

Älytekstiilit

- kudotut tekstiilirakenteet, vuorovaikutus ja CASE terveydenhoito

10.3.2022

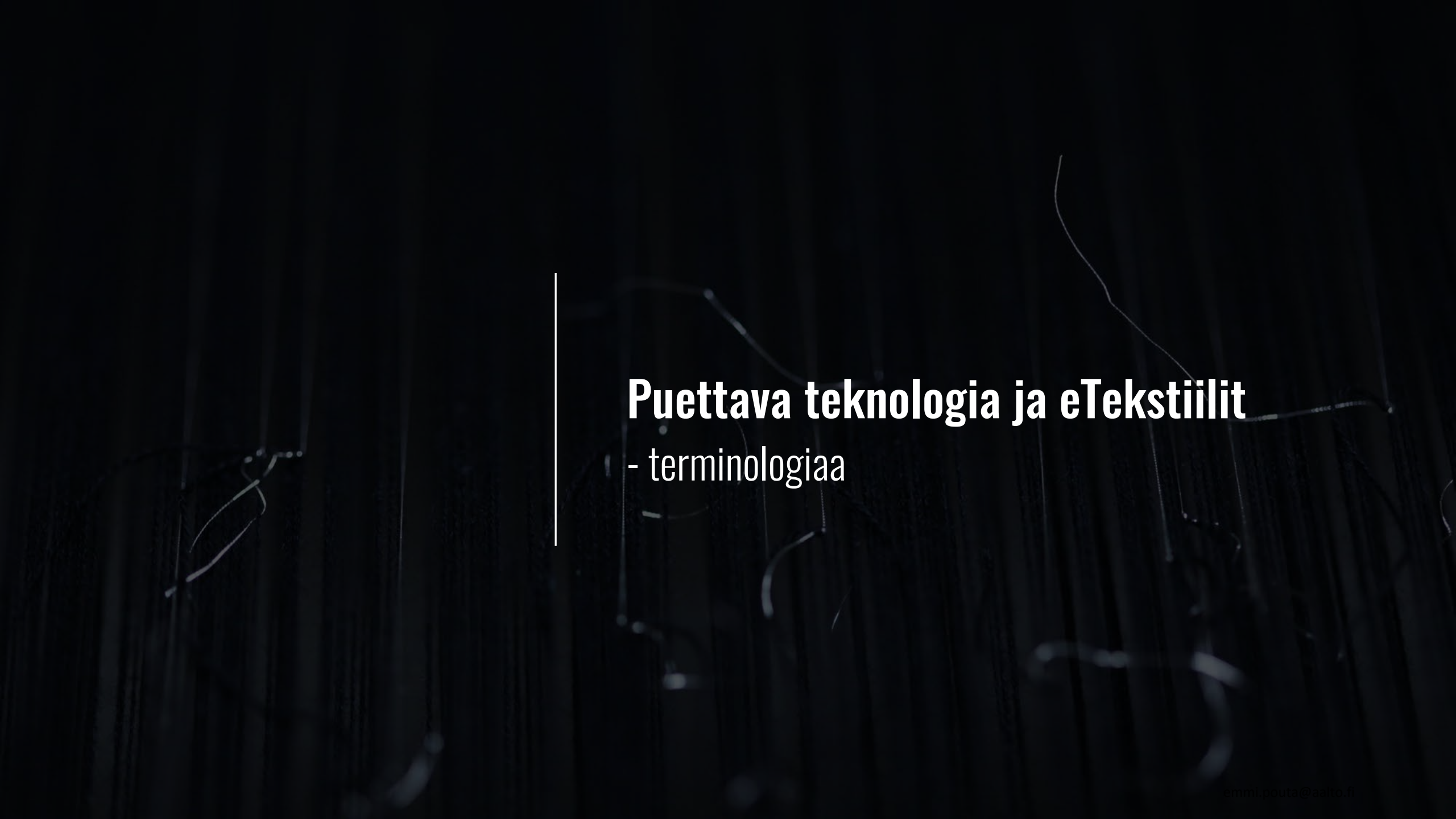
Agenda

- Puettava teknologia ja eTekstiilit
- Kudotut eTekstiilit
- Älytekstiilit AVH-kuntoutuksessa

Intro

Emmi Pouta

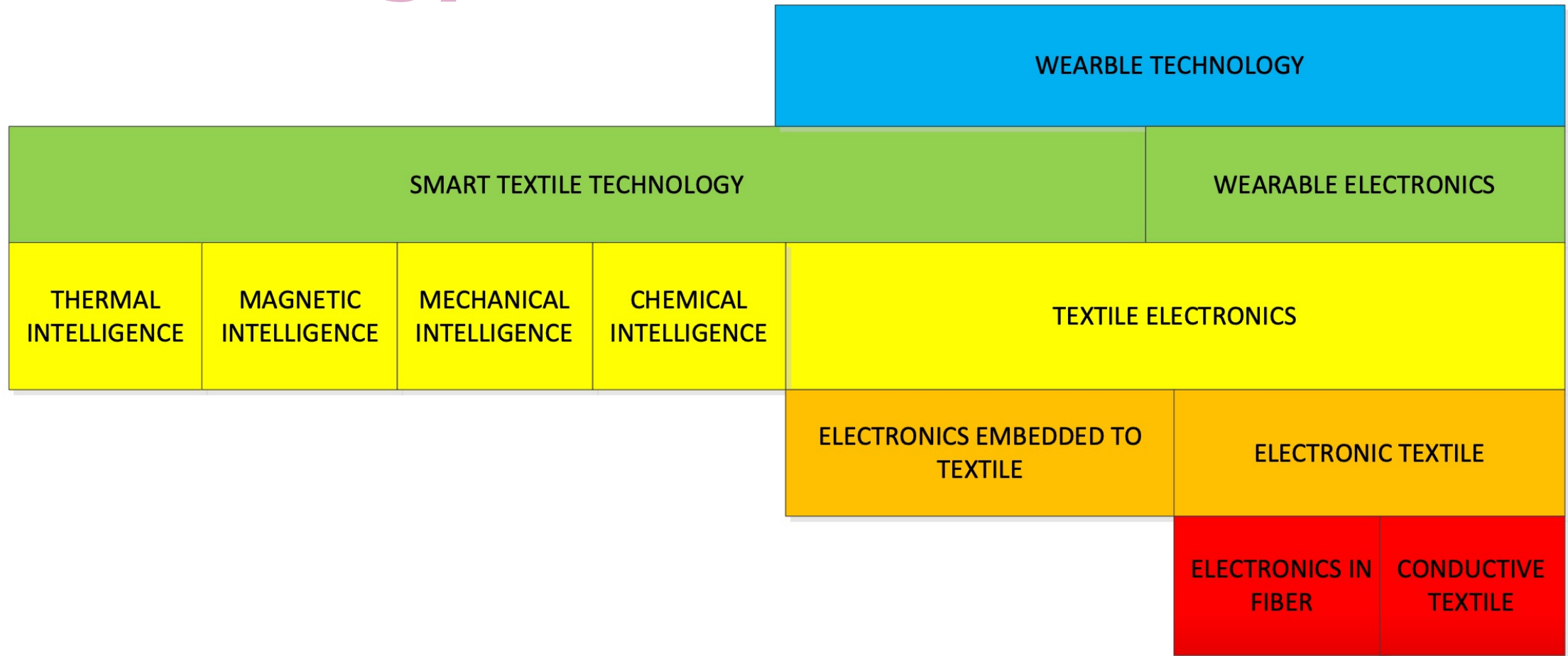
- MA in textile design
 - Woven textiles, eTextiles
- Startup entrepreneur 2014-2017
 - eTextile development
- Doctoral student, Aalto University, September 2017 -
 - DoD- ARTS / Comnet - ELEC



