Neurons and the Brain

Motivations

Neural Networks: Representation

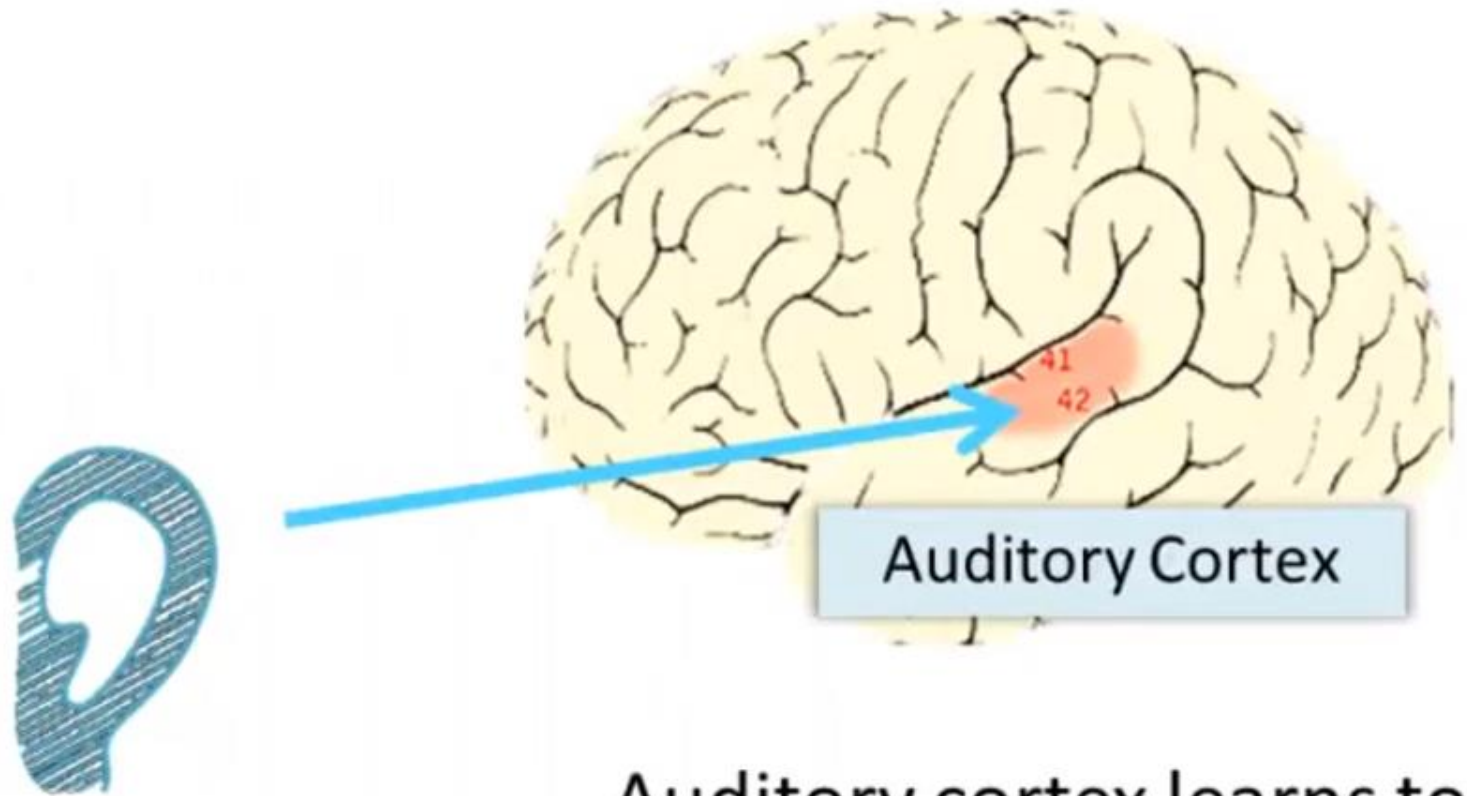
Introduction

- Neural Networks are a pretty old algorithm that was originally motivated by the goal of having machines that can mimic the brain.
- Now in this class, we will learn Neural Networks with you because they work really well for different machine learning problems and not, certainly not because they're logically motivated.

