



# None of Your Business!

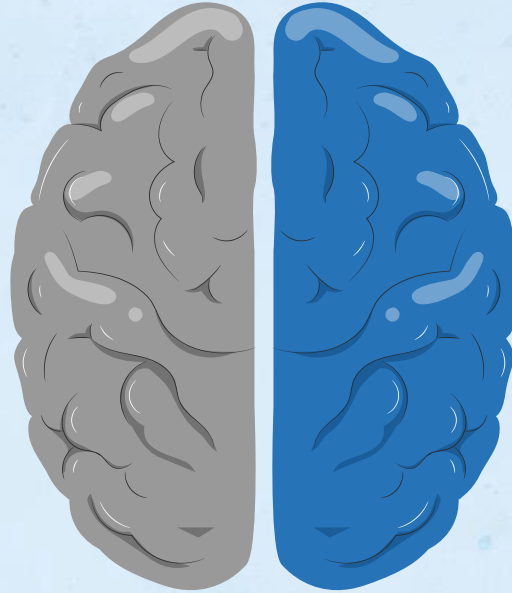
## The Usefulness of Neurotechnology As a Tool to Reveal Your Innermost Secrets

Oskar MacGregor | University of Skövde  
2023-12-07 | PICS Seminar

# NEURO + PRIVACY = ?

## The Neuro of Privacy

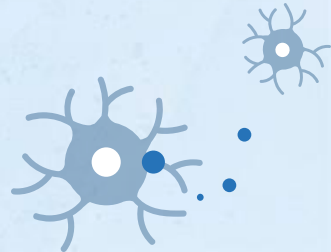
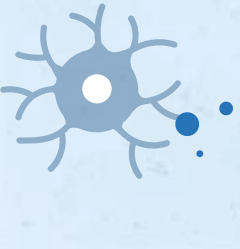
“What sorts of differences  
are there in brain states  
when we are in private vs.  
non-private situations?”



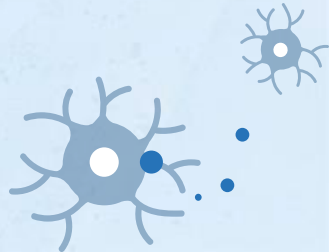
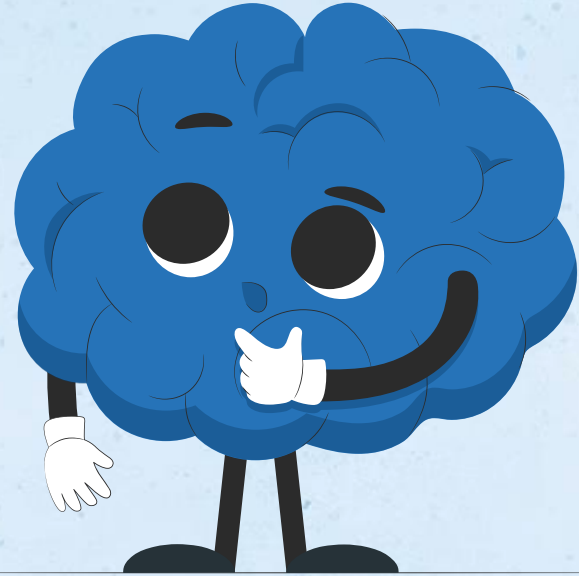
## The Privacy of Neuro

“How can we keep people’s  
neurodata secure?”

OR...



**CAN NEUROTECHNOLOGY  
BE USED TO SURREPTI-  
TIOUSLY GAIN ACCESS TO  
YOUR INNERMOST  
SECRETS?**





# OVERVIEW

01

## PRIVACY

Different sorts  
of concerns

02

## NEURO-...

Examples of neuro-  
privacy harms

03

## ...TECHNOLOGY

What can neurotechnologies  
actually conceivably do?

04

## CONCLUSIONS

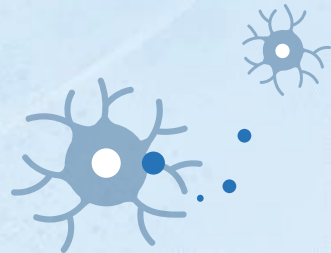
A primer on *robust*  
neuroprivacy



01

# PRIVACY

Different sorts of concerns

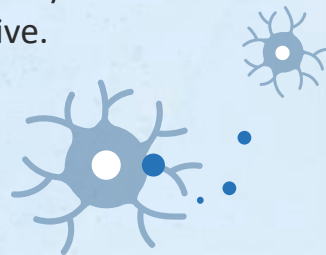




# MANY CONCERNS

- **Information collection** (surveillance, interrogation)
- **Information processing** (aggregation, identification, insecurity, secondary use, exclusion)
- **Information dissemination** (breach of confidence, disclosure, exposure, increased accessibility, blackmail, appropriation, distortion)
- **Invasion** (intrusion, decisional interference)
  
- **Basically:** balance between power/needs of the individual vs. the collective.