Puettava teknologia ja eTekstiilit

- terminologiaa

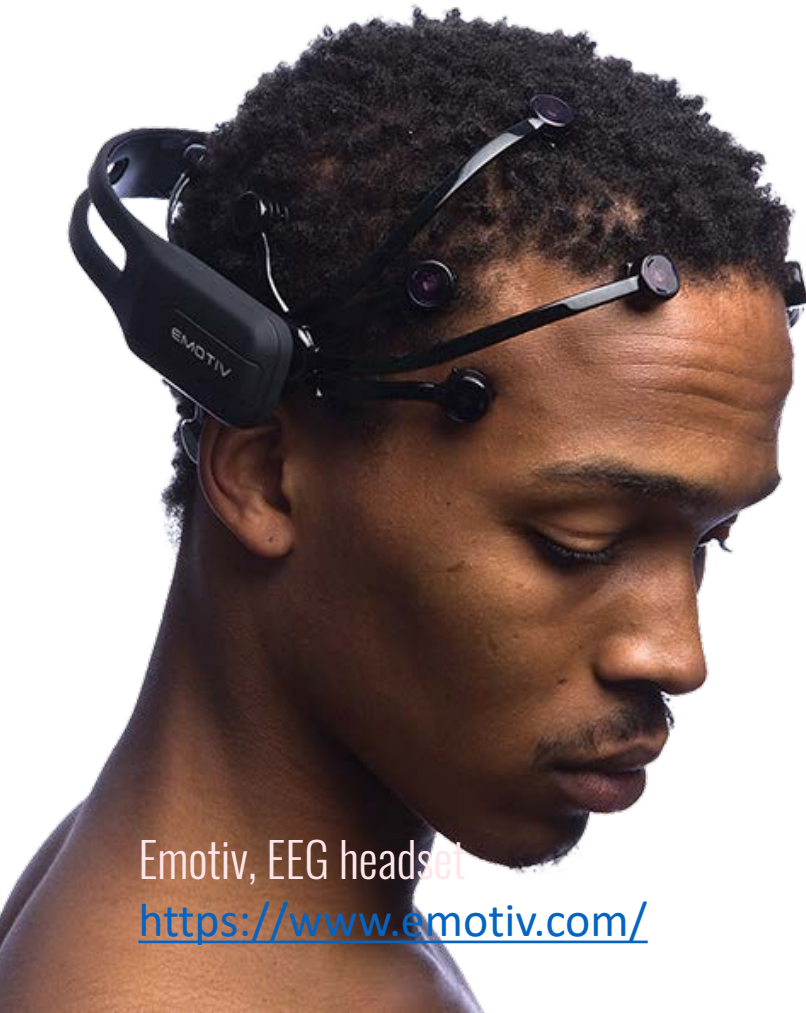
Smart textile and wearable technology



Ilen, 2015. "Decontamination of Wearable Textile Electrodes for Medical and Health Care Applications"

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Wearable electronics



Emotiv, EEG headset

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



Smart textile technology



Myontec, Mbody

<https://www.myontec.com/en/>



Cute Circuit, Aurora Dress

<http://cutecircuit.com/media/aurora-dress/>

eTextiles



Google, Project Jacquard
<https://atap.google.com/jacquard/>



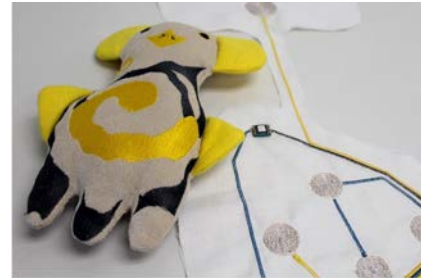
Nottingham Trent University, Electronically Active Yarns
<https://www.ntu.ac.uk/research/groups-and-centres/projects/electronically-active-yarns>
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eTextiles – more examples

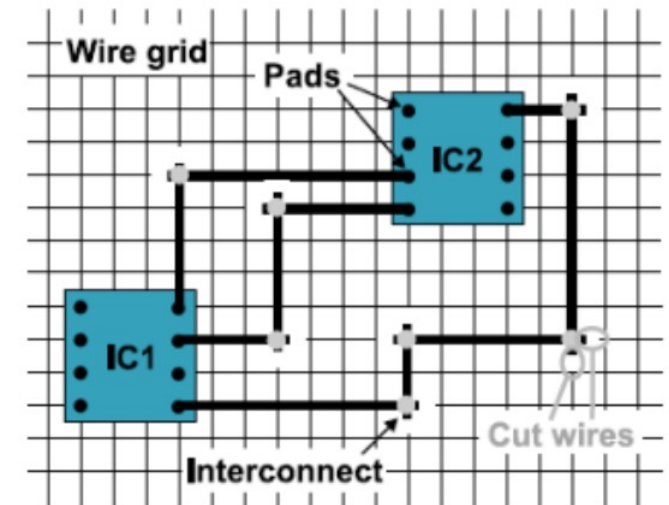
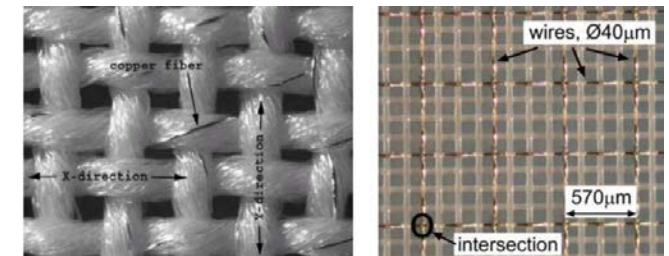
- Different textile techniques: embroidering, knitting, sewing, weaving...



Bredies, 2017. "Explorations on Textile Electronics."



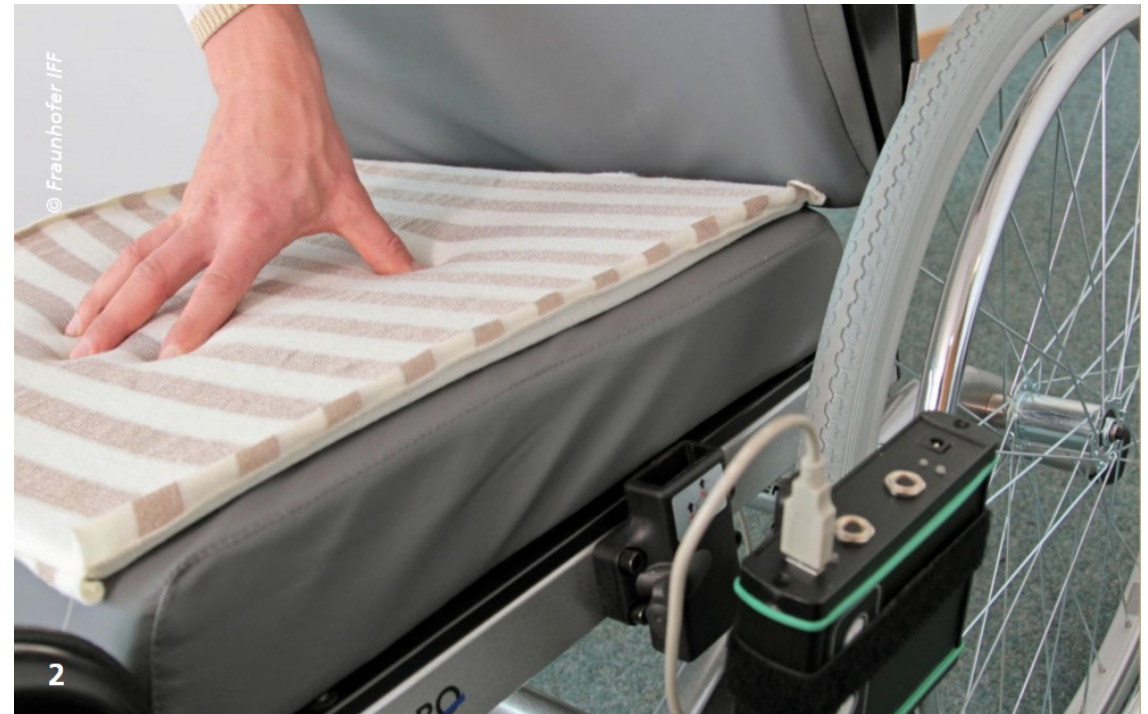
Berzowska et al. 2019. "Baby Tango: Electronic Textile Toys for Full-Body Interaction."