Introduction

- Origins: Algorithms that try to mimic the brain.
- Was very widely used in 80s and early 90s
  - However popularity diminished in late 90s. Why?
  - They are computationally expensive!
- Recent resurgence: State of the art technique for many applications
  - Computers are fast today!
- Brain is amazing
  - Touch, feel, know calculus, statistics, see,
- So if you want to mimic the brain, you have to write lots of codes for different things that the brain does.
- **Amazing fact:** the way the brain does it, is worth just a single learning algorithm

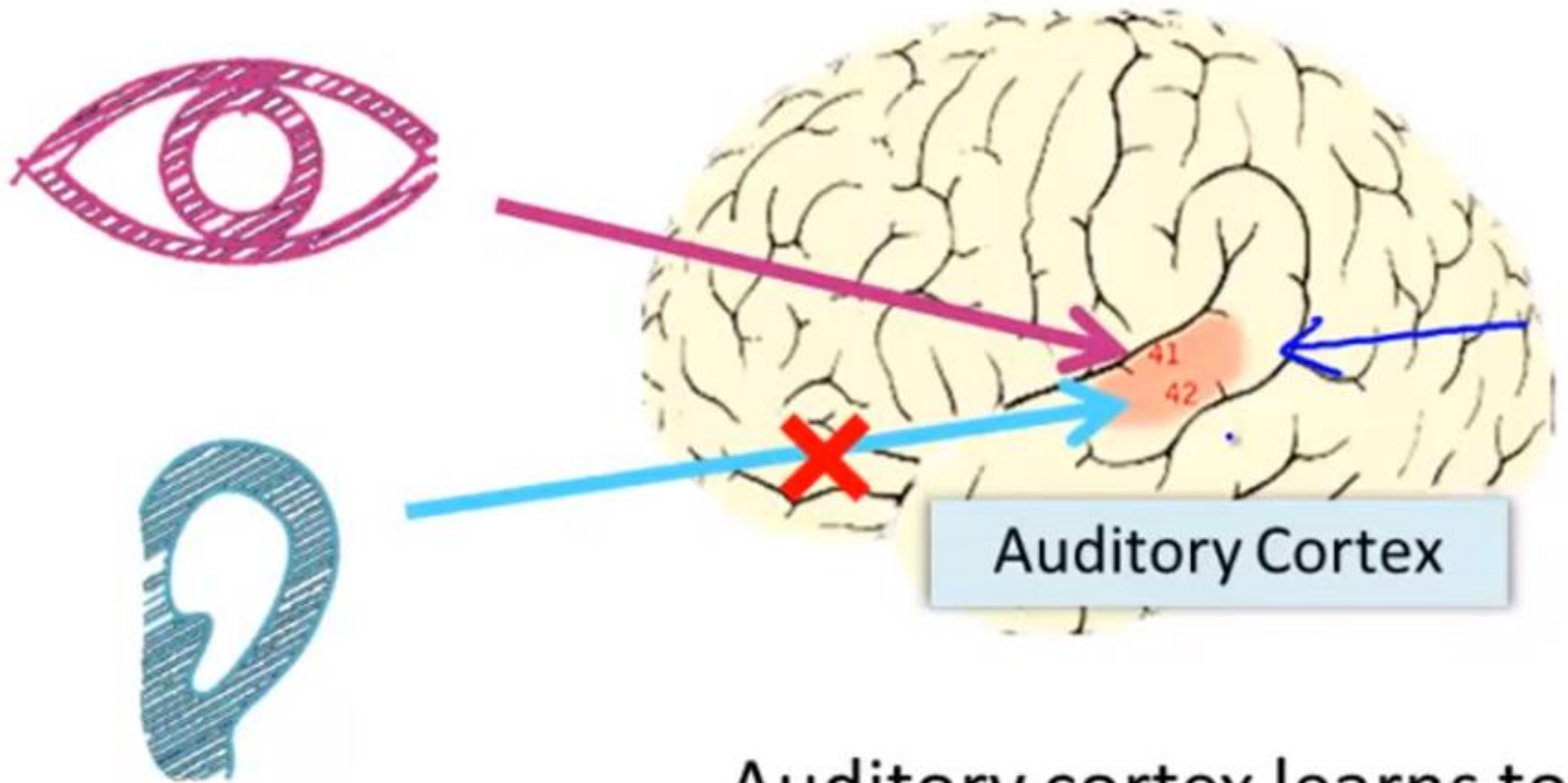
The “one learning algorithm” hypothesis



Auditory cortex learns to see

[Roe et al., 1992]

