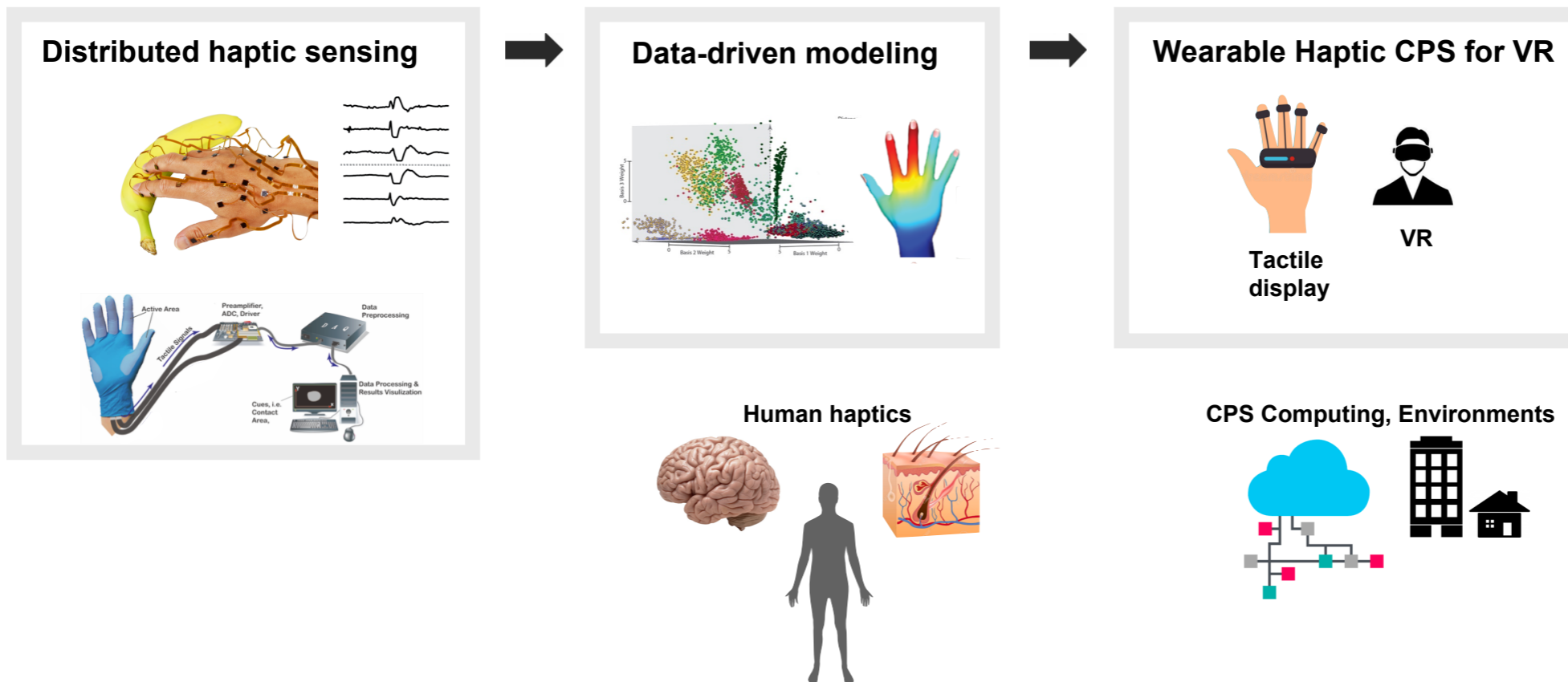




CPS: Breakthrough: Wearable CPS for Haptic Interaction in VR:
 From Whole Hand Tactile Imaging to Interactive Simulation, 1/2015 - 12/2017