Locher, 2006. "Technologies for System-on-Textile Integration."

Why eTextiles?

- Look & feel
 - one of the key elements in user acceptance
 - textile-based electronics are soft – can provide better fit comfort
 - electronics can be hidden inside of the textile structure - no need to compromise the aesthetics
- Large area integration
 - for antennae, whole garment networks, energy harvesting?

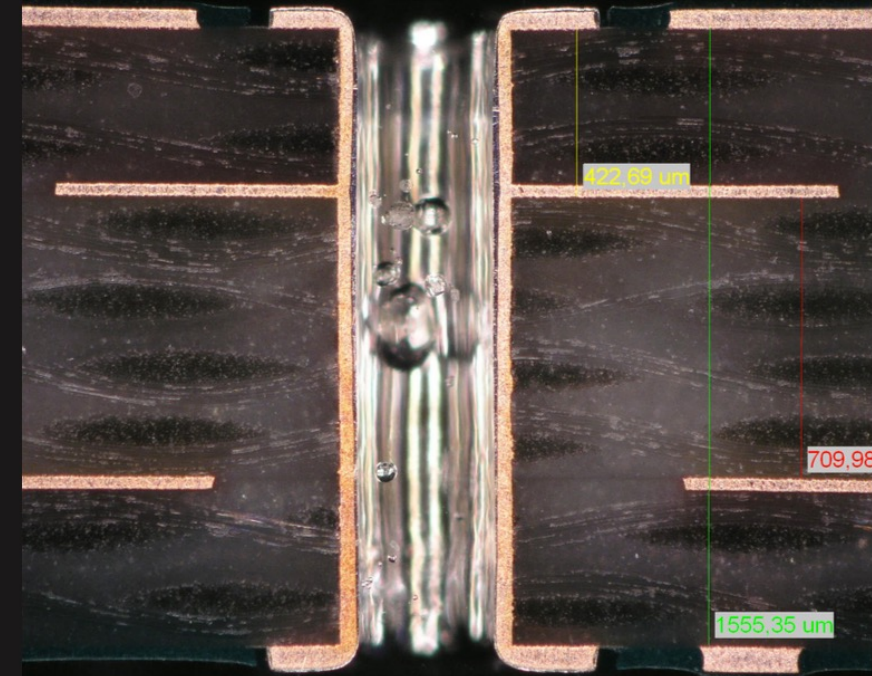
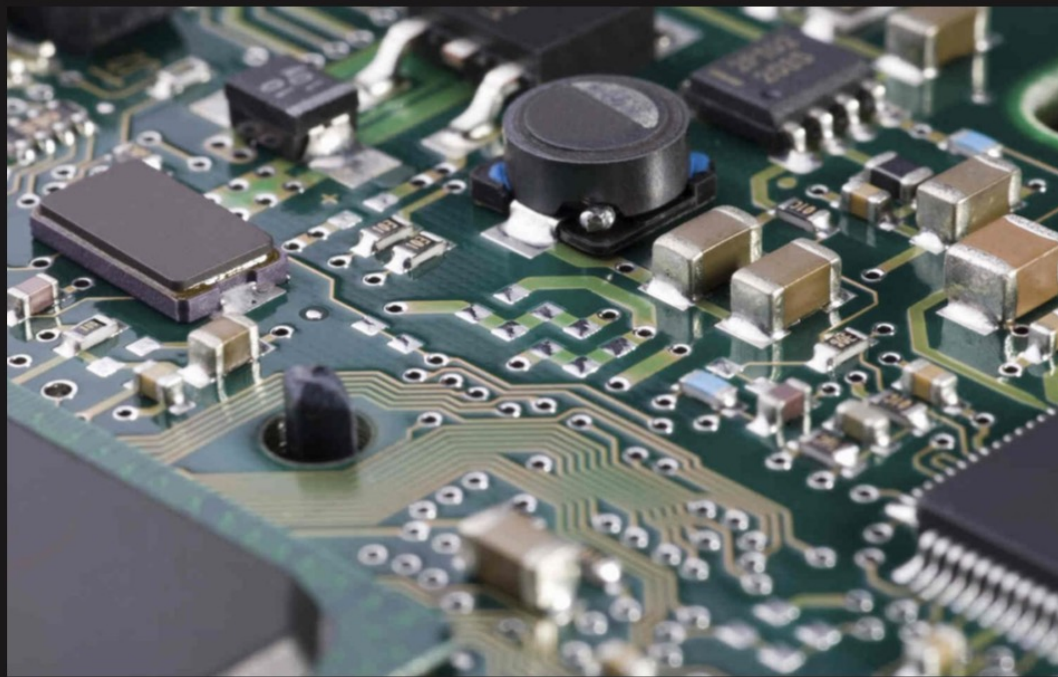
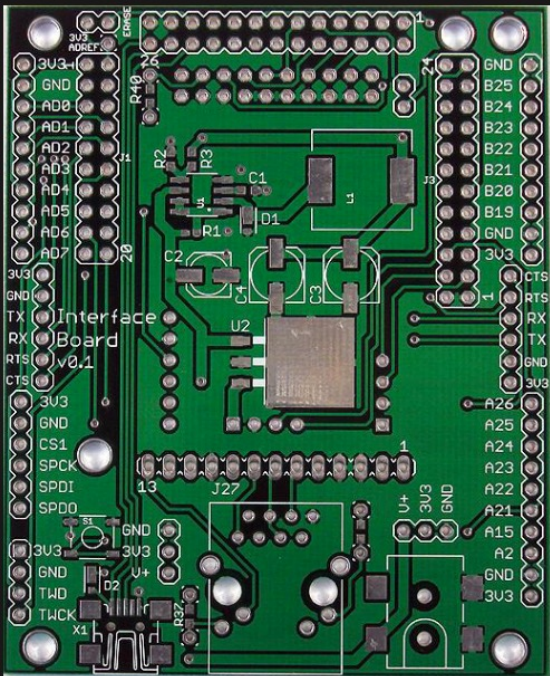


<https://www.iff.fraunhofer.de/content/dam/iff/en/documents/publications/textile-sensors-for-surface-pressure-sensing-fraunhofer-iff.pdf>

