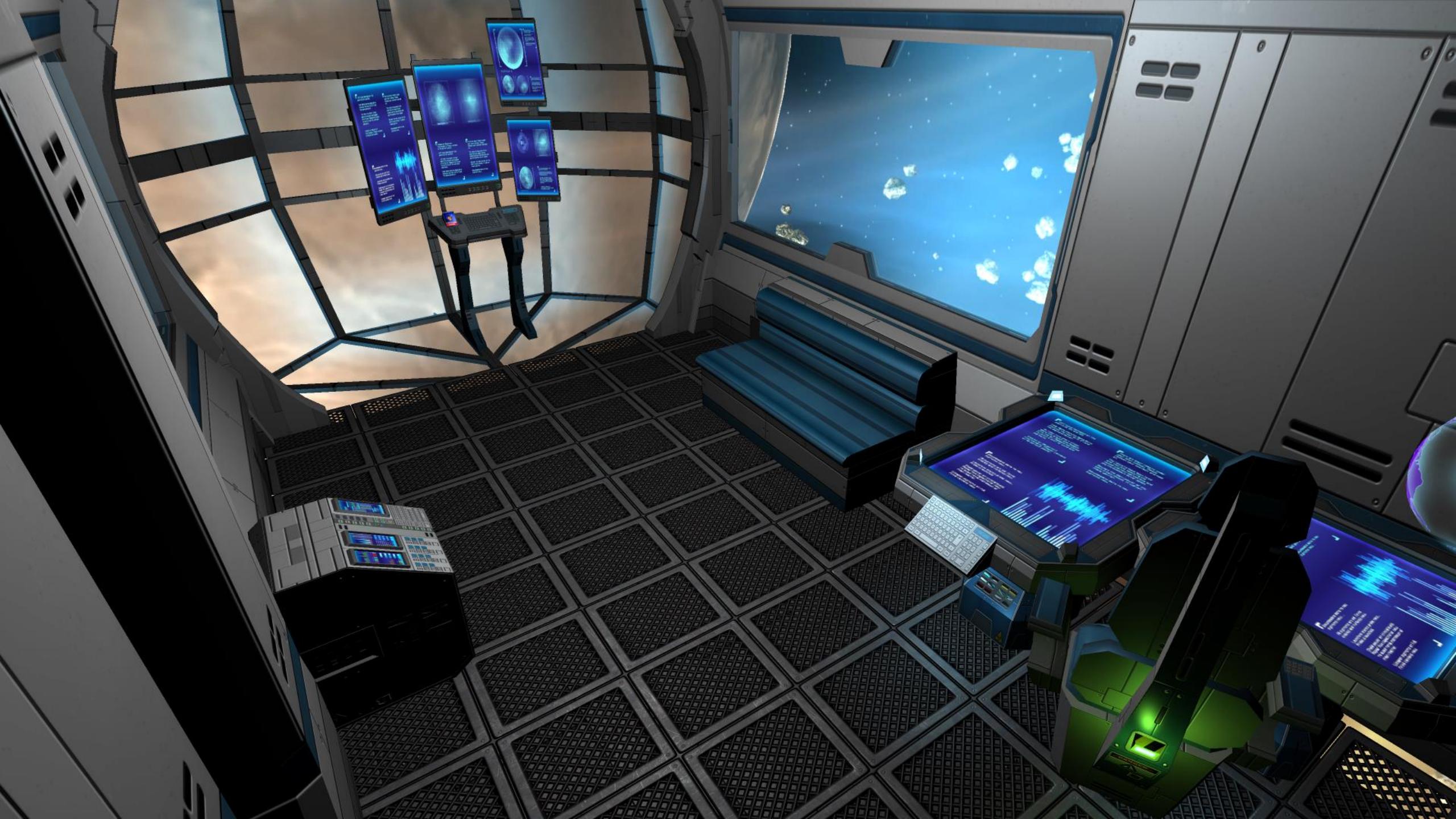
# MID-AIR INTERACTION



# PERVASIVE GAMES



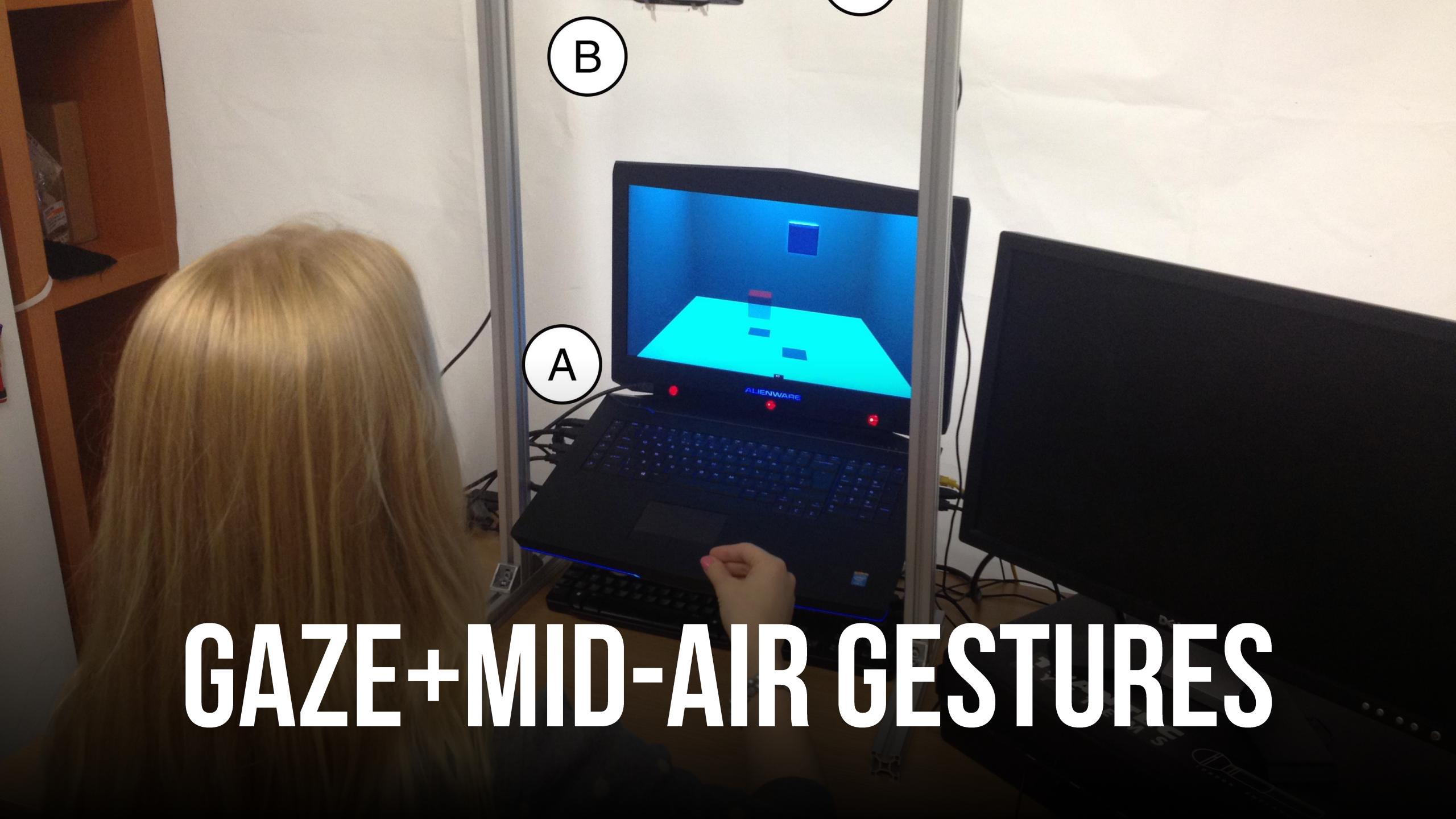




A 3D rendering of a medieval-style courtyard. In the foreground, there's a large wooden barrel on the left containing a green bottle and a small metal cup. To the right, there are several wooden barrels stacked. In the background, there's a stone-paved area with a wooden fence and a forest of tall trees. Several swords are mounted on the wall of a building on the left side of the scene.