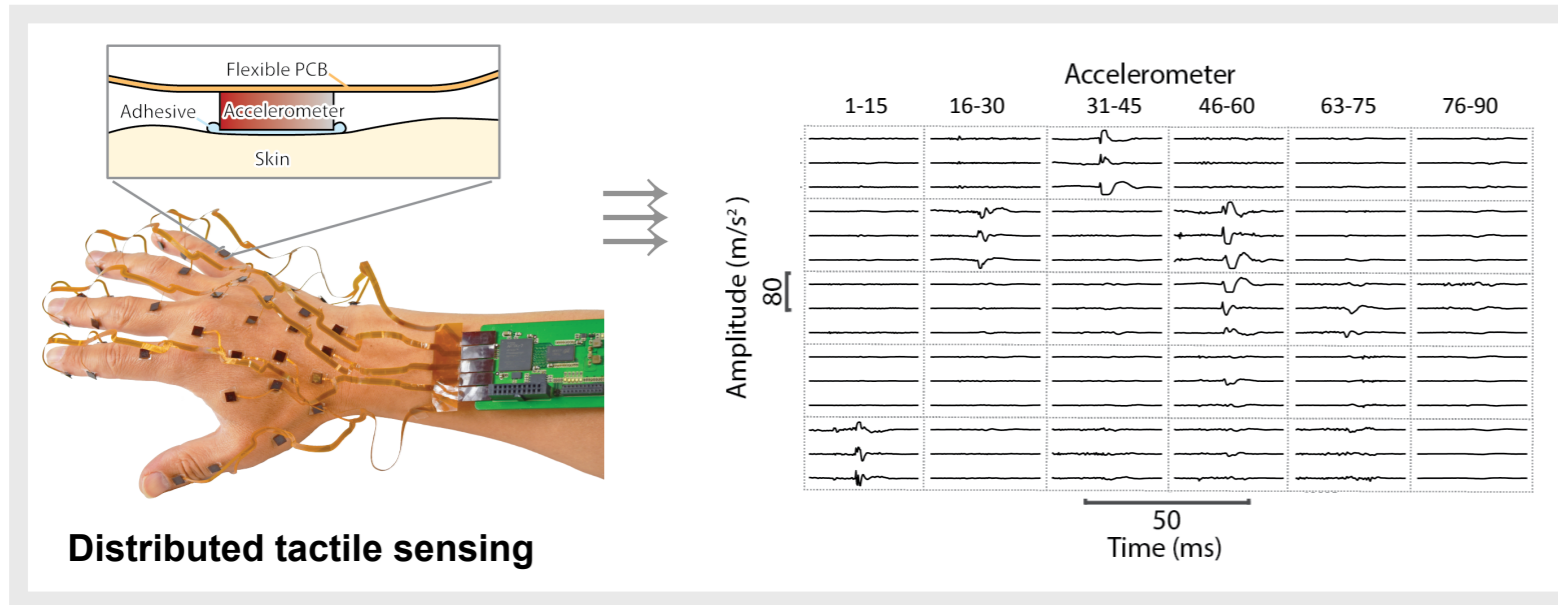
CNS-1628831

Yon Visell, Principal Investigator
University of California, Santa Barbara
 Electrical and Computer Engineering
 Media Arts and Technology
www.re-touch-lab.com
yonvisell@ucsb.edu