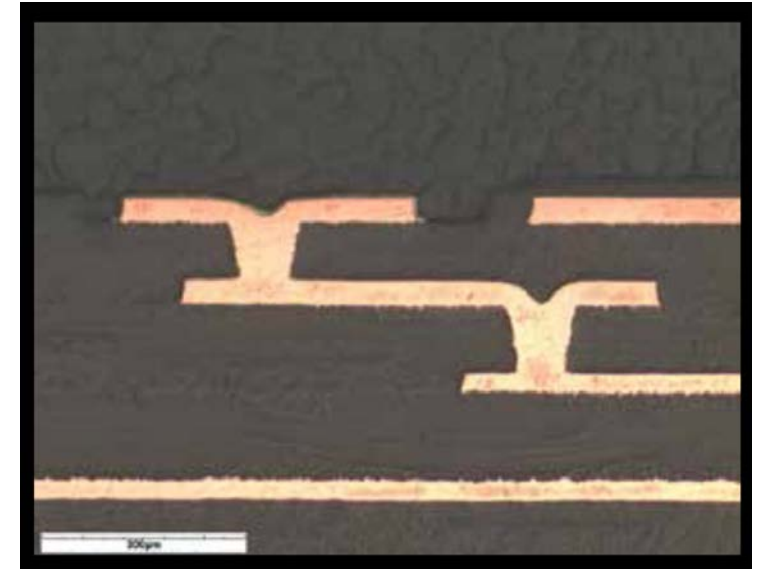
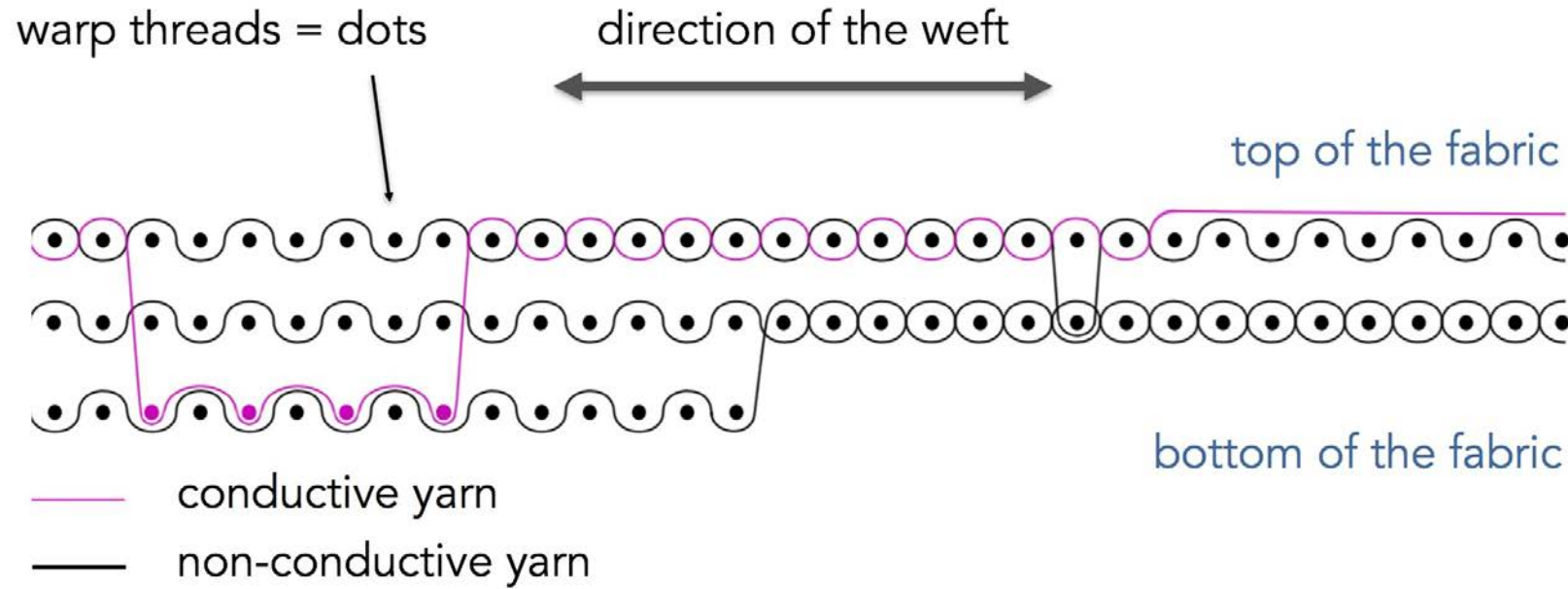


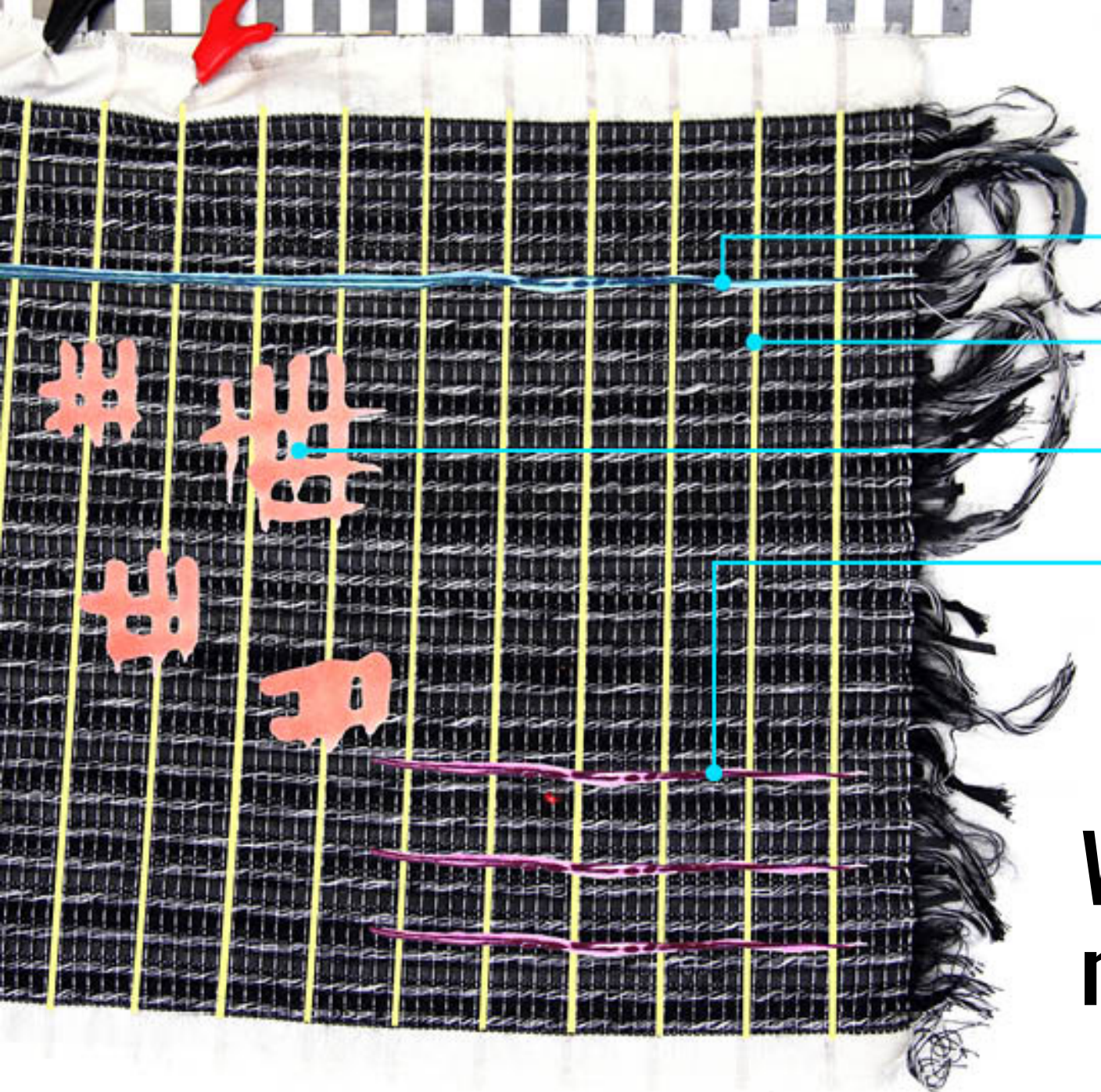
Kudotut eTekstiilit

Starting point - a circuit board



Applying woven structures into electronic circuit design





Computational power integrated into the fabric,
e.g. processor suitable for soft structures