**SUBSTITUTIONAL REALITY**

# GAZE+MID-AIR GESTURES

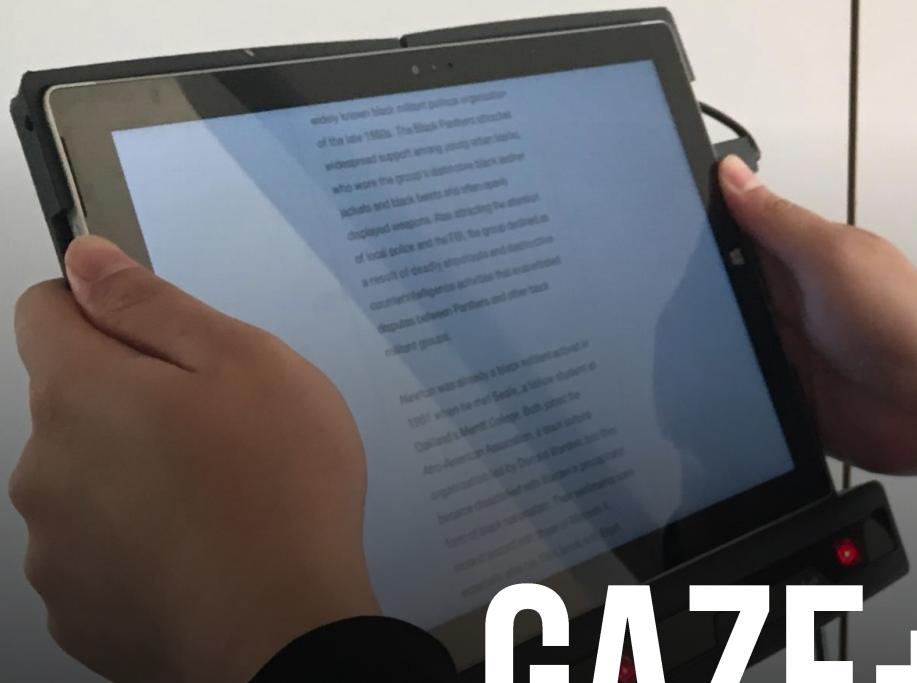


# Arcade+



# GAZE+SMARTWATCHES

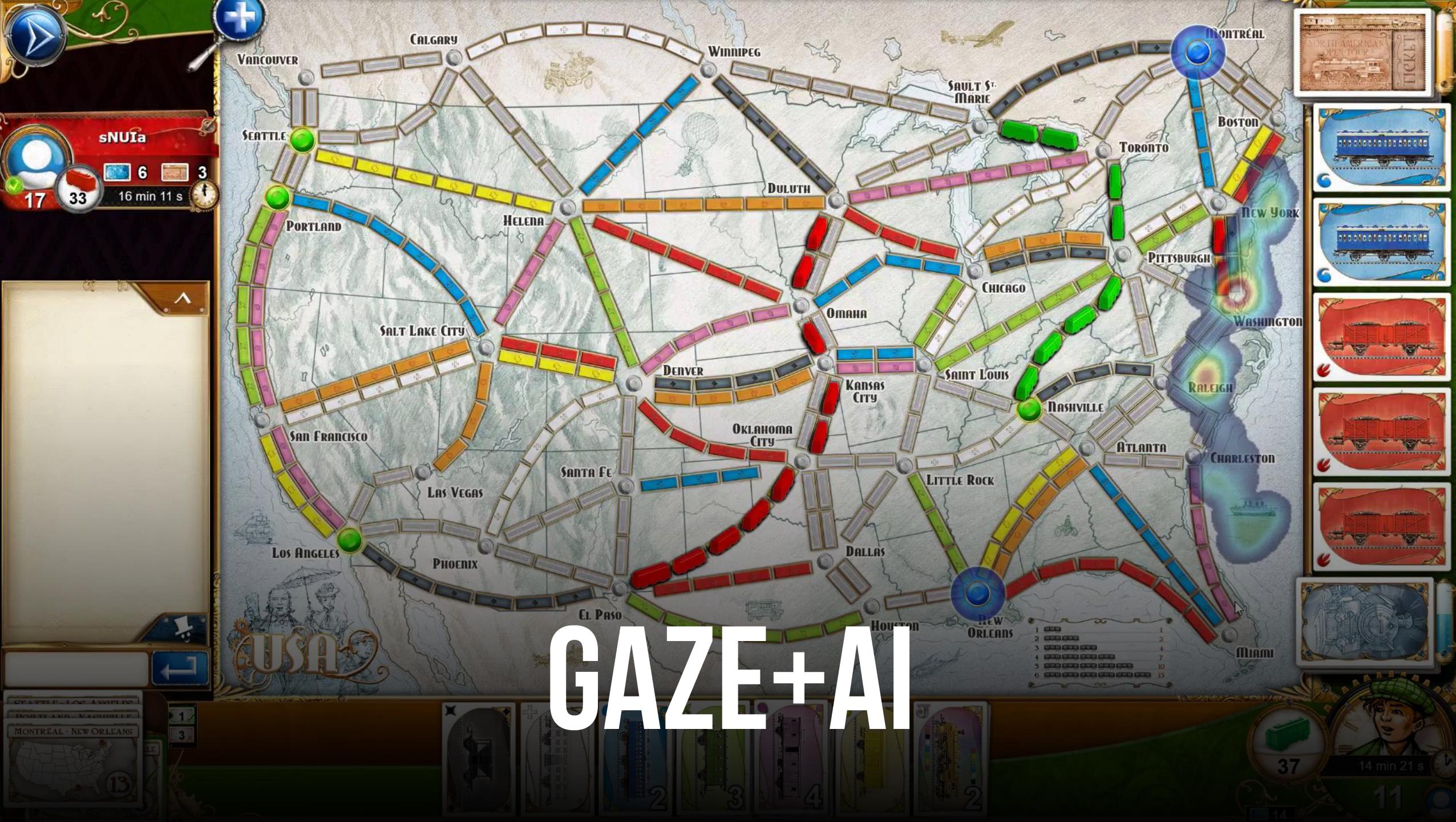




# GAZE+TABLETS



# GAZE+HOLOLENS



# GAZE+AI

*What does this  
mean for you?*

# INTENDED LEARNING OBJECTIVES

1

*Develop a deeper  
understanding of mobile  
systems, their challenges, and  
their programming*

2

*Get hands-on experience on  
programming applications for  
mobile devices that includes the  
integration of sensed information*

# 3

*Learn to work in  
small effective  
teams*

# 4

*Discuss and present new mobile research topics and technologies in oral and written form*

**POLL TIME!**

# YOU SHOULD NOT BE HERE IF:

*You expect an easy, lightweight course*

*“I felt that we had an awful lot to do in not a lot of time.”*

*“This subject has felt like a full time job, the project is too big.”*

# YOU SHOULD NOT BE HERE IF:

*You expect an easy, lightweight course*  
*You are not a self-driven learner*

*“I felt like I had to learn most of  
the content independently.”*

*“often it felt a lot of the code based  
content had to self-taught”*

# **YOU SHOULD NOT BE HERE IF:**

*You expect an easy, lightweight course*

*You are not a self-driven learner*

*You are not in your last year*

*Expect to be spoon-fed bullet points*





*“None of my group m8s and my tutorial m8s agree with ur slides style!!!”*

*“We pay our fees and expect to get slides filled with actual content instead of 1 or 2 useless icons that don't tell anything.”*