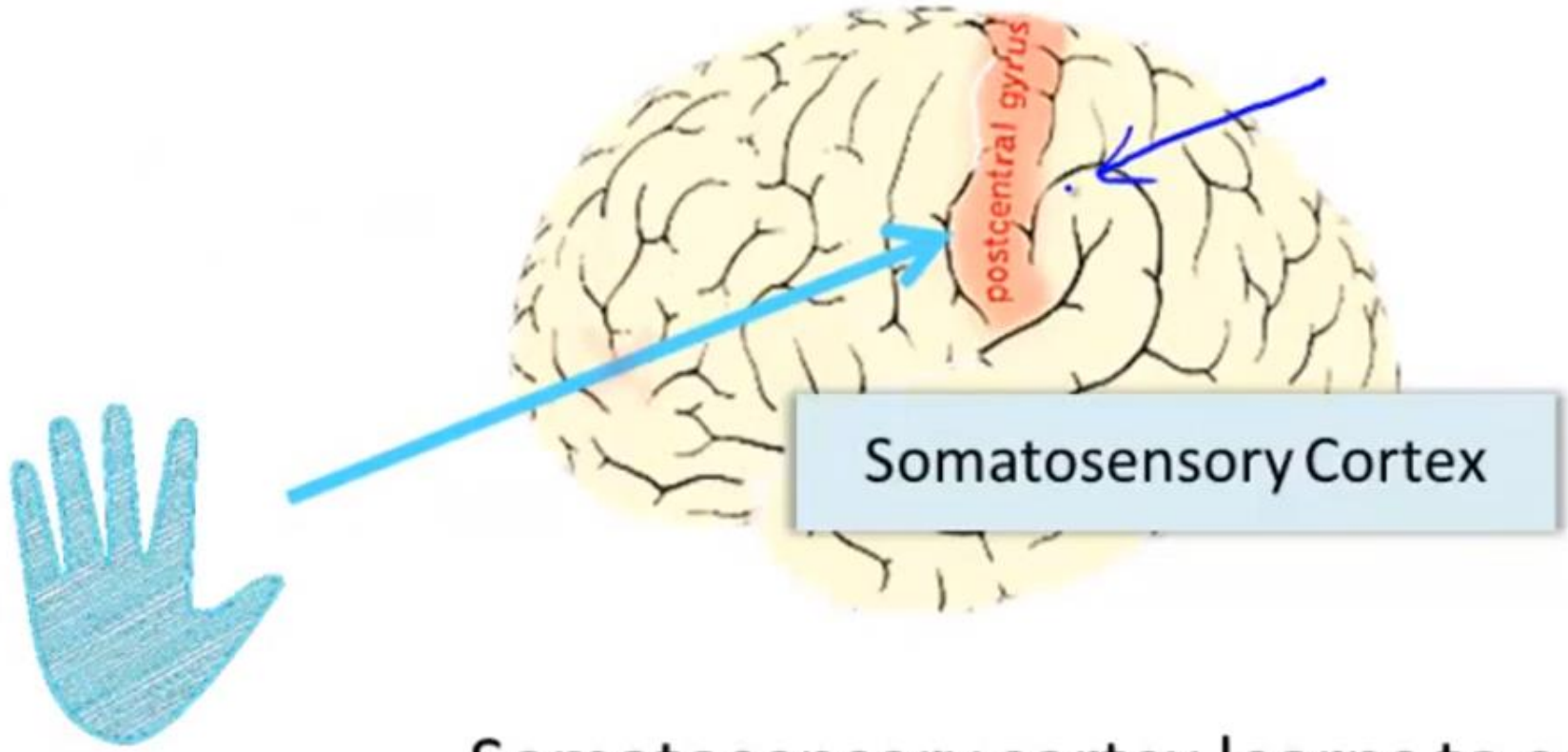
The “one learning algorithm” hypothesis



Auditory cortex learns to see

[Roe et al., 1992]