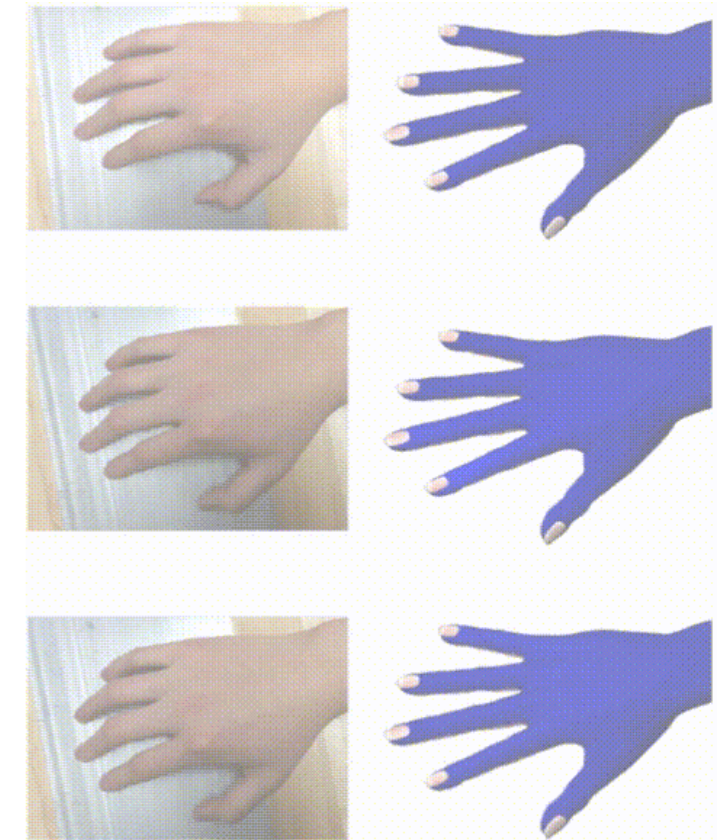


Touch-elicited viscoelastic waves in the hand

Transient or fluctuating stimulation of the skin elicits mechanical tactile signals that propagate throughout the entire hand