*“Eduardo's lectures were great, probably the best lecture set I've seen.*

*I really liked the lecture slides, and the fact they didn't have much on them meant you actually had to listen and take notes, which is much better than mindlessly copy bullet points from a list on a slide.*

*All lectures should really be set out like Eduardo's - it's a much better way to learn content when you actually engage with it.”*

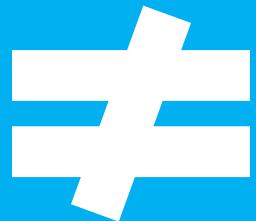
*“I thought your slides were crap as you didn’t list all the points like Mitchell did in 2016. So I kept criticising about you in front of my friends haha.”*

*But then I found out that this is how it’s supposed to be like when studying at uni. The slides were made for understanding, not plain memorisation through reading.*

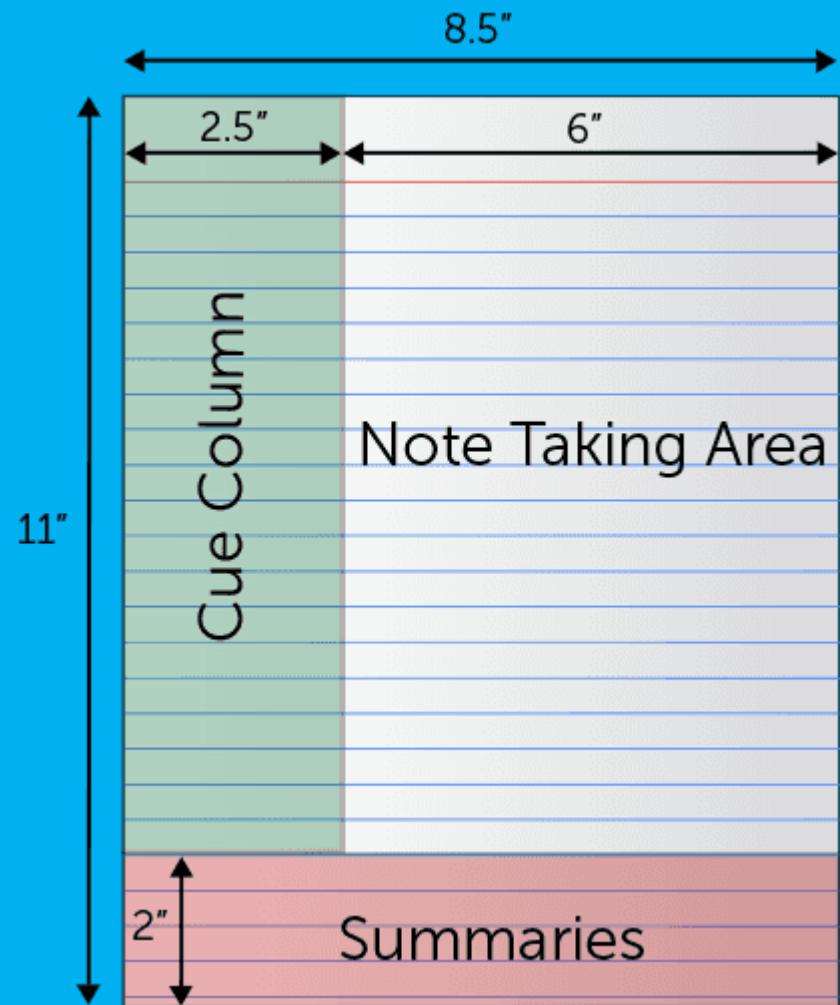
*Maybe a lot of people like me cannot get used to that upfront, but they will gradually understand how helpful this is.*

