



# Human Computer Interaction

## Chapter 10: Wearable Technology

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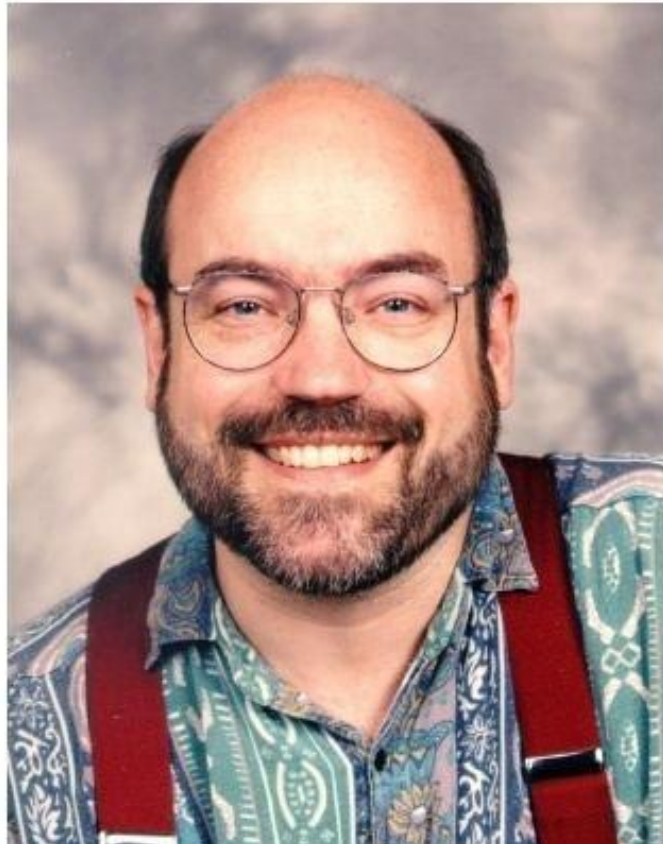
## 07 References