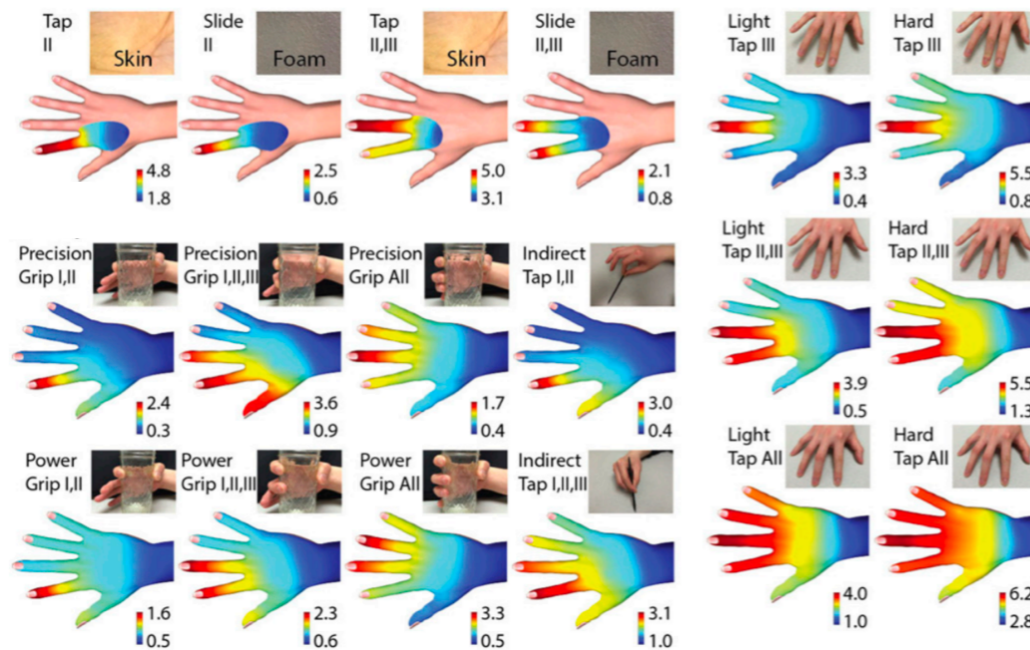


Touch Elicited Wave Propagation

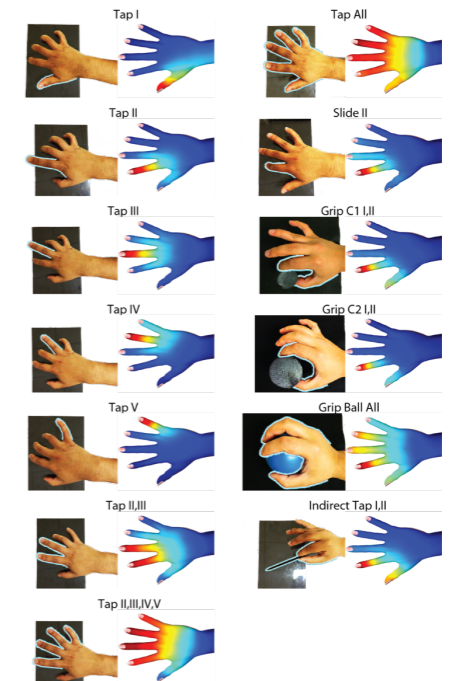
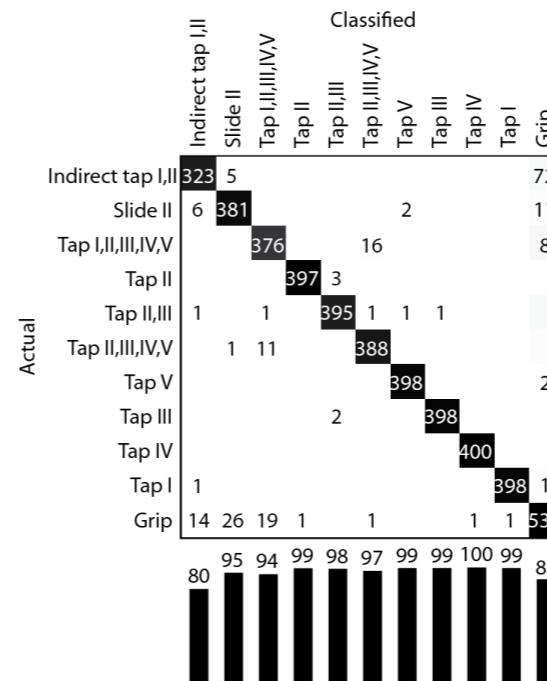


1/30 Speed

Computational Imaging



Gesture Classification

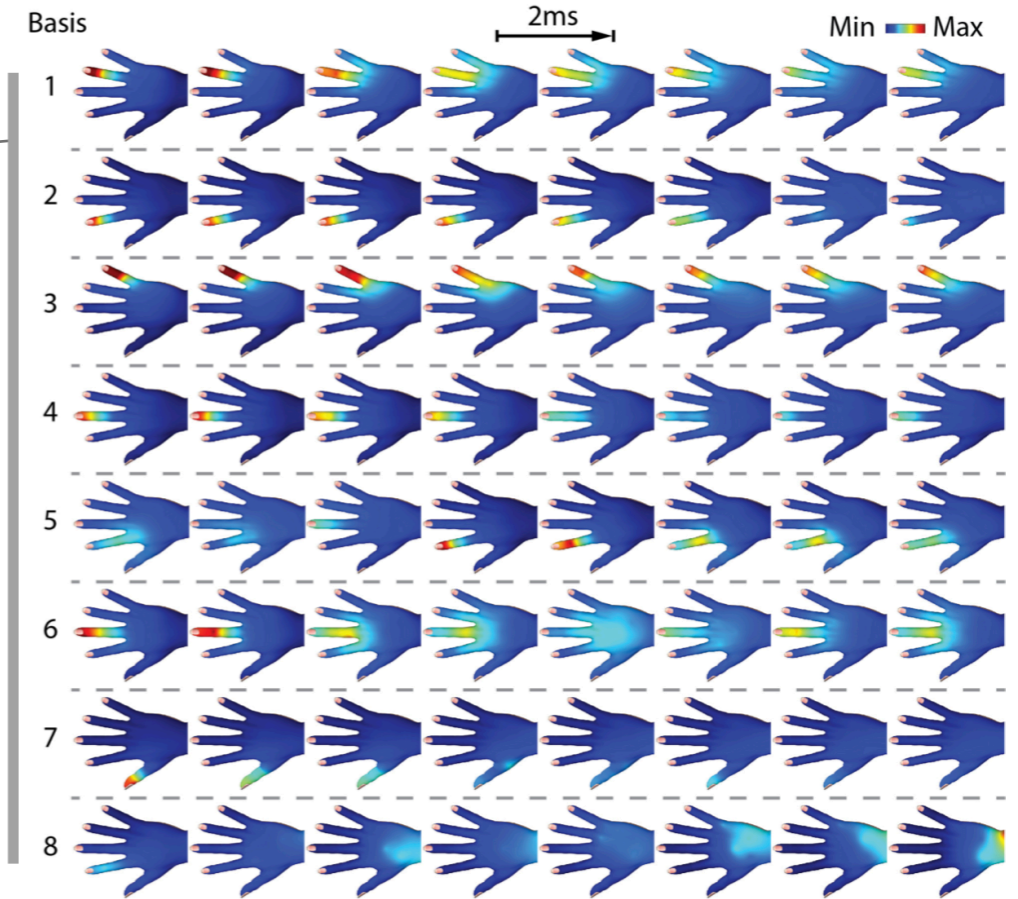
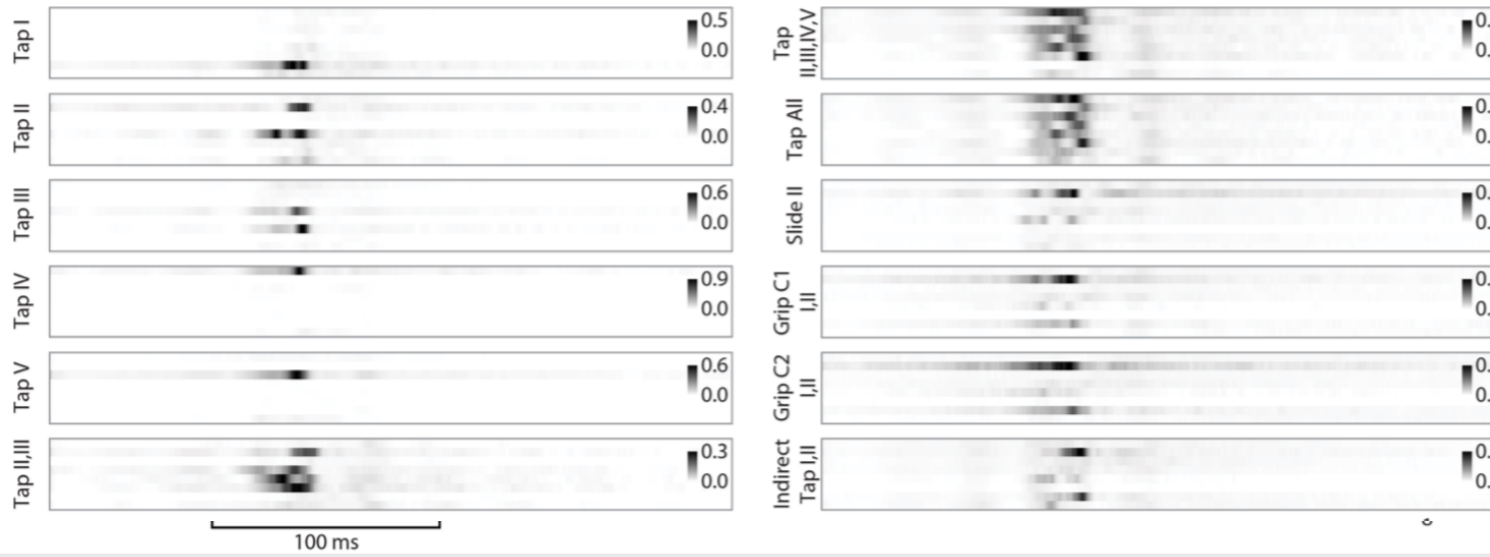