*Thank you, and keep that s\*\*t up*

LECTURE SLIDES

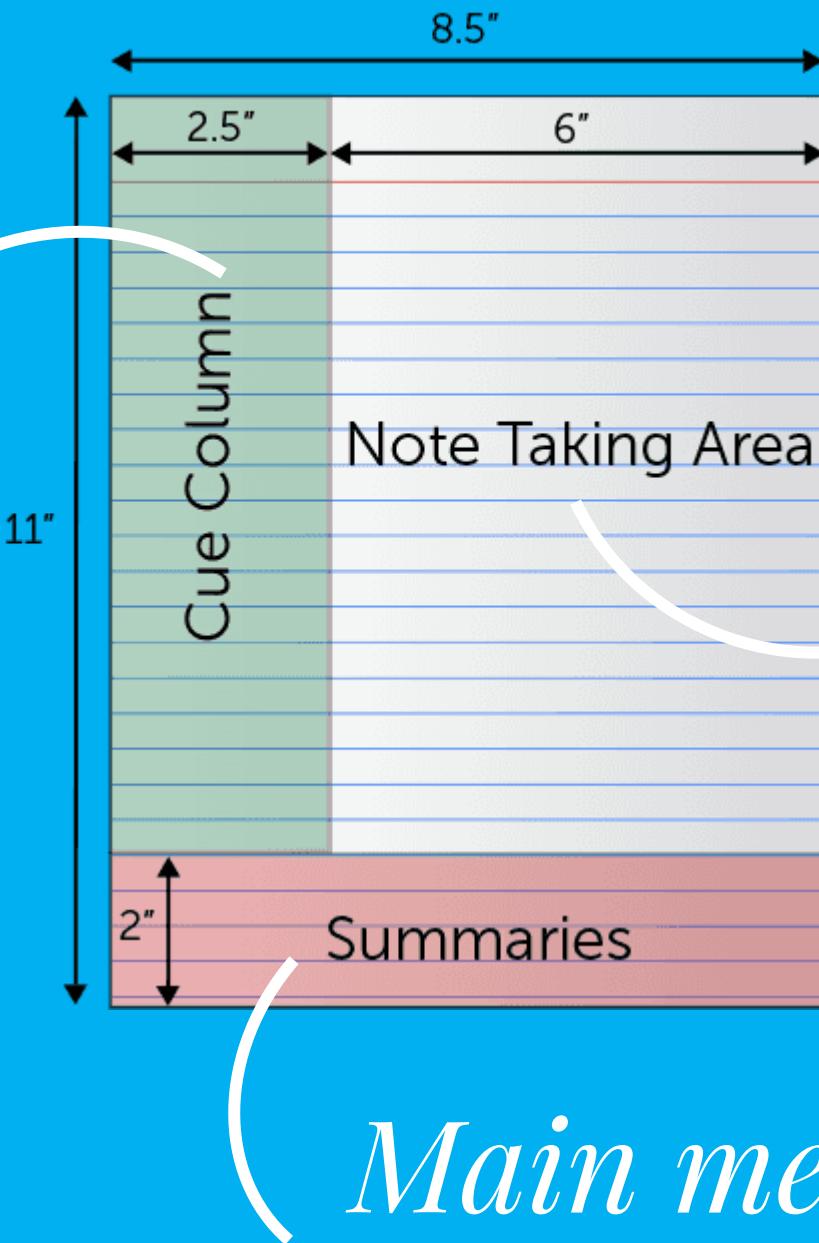


LECTURE NOTES



# CORNELL NOTES

*Questions  
Keywords  
Prompts*



*Ideas  
Concepts  
Paraphrasing  
Diagrams*

*Main messages  
Re-structured content*

# **YOU SHOULD NOT BE HERE IF:**

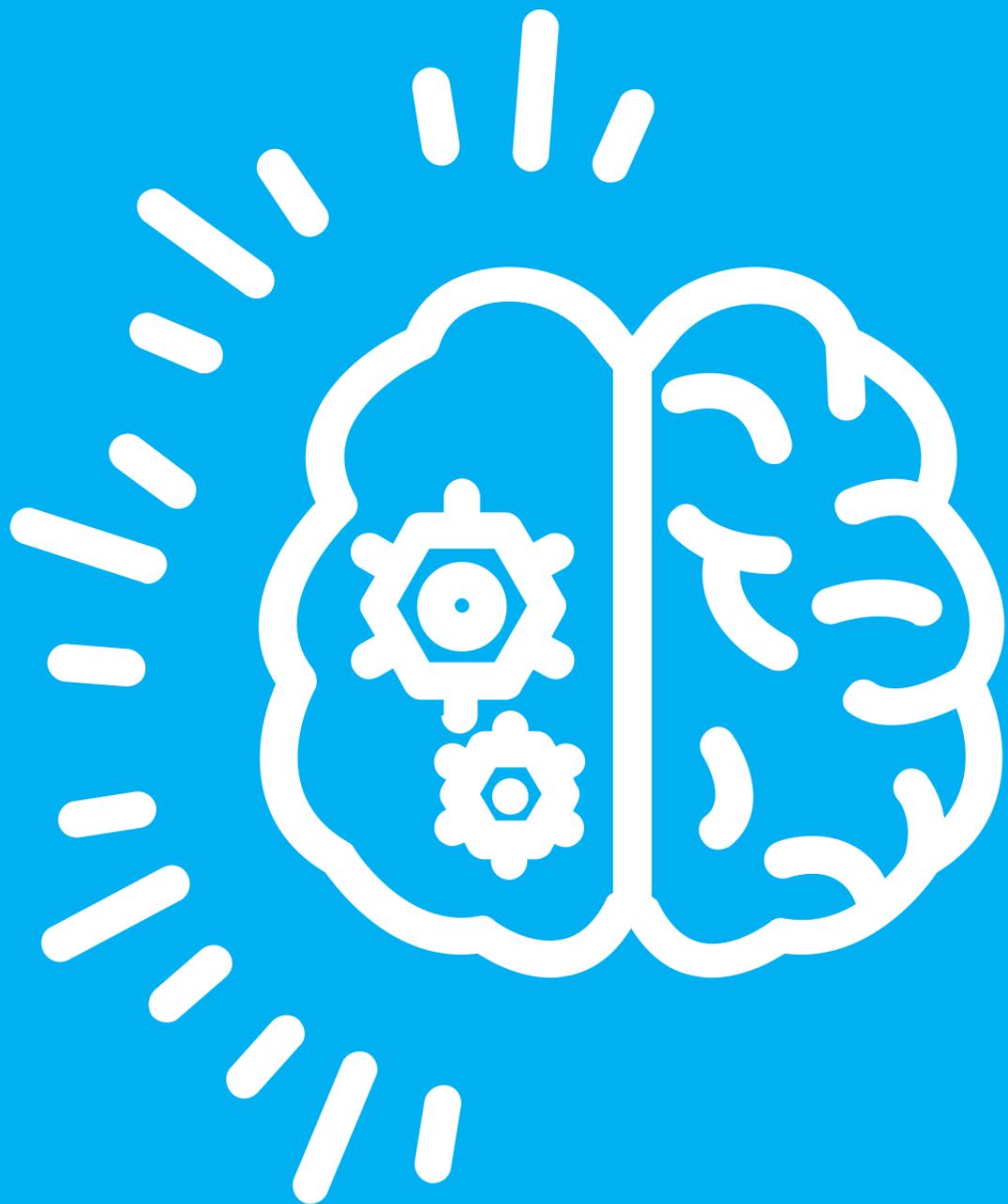
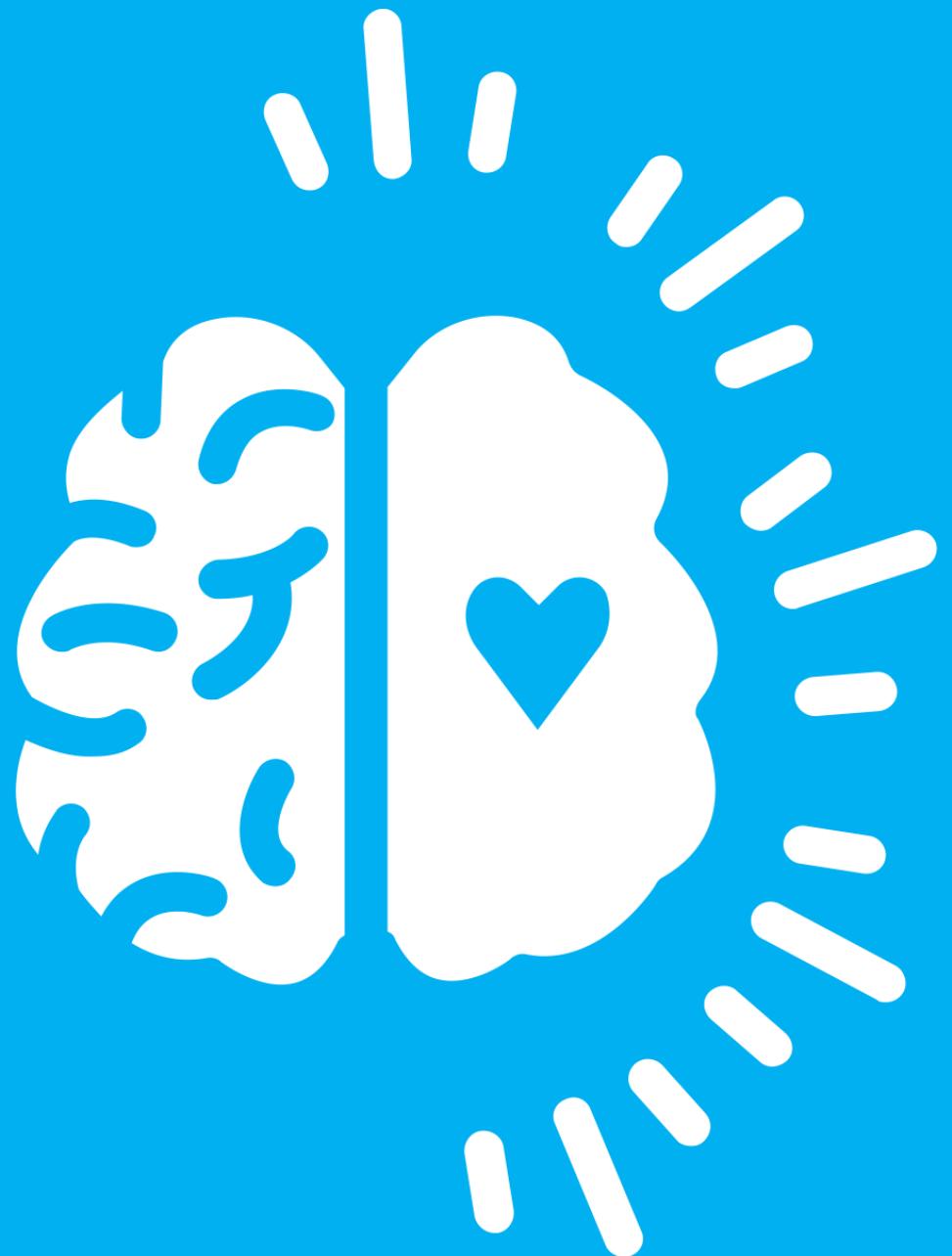
*You expect an easy, lightweight course*