Solove, DJ (2006) *U Penn Law Rev* 154.3:  
477. [doi.org/10.2307/40041279](https://doi.org/10.2307/40041279)

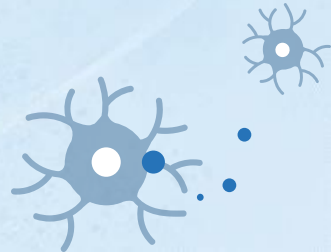




02

# NEURO-...

Examples of neuroprivacy harms





# EXISTING NEUROPRIVACY CONCERNS

1

## Attention

Chaudhary, U et al. (2016) *Nat Rev Neurol* 12.9: 513. [doi.org/10.1038/nrneurol.2016.113](https://doi.org/10.1038/nrneurol.2016.113)

2

## Fatigue

Tran, Y et al. (2020) *Psychophysiol* 57.5: e13554. [doi.org/10.1111/psyp.13554](https://doi.org/10.1111/psyp.13554)

3

## Emotion

Shu, L et al. (2018) *Sensors* 18.7: 2074. [doi.org/10.3390/s18072074](https://doi.org/10.3390/s18072074)

4

## Lie Detection

Abootalebi, V et al. (2009) *Comp Met & Prog in Biomed* 94.1: 48. [doi.org/10.1016/j.cmpb.2008.10.001](https://doi.org/10.1016/j.cmpb.2008.10.001)

5

## Secrets

Lange, J et al. (2018) *Brain Informatics* 5.2: 1. [doi.org/10.1186/s40708-018-0090-1](https://doi.org/10.1186/s40708-018-0090-1)

6

## Manipulation

Lews et al. (2016) *The Neuroscientist* 22.4: 406. [doi.org/10.1177/1073858416646707](https://doi.org/10.1177/1073858416646707)

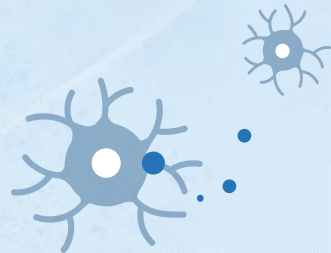




03

# ...TECHNOLOGY

What can neurotechnologies  
actually conceivably do?



# AVAILABLE NEUROTECHNOLOGIES

<b>PET, SPECT, fMRI, fNIRS...</b>	Passively reads brain function (blood flow or other <i>slow</i> biological processes) in <i>still</i> subjects. Requires <i>extremely</i> complex equipment.
<b>EEG/ERP, MEG, EROS...</b>	Passively reads brain function (tracks neural activity, <i>fast</i> ) in <i>still</i> subjects. Only reads cortical <i>surface</i> . Very <i>low</i> tolerance to noise.
<b>TMS/rTMS, tES (tDCS, tACS, tRNS), ECT...</b>	Actively stimulates function in <i>still</i> subjects. Limited to cortical <i>surface</i> . Can be painful/induce seizures. Mixed findings for some (tES).
<b>Single-unit recordings, ECoG, DBS, optogenetics...</b>	Invasive methods (require opening up the skull and often damaging cortical tissue). DBS and related tech have <i>multiple possible uses!</i>





# NEUROHYPE!

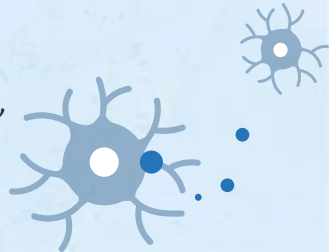
The human brain is **sexy** (for marketers)!

A “scientific-looking” image of a brain scan makes reader judge a text as more trustworthy.

Even when the text has *nothing* to do with neuroscience!

Hence the flourishing of “neuro-” prefixes across sectors and niches...

McCabe, DP, Castel, AD (2008) *Cognition*, 107.1: 343. [doi.org/10.1016/j.cognition.2007.07.017](https://doi.org/10.1016/j.cognition.2007.07.017)

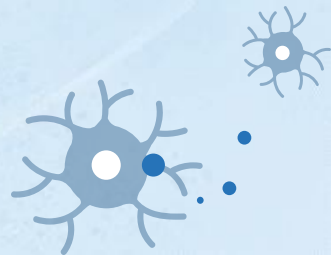




04

# CONCLUSIONS

A primer on *robust* neuroprivacy



# IS IT A *ROBUST* CONCERN?



## Attention

Only for high-grade equipment and specific variants of visual attention.  
(Or invasive technologies.)