- Shao, Hayward, Visell, PNAS 2016
- Chartier, et al., Proc. Haptics Symposium 2016 (Best Paper, WIP)

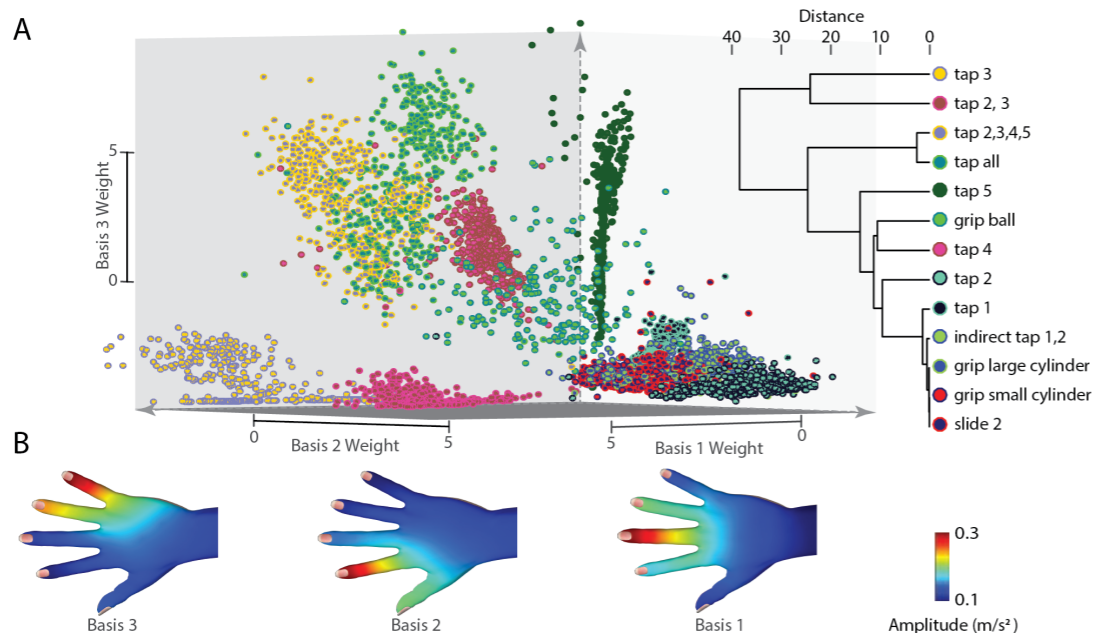
Learning meaningful spatiotemporal primitives from data