*You are not a self-driven learner*

*You are not in your last year*

*Expect to be spoon-fed bullet points*

*You want a fully technical course*





# TRADITIONAL CLASS

*Class: Exposure to the material*

*Home: Practice, reinforcement*

# FLIPPED CLASS

*Home: Exposure to the material*

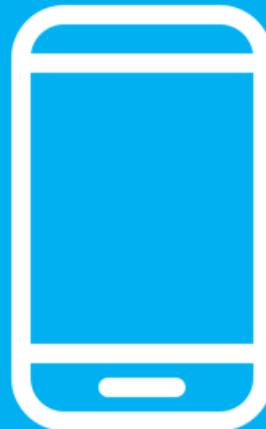
*Class: Practice, reinforcement*

**ATTENDANCE  
IS CRUCIAL**

# COURSE STRUCTURE

# W1

## *Introduction & Course Overview*



# W2

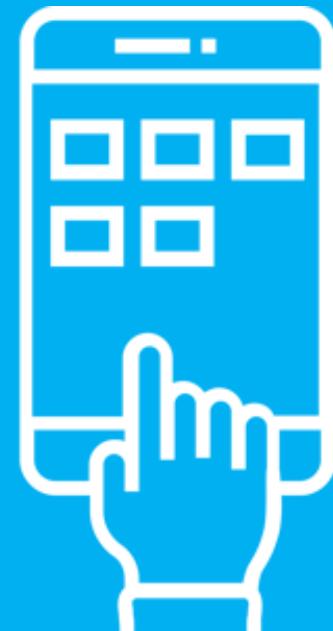
*User Experience  
Research*





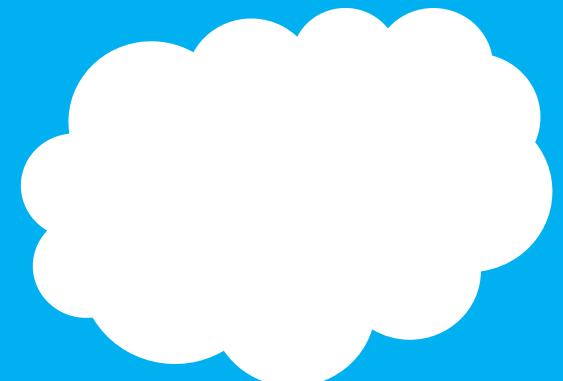
# W3

*Mobile Interaction  
Design*



# W4

*Cloud Tools  
for Mobile*

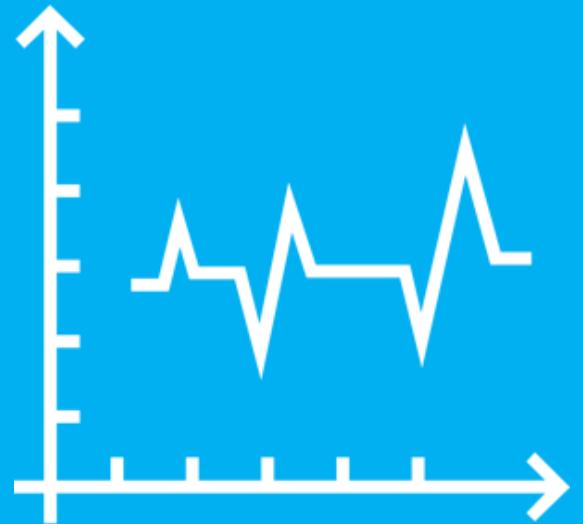