Soft conducting wires for connecting different
components

Soft, textile-made sensor and actuator structures

Other input / output components

What could this mean in practice?

Woven-in components

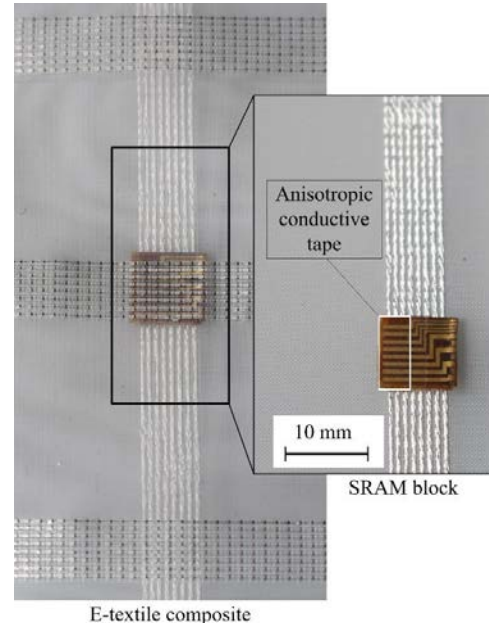
- Components integrated in the structure of woven fabric - either on the surface or between layers
- Often utilize woven bus structures



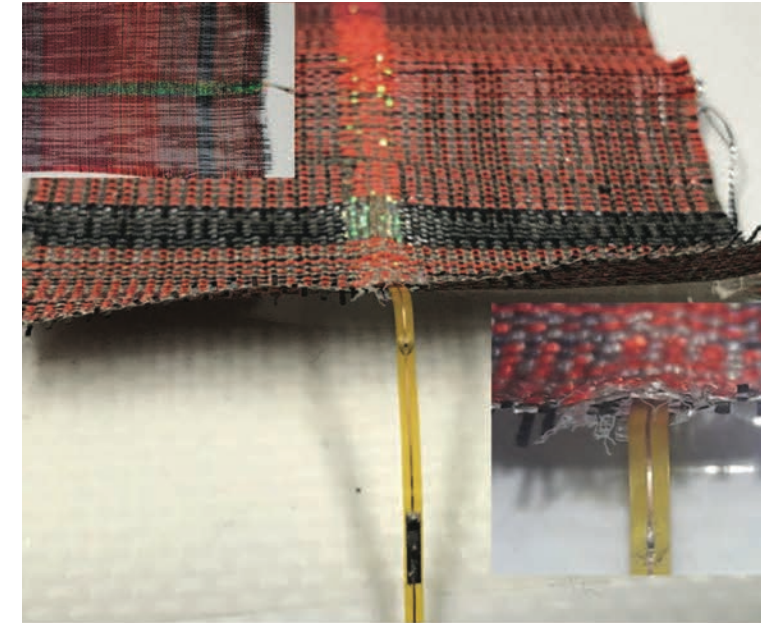
Rathnayake et al. 2015. "Yarns with Embedded Electronics."



Wirtanen, 2018. "Solar Cells inside Woven Textiles."



Varga et al., 2015. "Programmable E-Textile Composite Circuit."



Komolafe et al., "Integrating Flexible Filament Circuits for E-Textile Applications."



Electronically functional weave

- Woven actuators

- Dynamic structures that can change their properties, e.g. colour or shape
- E.g. dynamic textile displays that utilize optical fiber or thermochromic pigments



Berzowska, and Skorobogatiy. 2010. "Karma Chameleon: Bragg Fiber Jacquard-Woven Photonic Textiles."



Devendorf et al. 2016. "I don't Want to Wear a Screen": Probing Perceptions of and Possibilities for Dynamic Displays on Clothing.

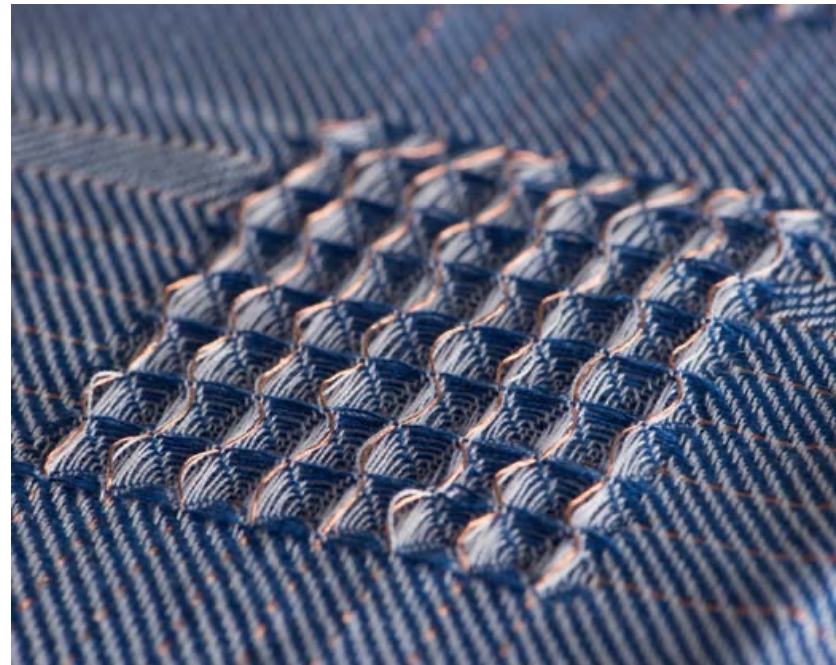
Electronically functional weave

- Woven sensing elements

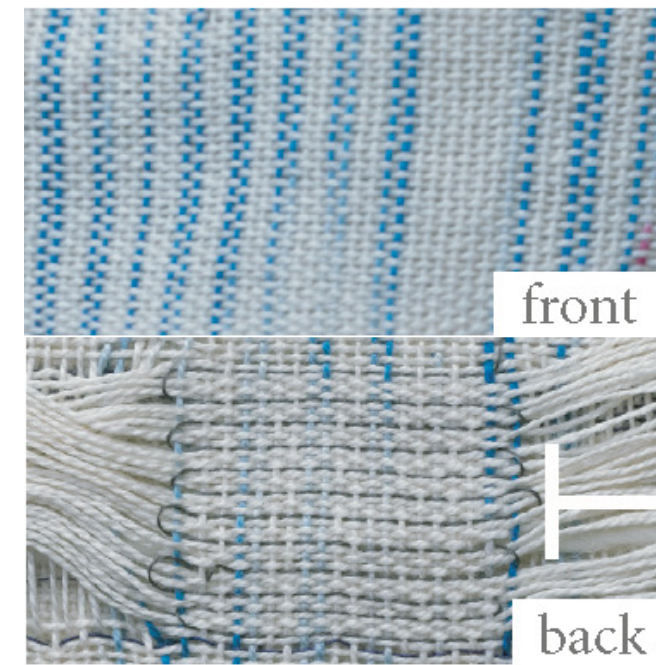
- Specific woven structures that can sense inputs
- Typically touch-based sensors: capacitive and resistive sensor structures