2



## Fatigue

Yes, this is a *potential* concern!  
(But the research still needs to find more robust correlates of fatigue!)



## Emotion

Detecting emotions from neurotech is hampered by methodological issues with classifying/measuring emotion!



## Lie Detection

Confounding lie detection is as easy as it's always been. Don't be nervous, clench your jaw, wiggle your toes, etc.



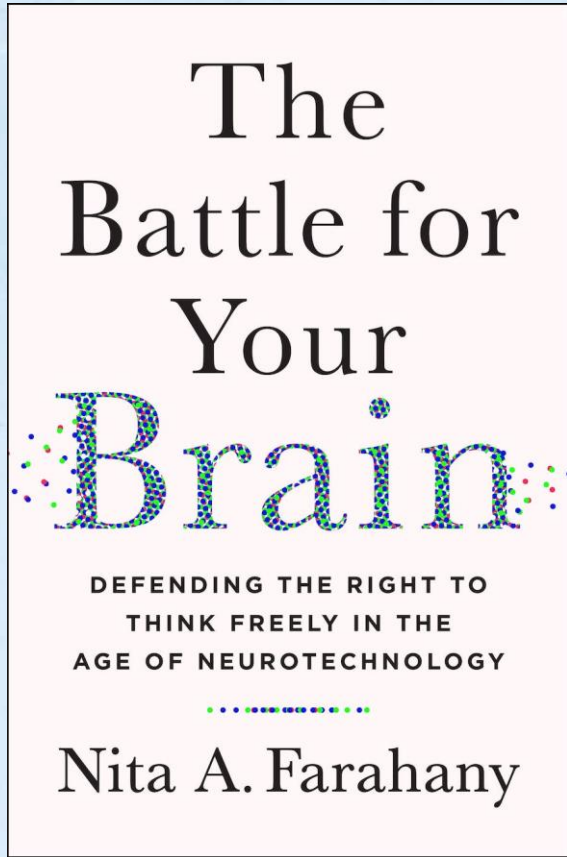
## Secrets

Only for high-grade equipment and hyper-specific experimental setups!  
(Or invasive technologies.)



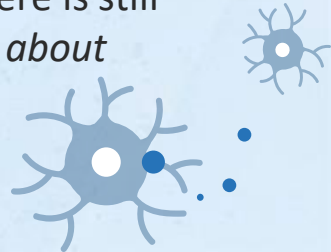
## Manipulation

For invasive technologies, possibly.  
For anything else: NOT A CHANCE!



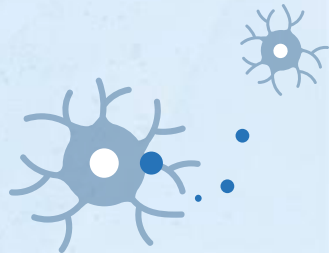
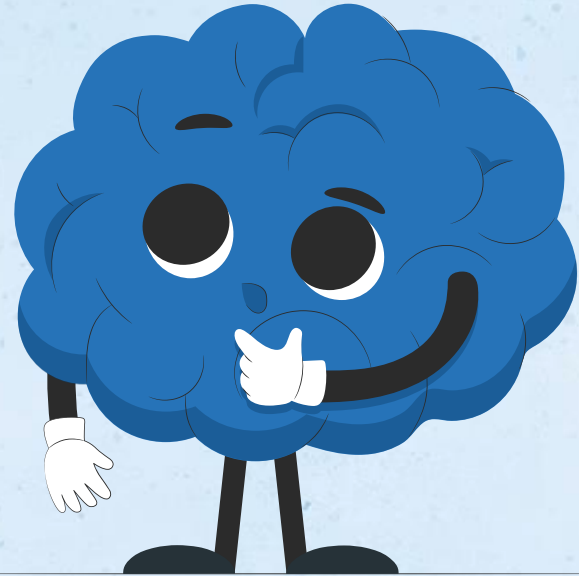
## FINAL THOUGHTS

- Technology introduces a number of novel privacy concerns (or strengthens existing ones)
- Conceivably, neurotechnology makes many of these far more worrying...
- **BUT:** Almost *all* these worries are about *potential* future uses of neurotechnology
- **AND:** Even in a “perfect” neuro-manipulation context, there is still *too much we don’t know about the brain!*



**CAN NEUROTECHNOLOGY  
BE USED TO SURREPTI-  
TIOUSLY GAIN ACCESS TO  
YOUR INNERMOST  
SECRETS?**

**NOPE!**



# THANKS!

Any questions?

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