Microsoft  
Azure

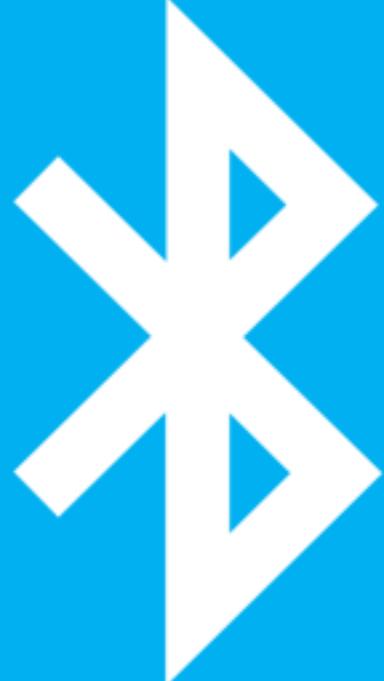
# W5

## *Data Processing Techniques*



# W6

*Bluetooth &  
ZigBee*

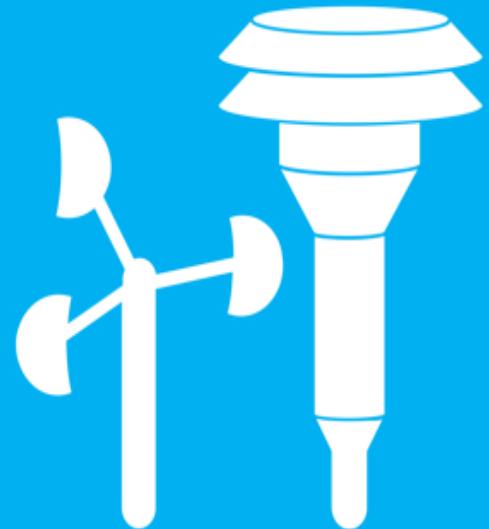


# W7 *RFID*



# W8

# *Wireless Sensor Networks*



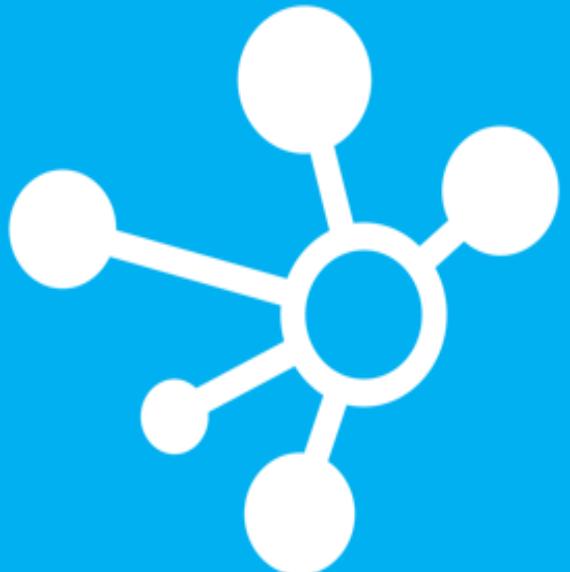
# W9

*Security &  
Location  
Privacy*



# W10

## *Routing*



# W11

*Projects  
Showcase*





iag

# W12

*Future  
Directions  
& Conclusion*



*But when do we actually  
learn how to program  
the apps?*

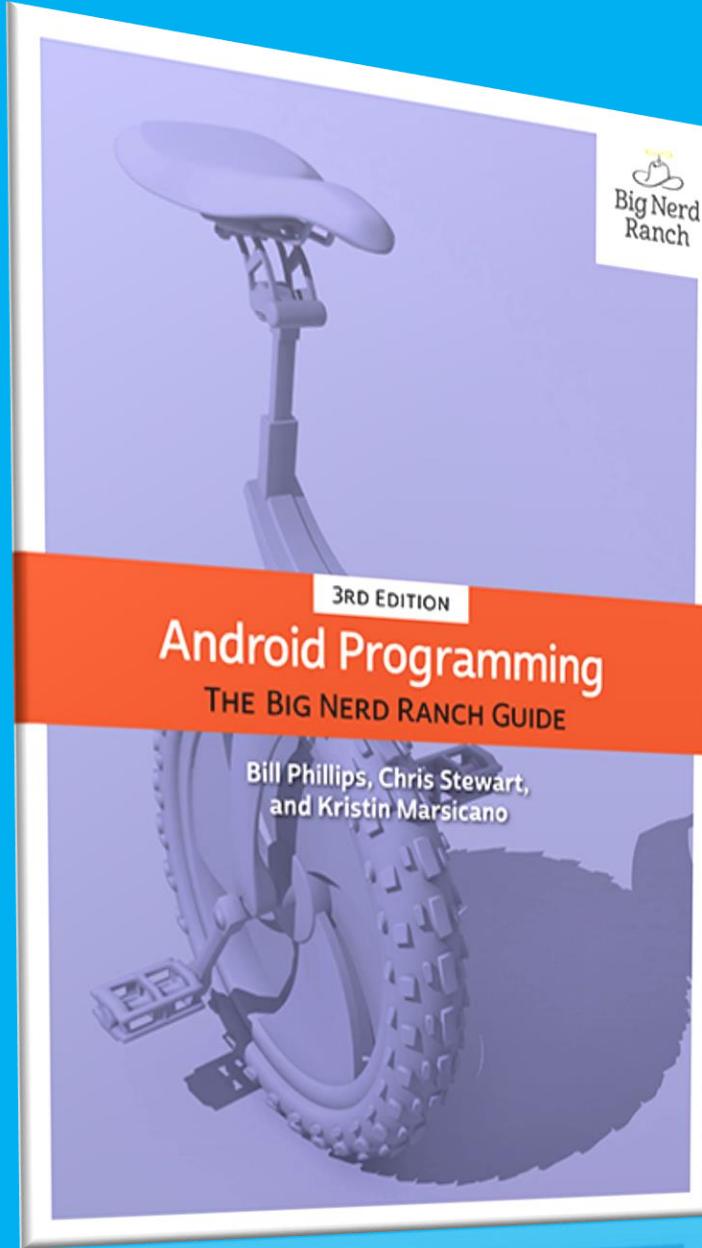
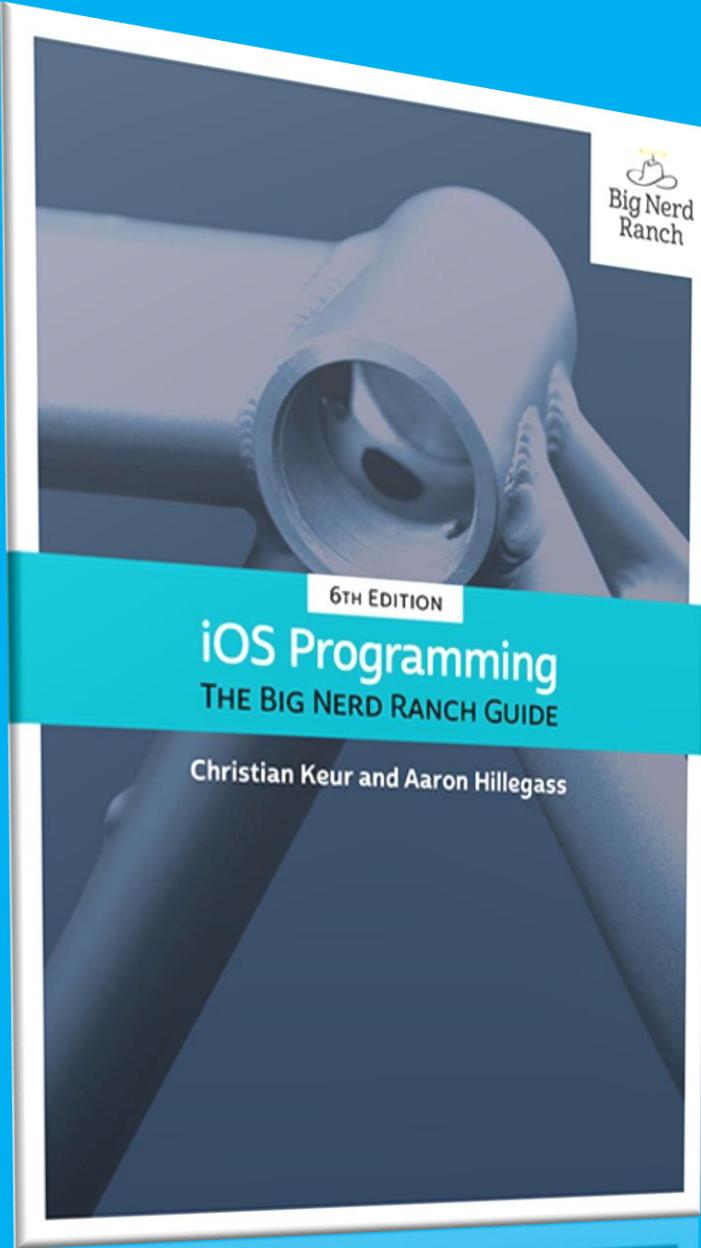
# TUTORIALS

*iOS*

*Meng Yang  
Martin Reinoso*

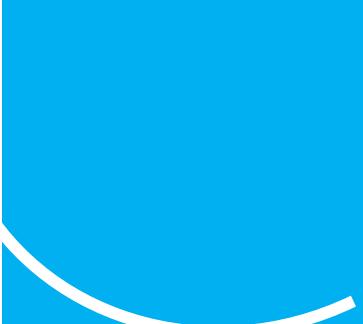
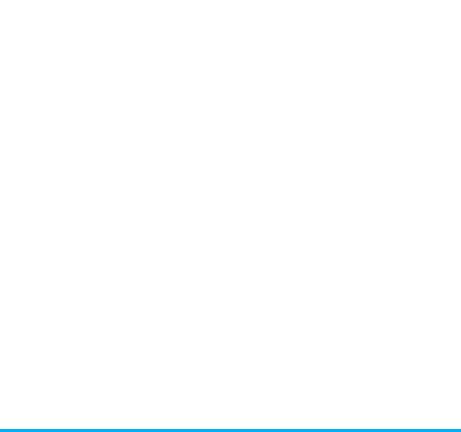
*Android*