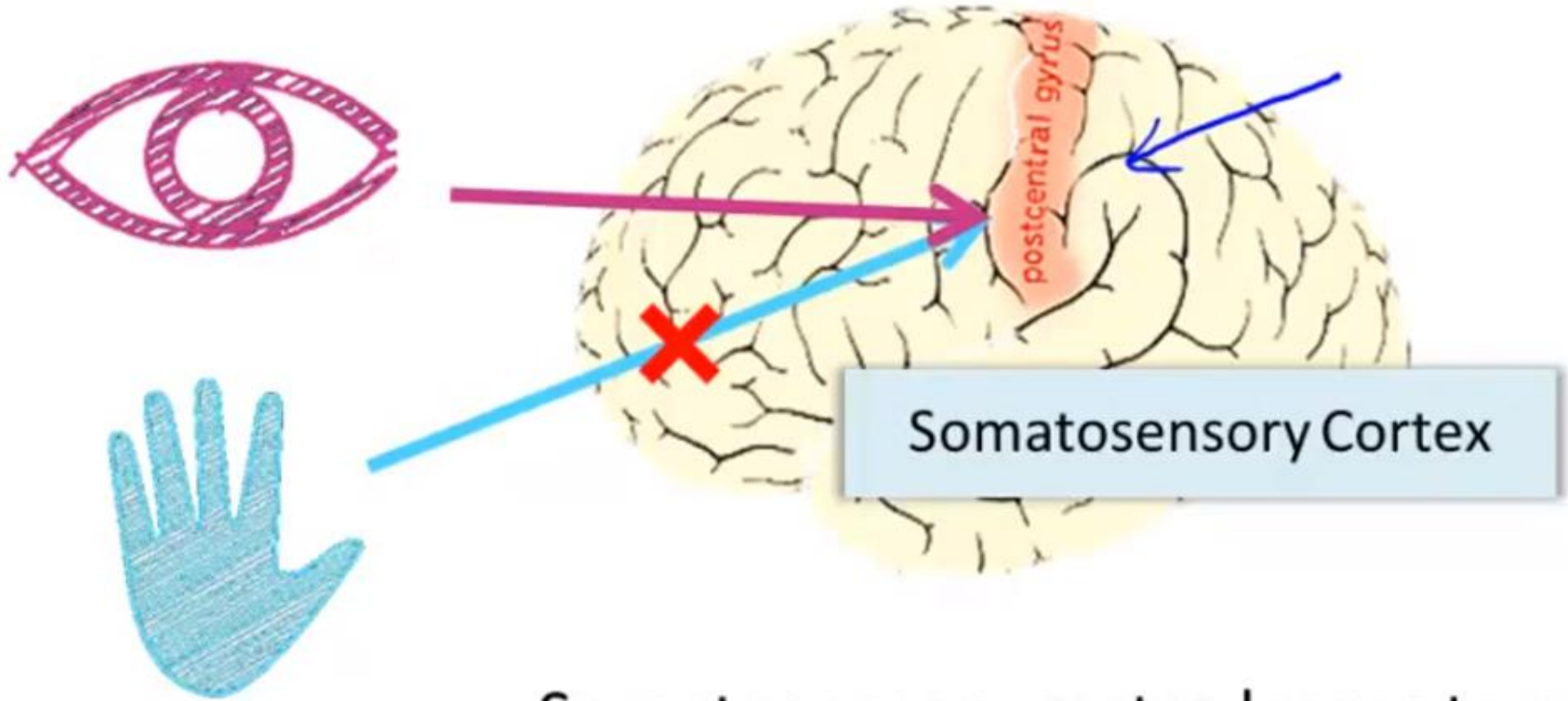
The “one learning algorithm” hypothesis



Somatosensory cortex learns to see

[Metin & Frost, 1989]

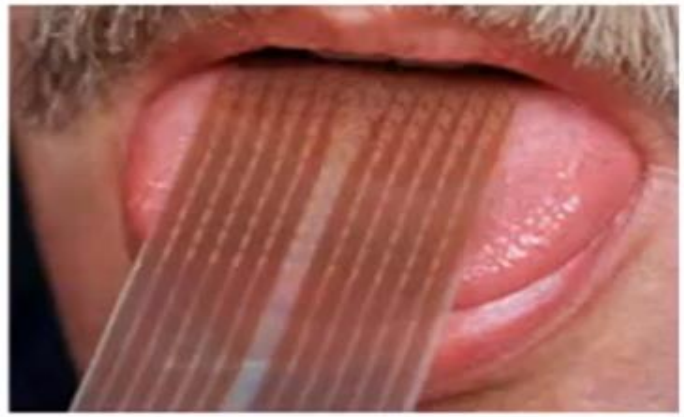
The “one learning algorithm” hypothesis



Somatosensory cortex learns to see

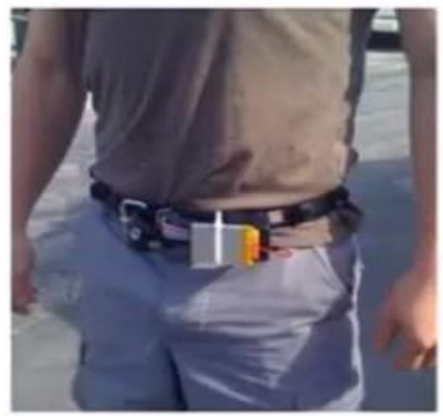
[Metin & Frost, 1989]

Sensor representations in the brain



Seeing with your tongue

Human echolocation (sonar)



Haptic belt: Direction sense

Implanting a 3rd eye

[BrainPort; Welsh & Blasch, 1997; Nagel et al., 2005; Constantine-Paton & Law, 2009]

Andrew Ng

https://www.coursera.org/learn/machine-learning/lecture/IPmzw/neurons-and-the-brain

The Brain

- https://www.youtube.com/watch?v=Wby1CIhnYWI

- So, it's pretty amazing to what extent is as if you can plug in almost any sensor to the brain and the brain's learning algorithm will just figure out how to learn from that data and deal with that data!