Machine Learning and Data Analytics Lab (MaD) in Erlangen



# Introduction



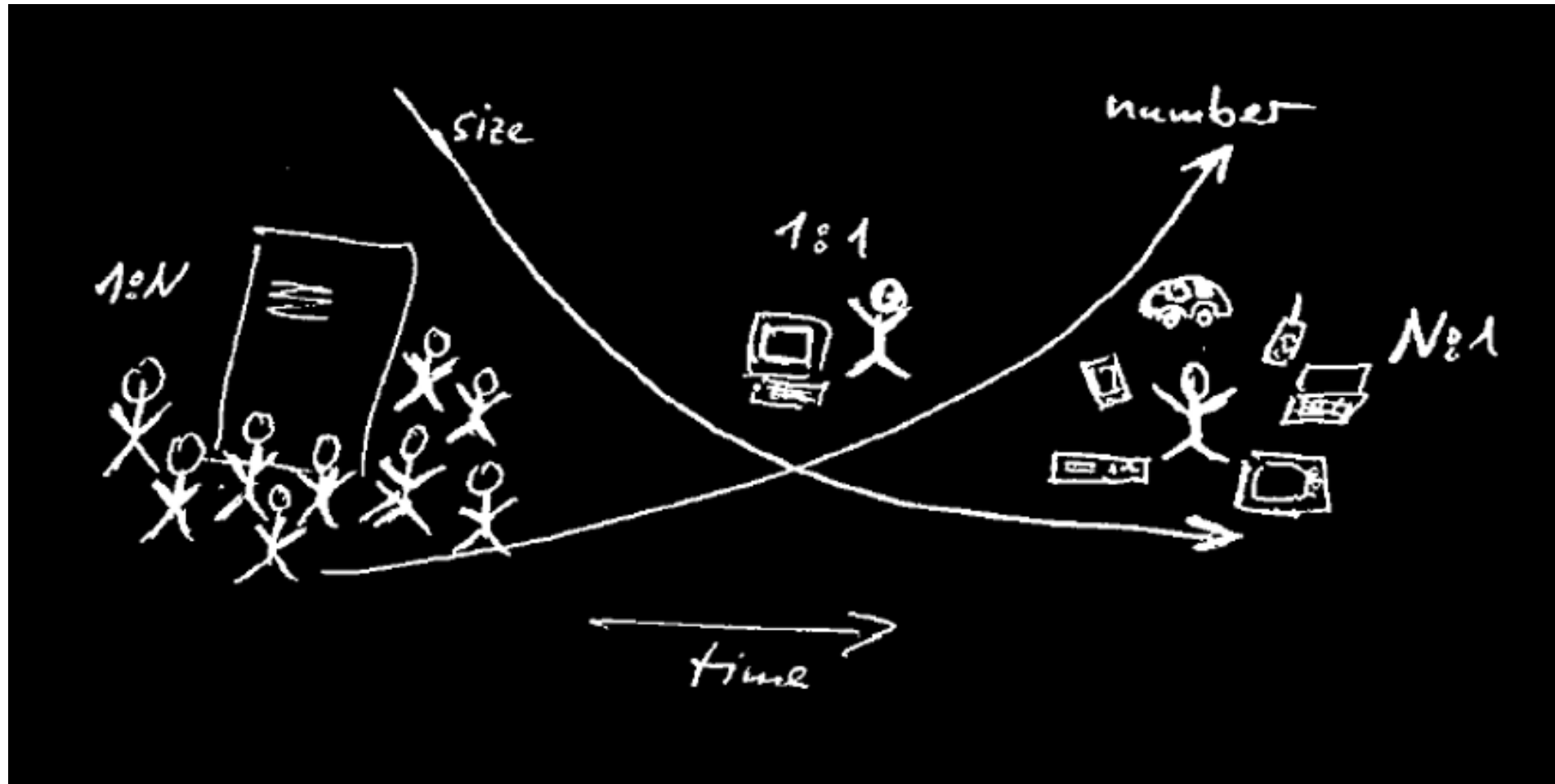
Mark Weiser  
(1952 - 1999)

Mark Weiser. The computer for the 21st century. Scientific American 265, 3

(January 1991).

*"... weave themselves into the fabric of everyday life until they are indistinguishable from it."*





A Computer on the body that is:



Always on



Always accessible



Always connected

*always on  
always accessible  
always connected.*



Steve Mann  
PHOTO: RYAN ENN HUGHES

Which wearable devices do you know, and which ones do you wear?



A Computer on the body that is:



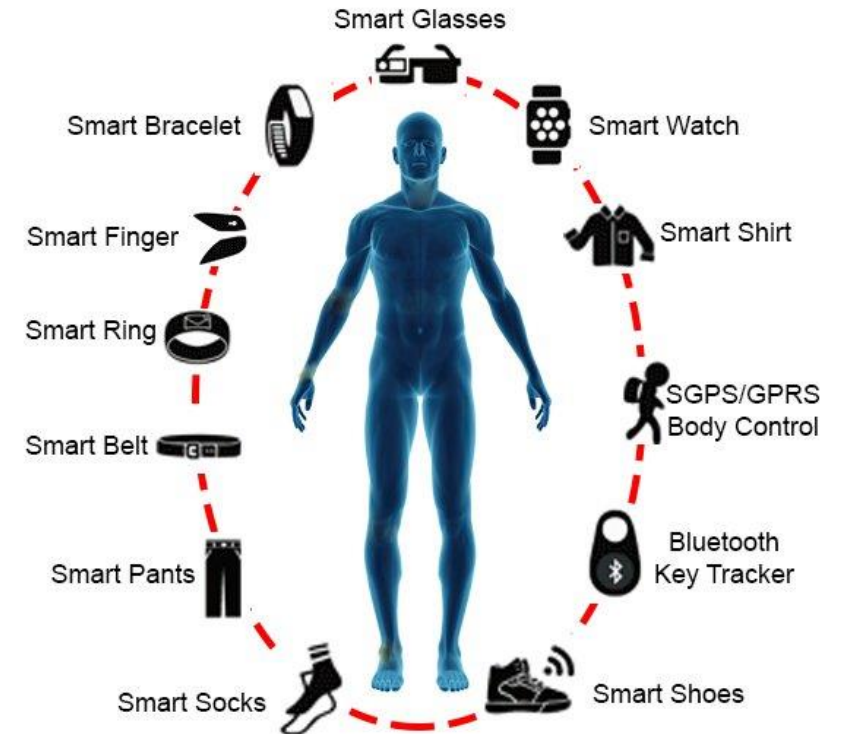
Always on



Always accessible

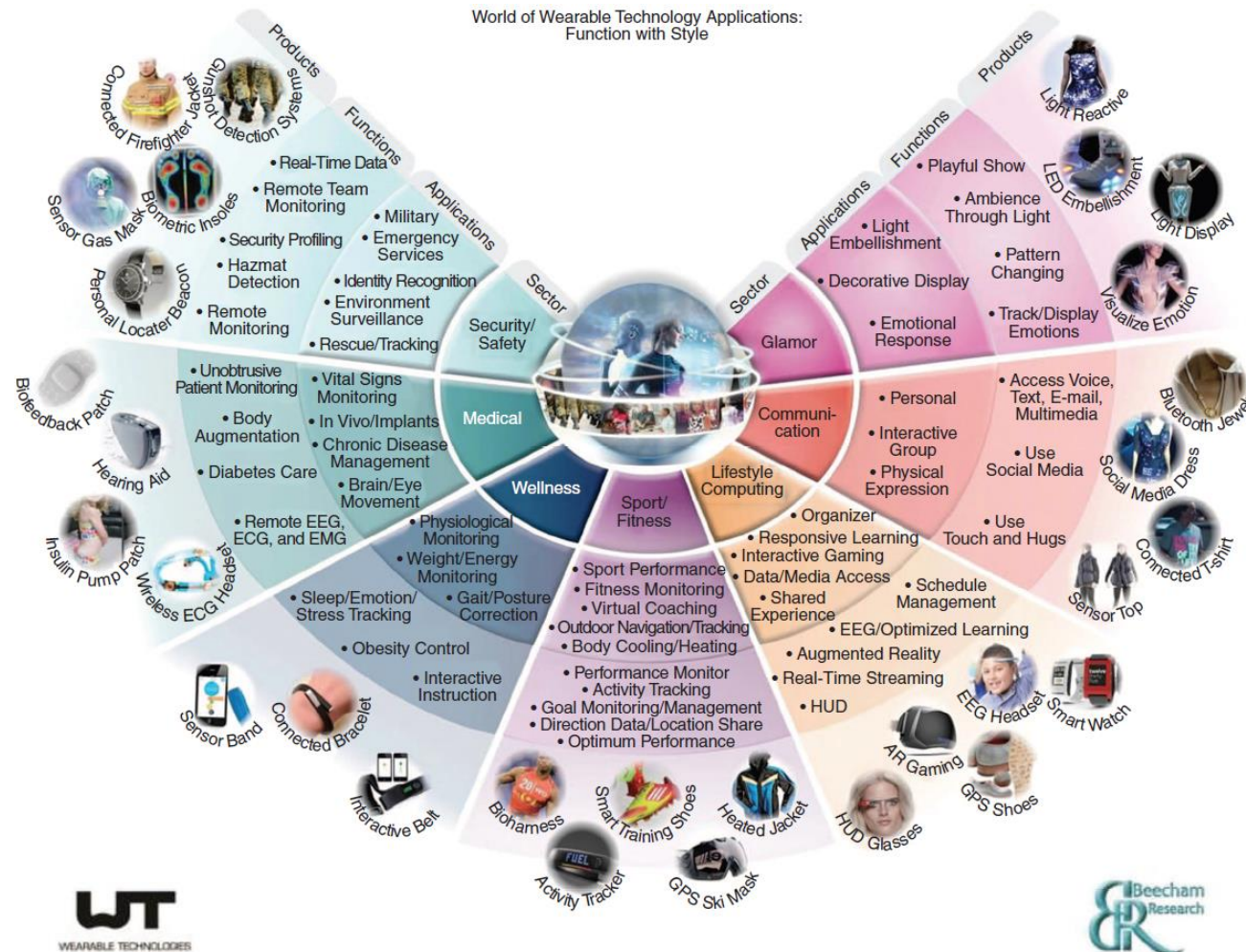