*Chu Luo  
Eman Bin Khunayn*



# ASSESSMENT



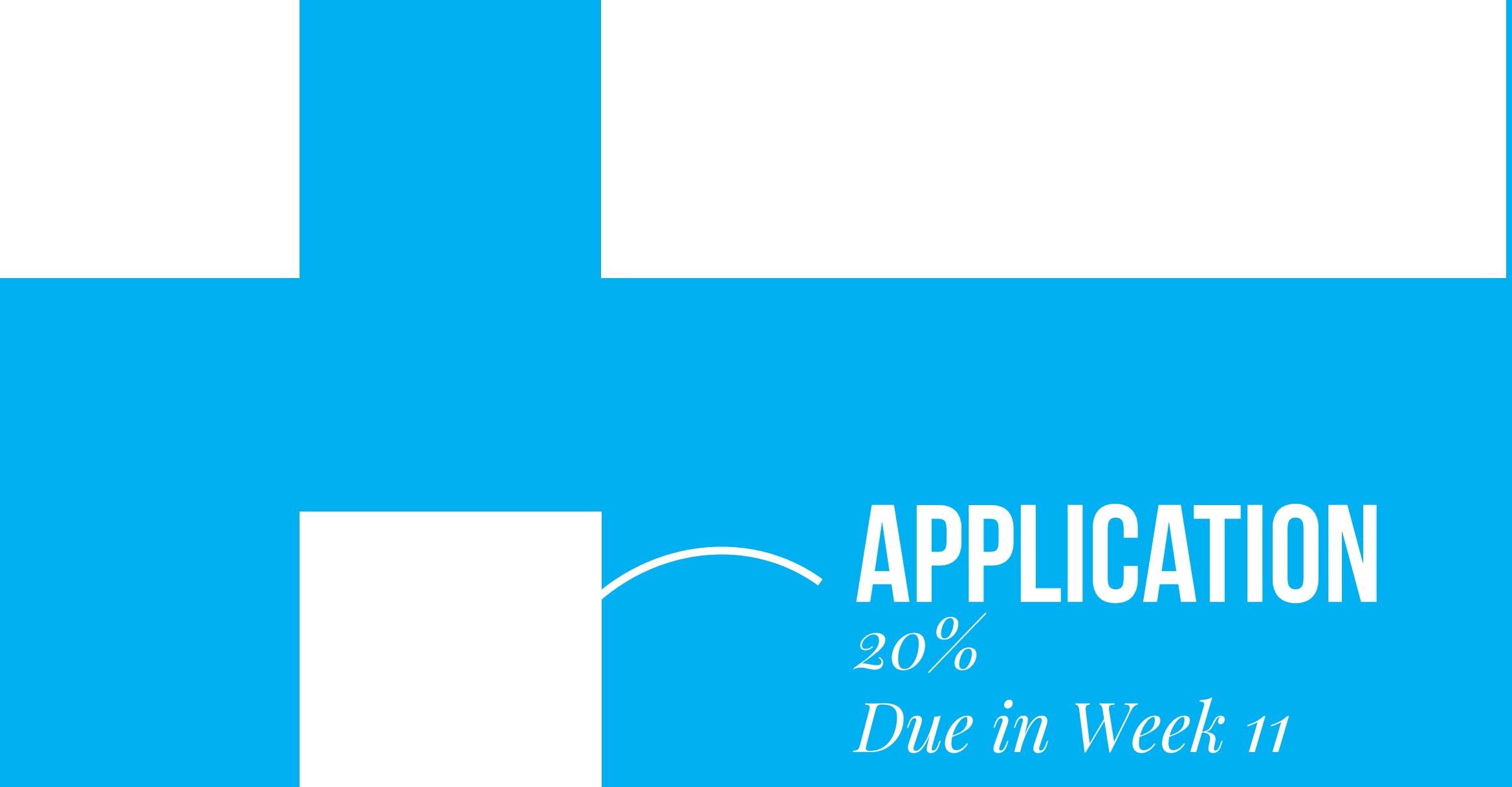


# DESIGN FICTION

*20%*

*Due in Week 6*



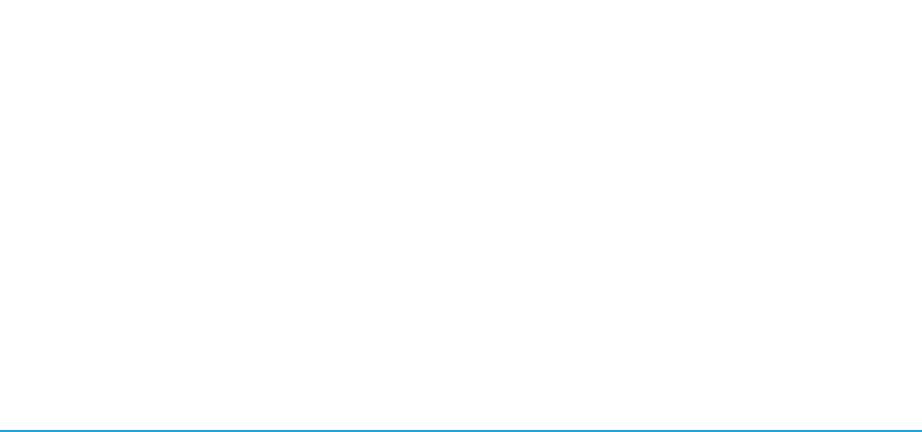


# APPLICATION

20%

*Due in Week 11*

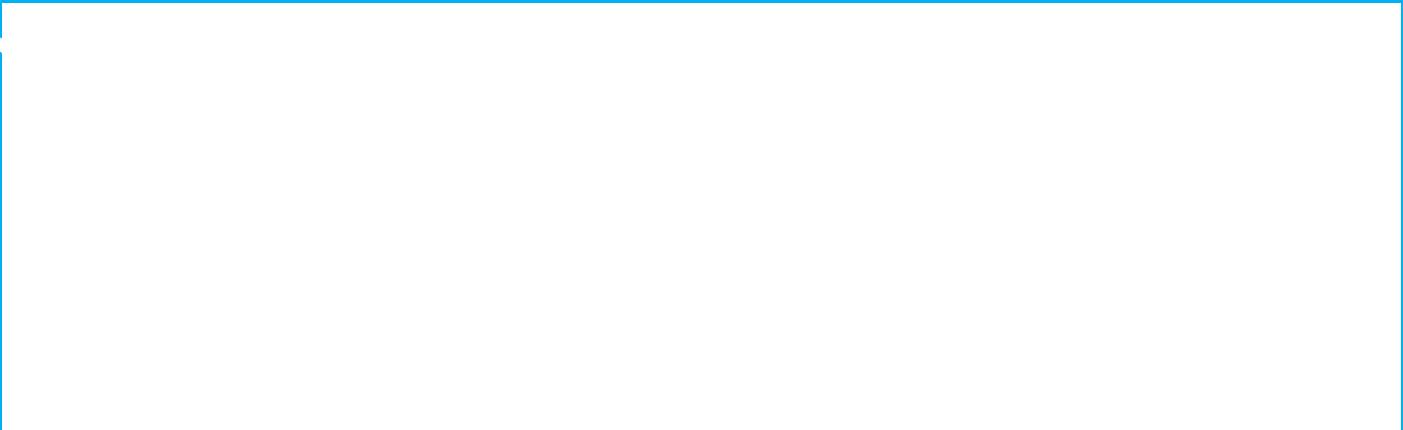




**EXAM**

60%

*End of semester*



# THE BRIEF

*Enabling active  
decision-making  
for a safer future*

# DESIGN FICTION

*The deliberate use of diegetic  
prototypes to suspend disbelief  
about change*

# DESIGN FICTION

- (1) *Something that creates a story world*
- (2) *Has something prototyped in that story world*
- (3) *Does so in order to create a discursive space*







# Pushing the Limits of Design Fiction: The Case For Fictional Research Papers

**Joseph Lindley**

HighWire CDT

Lancaster University

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## ABSTRACT

This paper considers how design fictions in the form of ‘imaginary abstracts’ can be extended into complete ‘fictional papers’. Imaginary abstracts are a type of design fiction that are usually included within the content of ‘real’ research papers, they comprise brief accounts of fictional problem frames, prototypes, user studies and findings. Design fiction abstracts have been proposed as a means to move beyond solutionism to explore the potential societal value and consequences of new HCI concepts. In this paper we contrast the properties of imaginary abstracts, with the properties of a published paper that presents fictional research, *Game of Drones*. Extending the notion of imaginary abstracts so that rather than including fictional within a ‘non-fiction’ research paper, *Game of*

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Sterling said that it was Julian Bleecker who “invented the interesting term” [44]. In Shaping Things, design fiction is introduced as Sterling’s way of delineating between science fiction’s “hand-waving hocus-pocus” and a style of writing that “makes more sense on the page” [42]. Design fiction is a relative of science fiction, however its intention and purpose go beyond the cultural and entertainment purposes of science fiction, “it sacrifices some sense of the miraculous, but it moves much closer to the glowing heat of technosocial conflict” (*ibid*).