$$\mathbf{X} \approx \sum_{t=0}^{T_o-1} \mathbf{W}_t \overset{t \rightarrow}{\mathbf{H}}$$

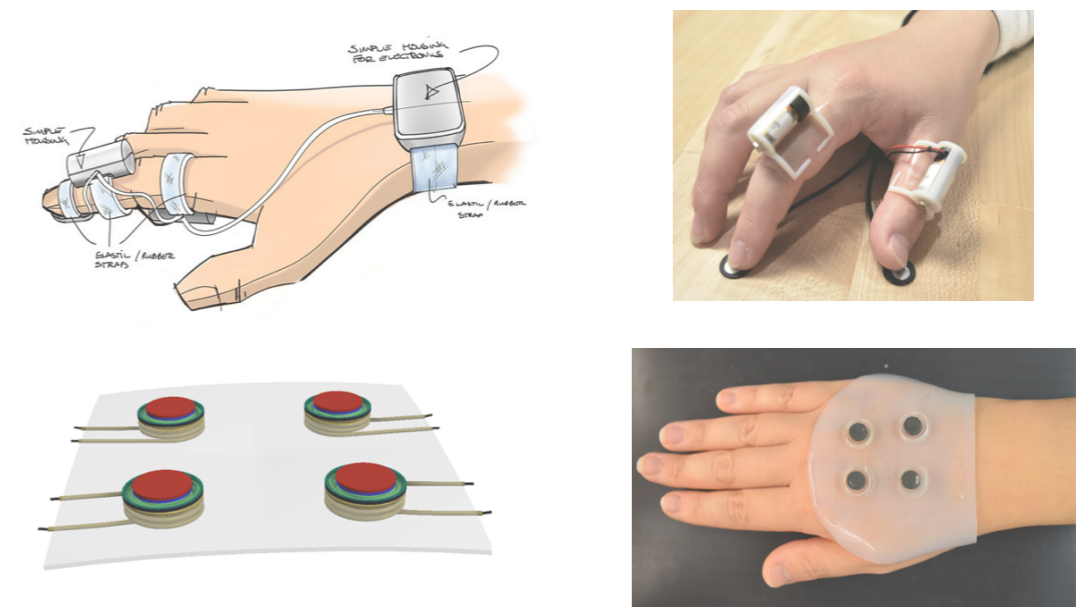
$$\underset{\mathbf{W}, \mathbf{H}}{\text{minimize}} \|\mathbf{X} - \sum_{t=0}^{T_o-1} \mathbf{W}_t \overset{t \rightarrow}{\mathbf{H}}\|_F \quad \text{s.t. } \mathbf{W}_t \geq 0 \forall t, \mathbf{H} \geq 0$$



Cluster Analysis: Gesture Dependence



Wearable Haptic CPS



- Shao, Visell, Proc. Haptics Symposium 2016 (Best Paper, 2nd Place)
- Shao, Visell, In Prep, 2017

- Do, Visell, Scientific Reports, 2017
- Do, Phan, Nguyen, Visell, In Review, 2017