Always connected



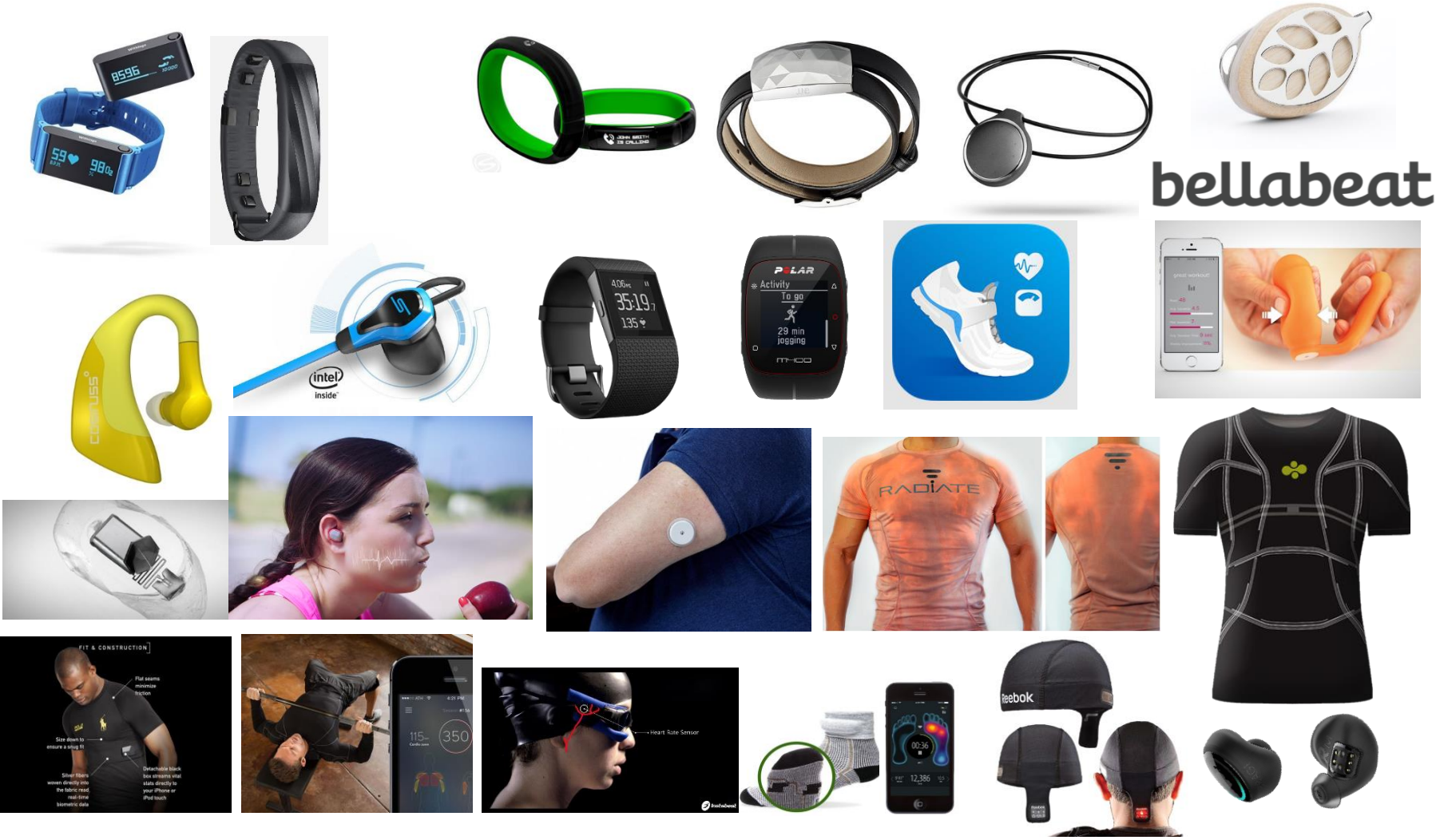
Which wearable devices do you know, and which ones do you wear?