In 2012, Sterling offered this concise definition of what design fiction is and what it tries to achieve: “the deliberate use of diegetic prototypes to suspend disbelief about change” [43]. Lindley and Coulton reflect on Sterling’s definition as it relates to HCI research and distil the definition to ‘something that creates a story world’ and then ‘something within that story world’ [30]. They

# Game of Drones

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## Abstract

In response to the recent European Directive the UK government sanctioned the use of drones by commercial providers subject to pilots holding an approved Drone Pilot Proficiency Certificate (DPPC). As the government anticipated the main use has been in providing services to local authorities that aid in the enforcement of local by-laws. Whilst many commercial providers have followed the traditional path of employing dedicated enforcement officers to pilot the drones, in this paper we present on-going research that 'gamifies' the enforcement activities to allow members of the local community to act as enforcement officers. In particular we have worked with retired members of the police and armed services as drone pilots in relation to the enforcement of by-laws relating to parking offences and dog fouling in a small UK city. The initial results indicate that not only does this age group find the game-like activity enjoyable they feel that they are providing an important service to their community.

## Author Keywords

Game design; privacy; drones; playbour; design fiction.

## ACM Classification Keywords

1.2.9. Robotics: Operator Interfaces.

## Introduction

While they were once the exclusive preserve of the military the adoption of Unmanned Aerial Vehicles

## **Conclusions**

The research in this paper and the associated artifacts are part of a design fiction [5]. Therefore, whilst this paper presents a fictional account of plausible future HCI research its purpose is not *only* to highlight potential usability or utility issues such systems might present but to also create a discursive space in which researchers can consider the wider societal and ethical issues of technological futures in which drones might be widely adopted. In future publications we will consider the effectiveness of this design fiction in addressing such challenges and design fiction more generally as a

# DESIGN FICTION

*3000-word fictional research paper*

*10-minute video presentation*

*Individual peer assessment*

*Monday, week 6, 10am*

# APPLICATION

*3-minute video demonstration*

*GitHub repository*

*Individual peer assessment*

*Monday, Week 11, 10am*

*Best project prize!!!*

*Don't wait until week 6 to start!*

# PEER ASSESSMENT



*John*



*Ana*



*Li*

# PEER ASSESSMENT

	JOHN	ANA	LI
JOHN			
ANA			
LI			

80

# PEER ASSESSMENT

	JOHN	ANA	LI
JOHN			
ANA			
LI			

40

40

# PEER ASSESSMENT

	JOHN	ANA	LI
JOHN	30		
ANA	40		
LI	30		

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# PEER ASSESSMENT

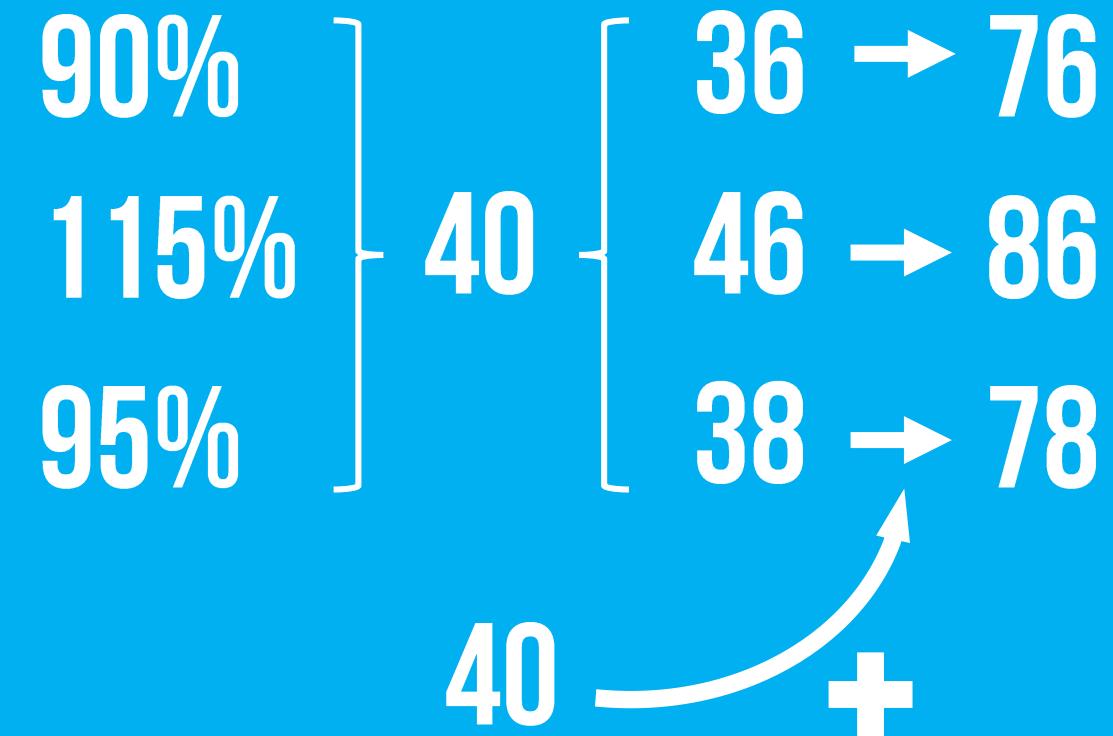
	JOHN	ANA	LI
JOHN	30	30	
ANA	40	35	
LI	30	35	

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40

# PEER ASSESSMENT

	JOHN	ANA	LI
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ANA	40	35	40
LI	30	35	30



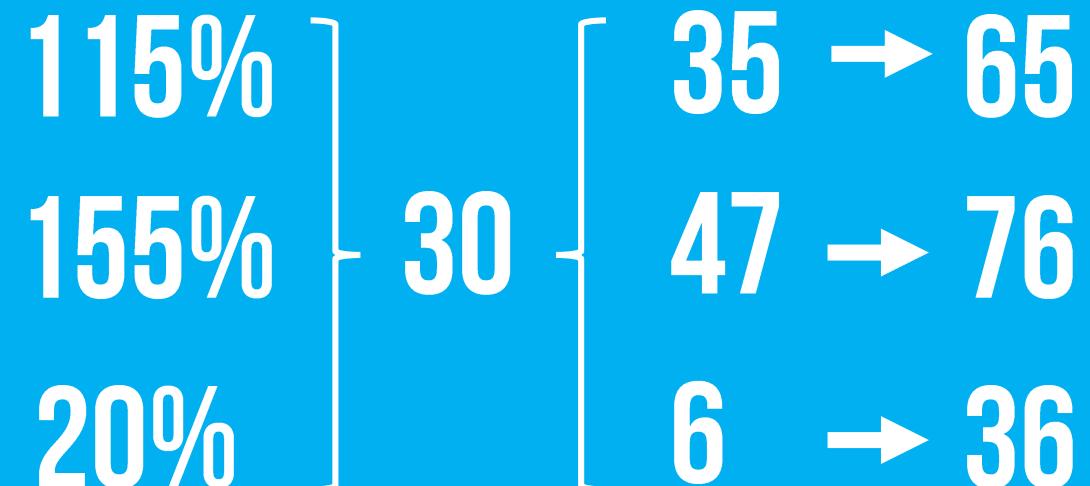
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JOHN	30	40	45
ANA	60	50	45
LI	10	0	10

60

# PEER ASSESSMENT

	JOHN	ANA	LI
JOHN	30	40	45
ANA	60	50	45
LI	10	0	10



# TAKE HOME MESSAGES

*Mobile computing has  
changed our way of life*

*It is a much broader concept  
than building phone apps*

# TAKE HOME MESSAGES

*It requires a different way of  
thinking about building systems*

*The subject will be FUN; but  
will require A LOT OF  
WORK!*