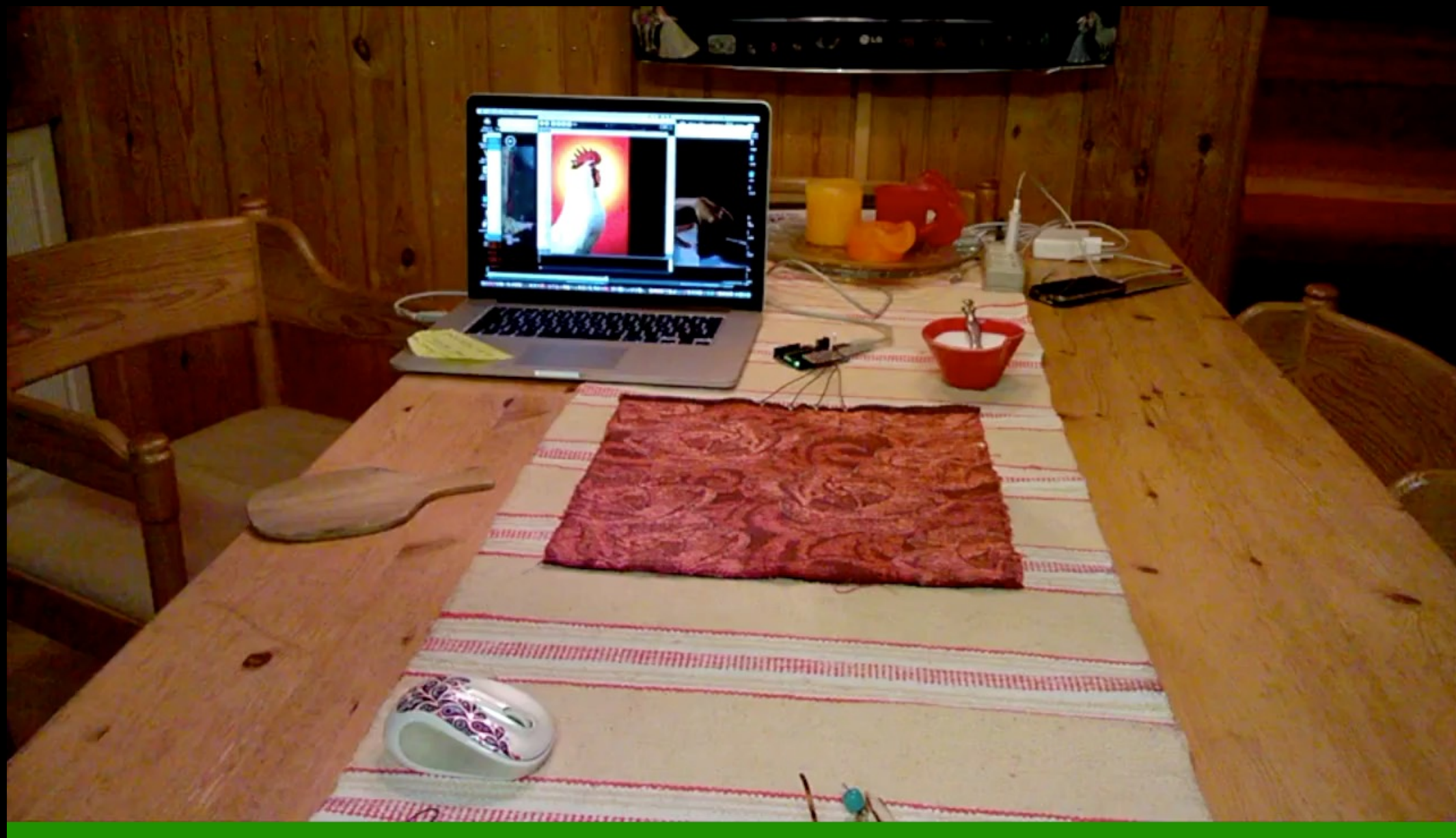
Poupyrev et al., 2016. "Project Jacquard."

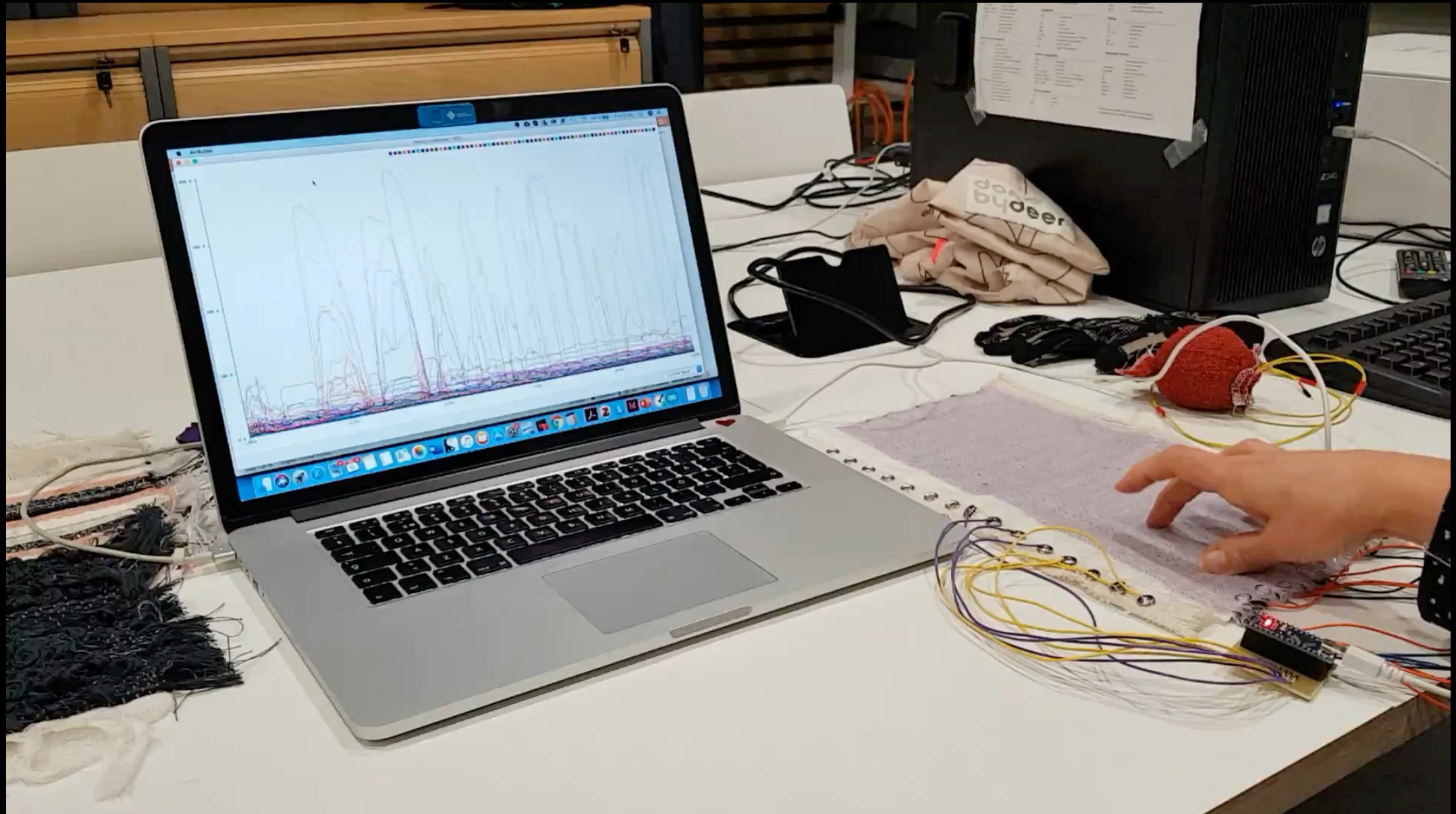


Bredies, 2017. "Explorations on textile electronics."