Rodrigues et. al. (2018).  
Enabling Technologies for  
the Internet of Health  
Things.



Wei, J. (2014). How Wearables Intersect with the Cloud and the Internet of Things : Considerations for the developers of wearables. *IEEE Consumer Electronics Magazine*





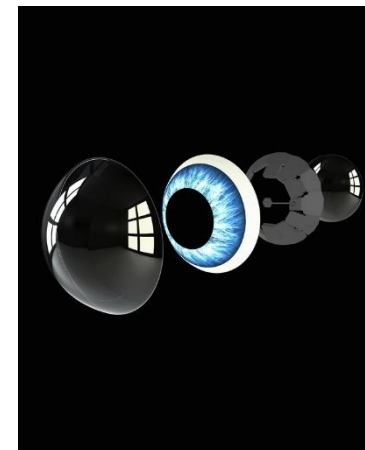
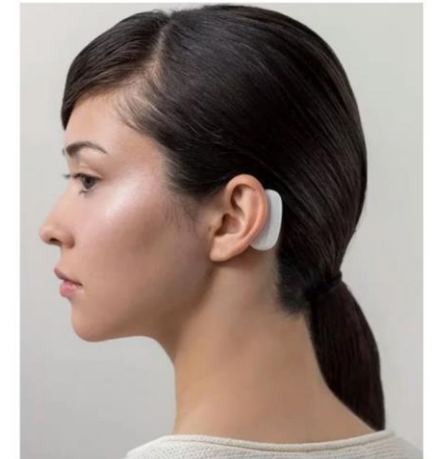
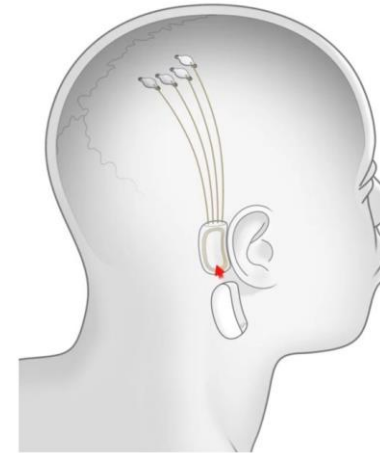


# History of Wearable Computing

# Computers – Scale Things Down



Machine Learning  
Data Analytics







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



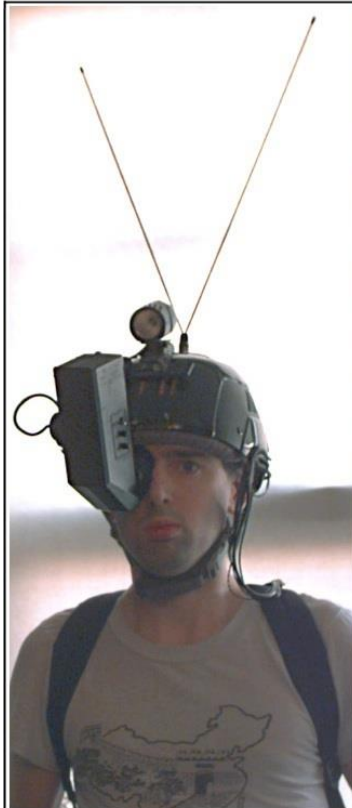
<https://atap.google.com/jacquard/products/levi-trucker/>



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



Steve Mann's "wearable computer" and "reality mediator" inventions of the 1970s have evolved into what looks like ordinary eyeglasses.



(a)  
**1980**



(b)  
**Mid 1980s**



(c)  
**Early 1990s**



(d)  
**Mid 1990s**

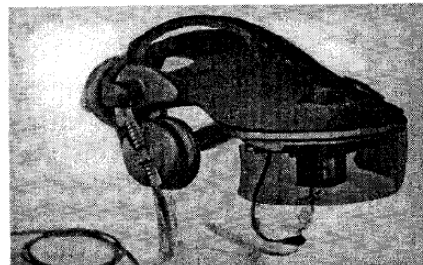
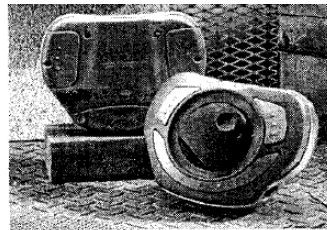
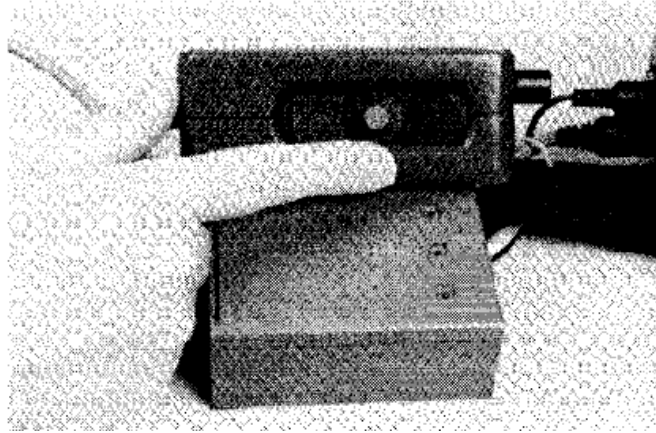