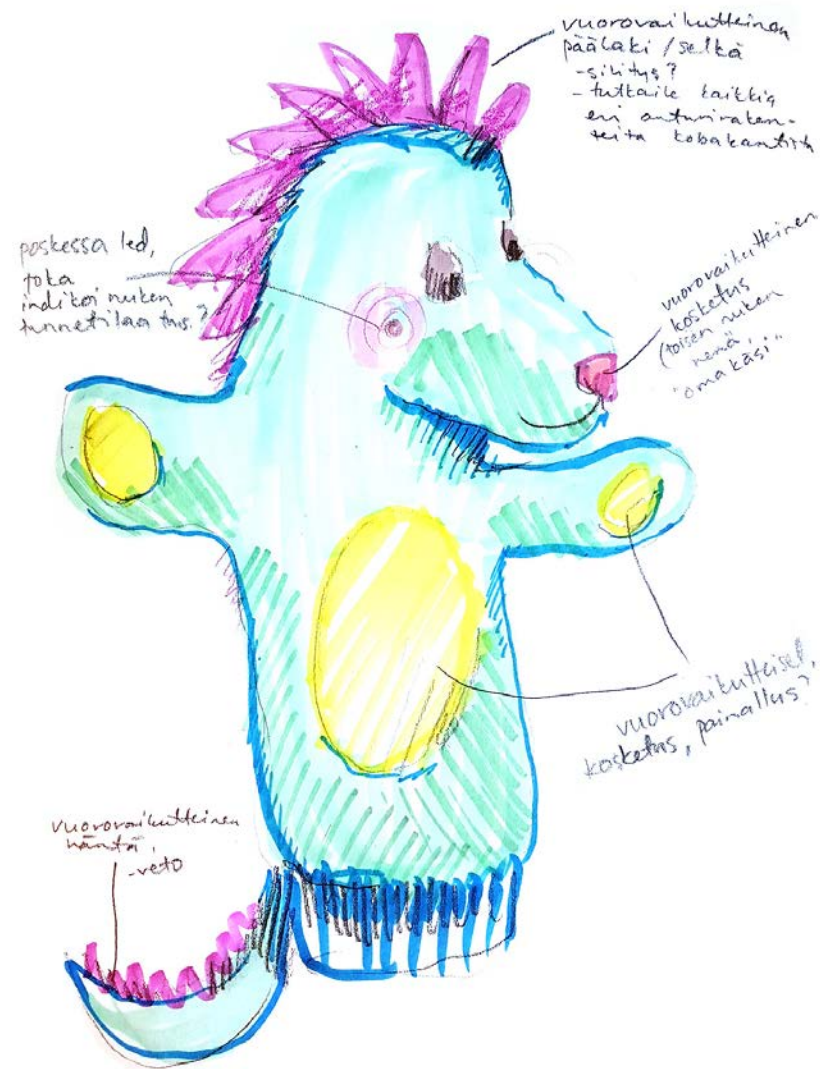
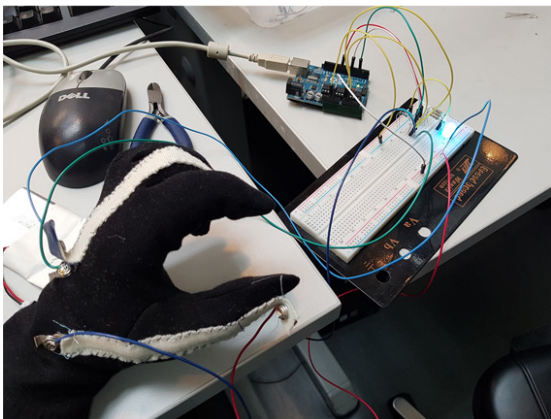


Devendorf and Di Lauro, 2019. "Adapting Double Weaving and Yarn Plying Techniques for Smart Textiles Applications."