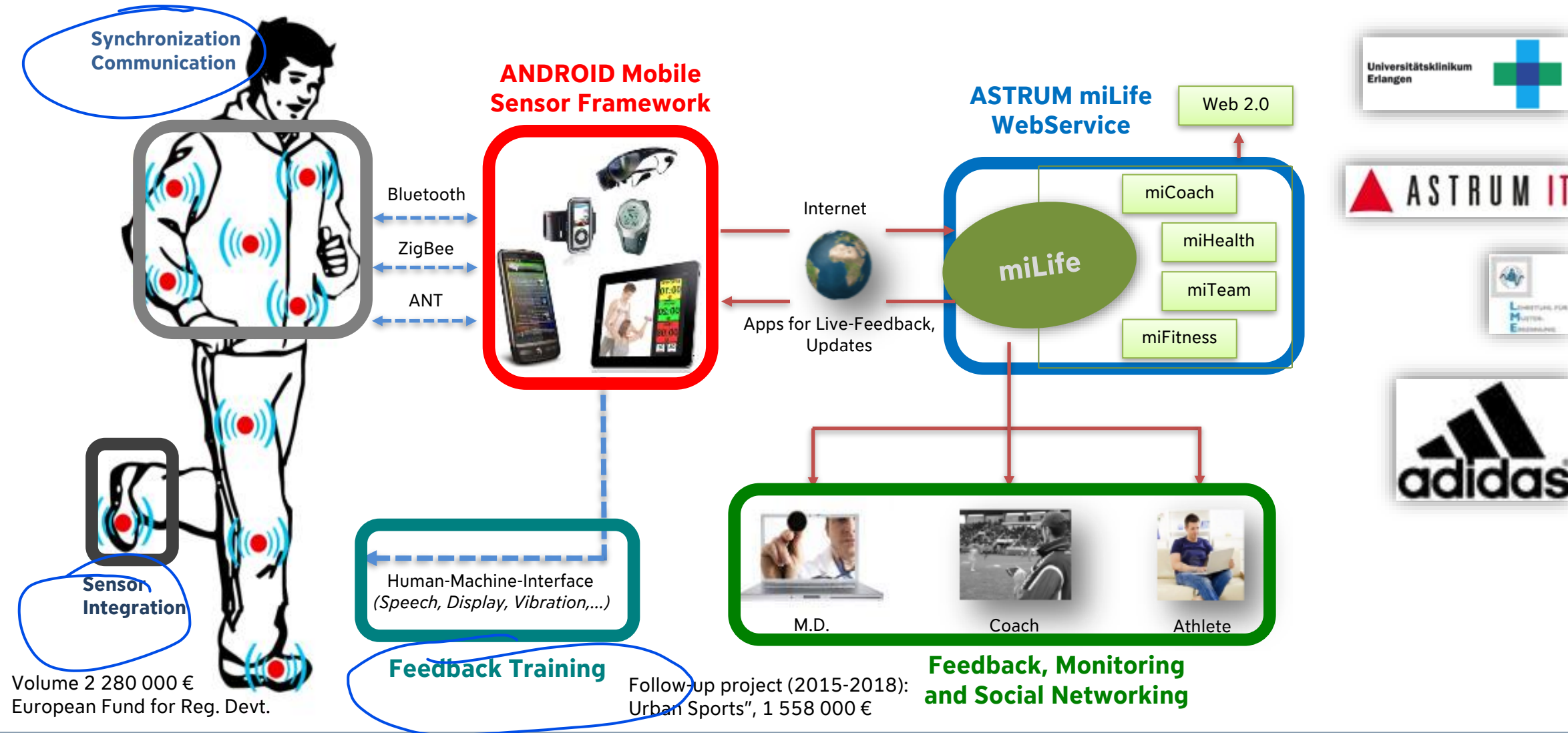
(e)  
**Late 1990s**

<http://genesis.eecg.toronto.edu/>

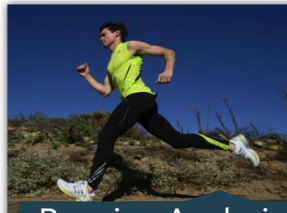








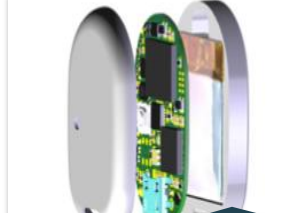




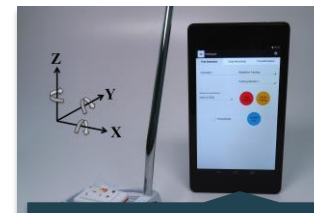
Running Analysis  
Schuldh. et al.,  
2012



Synchronization  
Kugler et al., 2012



Research Sensor  
Blank et al., 2014



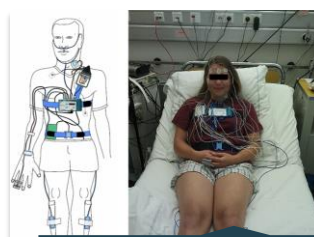
Golf Putting  
Jensen et al., 2015



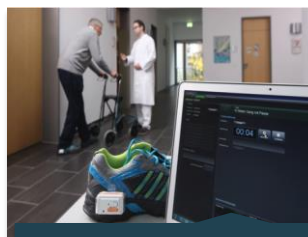
Swimming Classifi.  
Jensen et al., 2016