Interaction & UI design



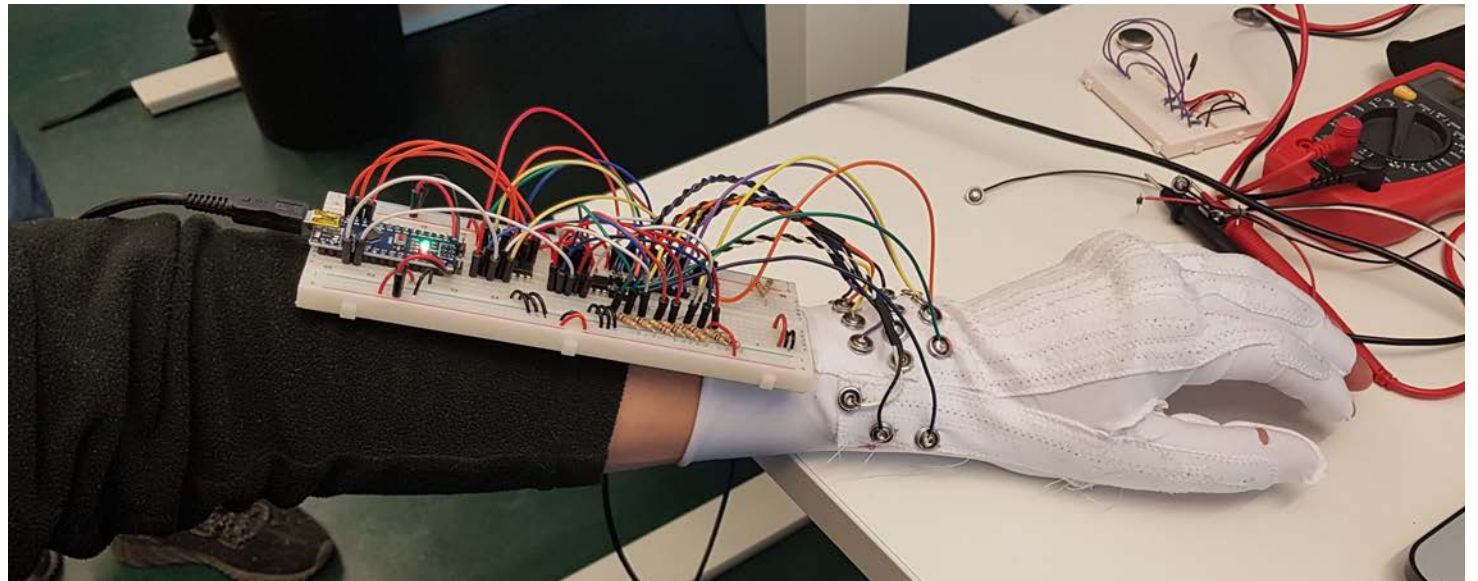
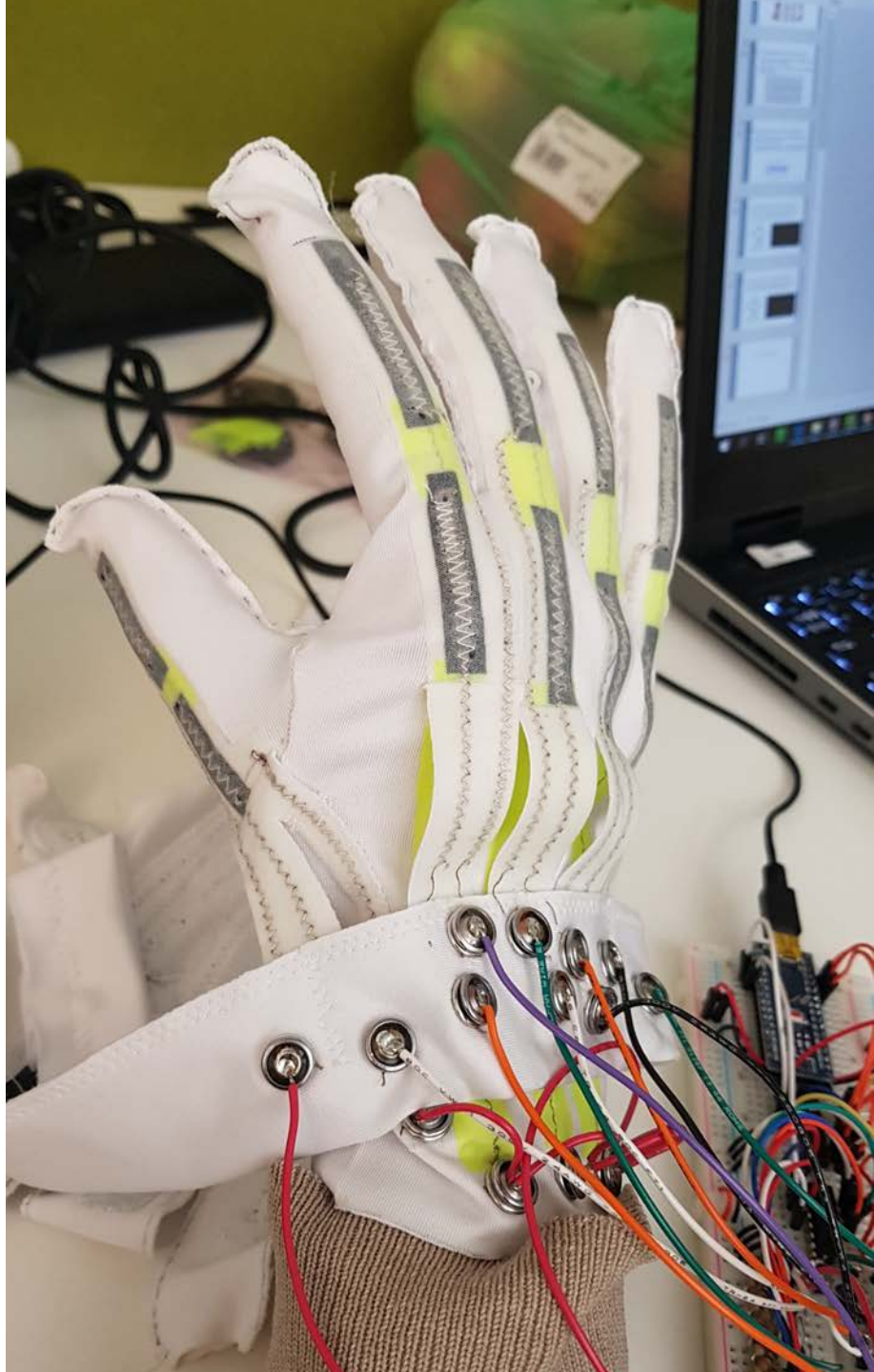
Älytekstiilit terveydenhuollossa

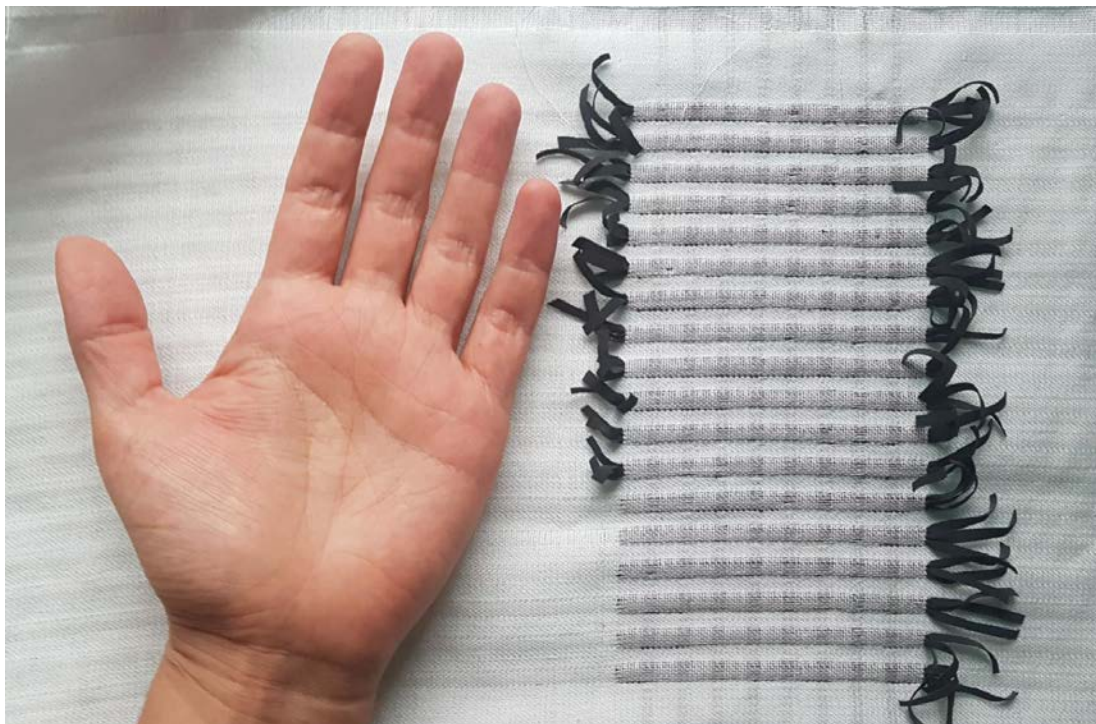
– CASE VR-harjoitteluympäristö
aivoverenkiertohäiriöpotilaiden kuntoutukseen



Älyhanska VR-ympäristön käyttöliittymänä

- Kuntoutusympäristö, joka tukee itsenäistä harjoittelua
- Kuntoutusharjoitteisiin pohjautuvat VR-pelit
- Älytekstiiliasusteet tunnistavat sormien ja käsien virheellisiä liikeratoja
- Visuaalinen ja haptinen palaute tukee harjoittelua ja immersiiivistä kokemusta





Muita terveydenhuollon sovelluskohteita

- Paineluelvytyksen harjoittelu – laadukkaan elvytyksen mittaaminen ja palaute
- Riskien ennakointi makuuhaavojen ehkäisyssä



Thank you!

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