ECG Classification  
Gradl et al., 2012



Sleep Monitoring  
Gradl et al., 2013



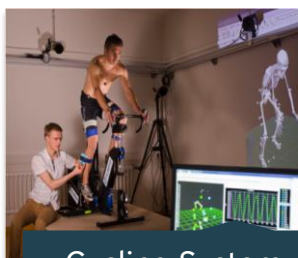
eGaT System  
Rampp et al., 2015



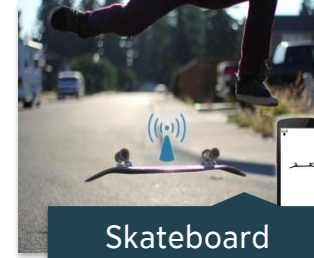
Nykturia Monit.  
Huppert et al., 2015



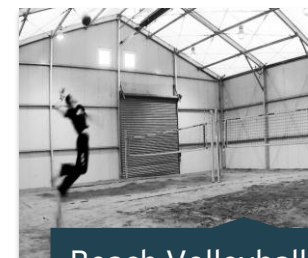
Wearable ECG  
Richer et al., 2016



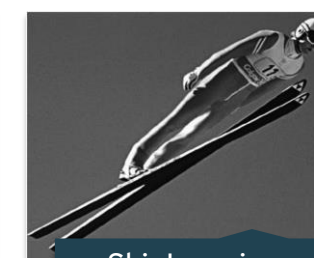
Cycling System  
Richer et al., 2015



Skateboard  
Classif.  
Groh et al., 2016



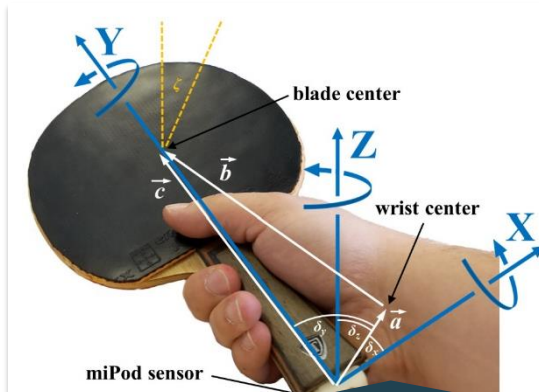
Beach Volleyball  
Kautz et al., 2016



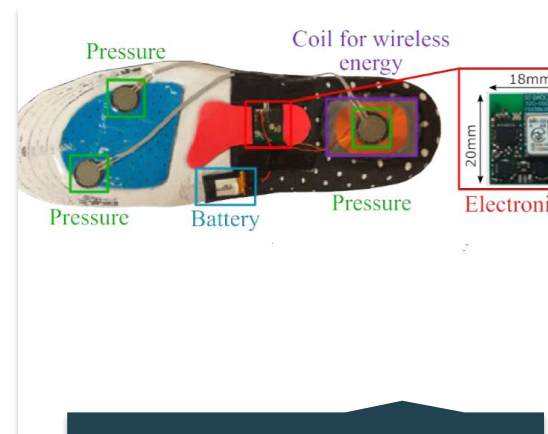
Ski Jumping  
Groh et al., 2016



Soccer System  
Zhou et al., 2016



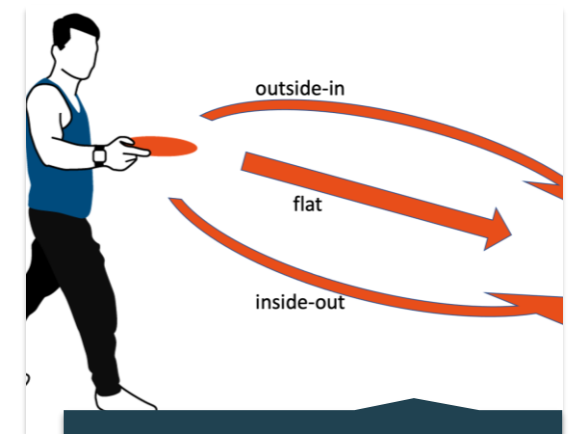
Ball speed and spin estimation in table tennis, Blank et al., 2017



Sensor Insoles for Gait Analysis, Martindale et al., 2018



Real-Time Ski Jumping Tracking System, Link et al., 2021



Activity Recognition in Ultimate Frisbee, Link et al., 2022

# Wearable Computing Products Today?



Machine Learning  
Data Analytics



<https://qbdgroup.com/en/blog/medical-device-industry-trends/>



- Knowledge in different disciplines required
  - Electrical Engineering
  - Computer Science / Algorithm development
  - Interaction Design
  - Product Design
  - ...
- Creating values for customers
  - Single Purpose device
  - Users' expectations
  - ...
- Different Development Processes
  - Prototyping
  - Electronics first? Design first?
  - ...







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# Thank you for your attention