

Can machines learn how to make bionic vision better?

STUDENT
Jamin Wu

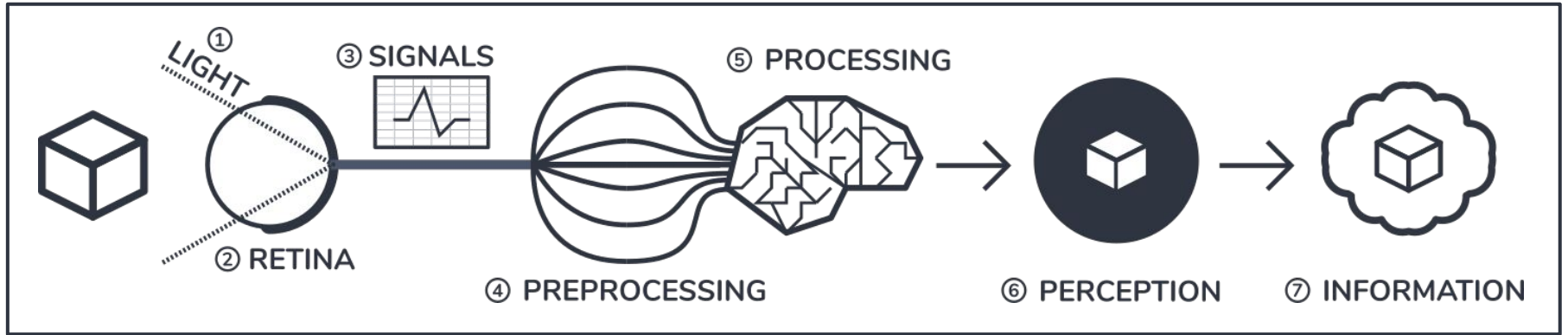
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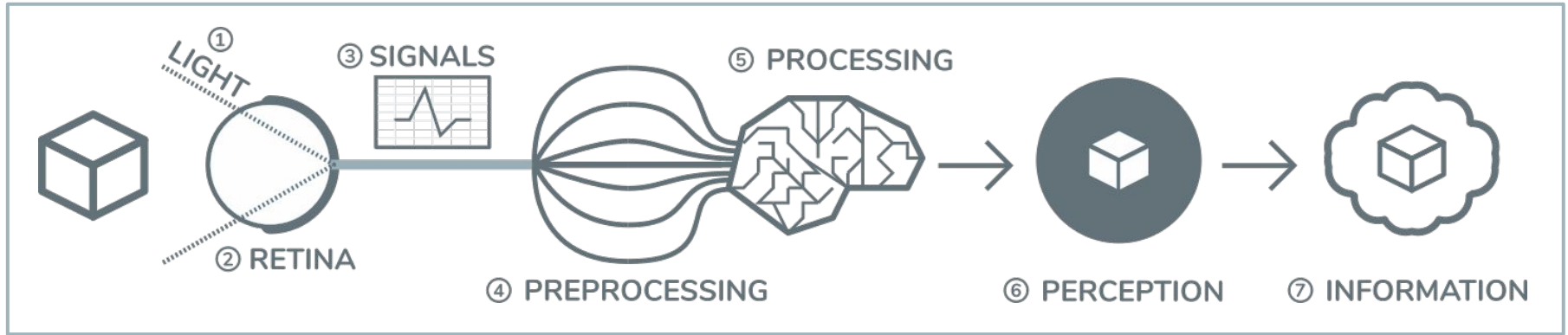


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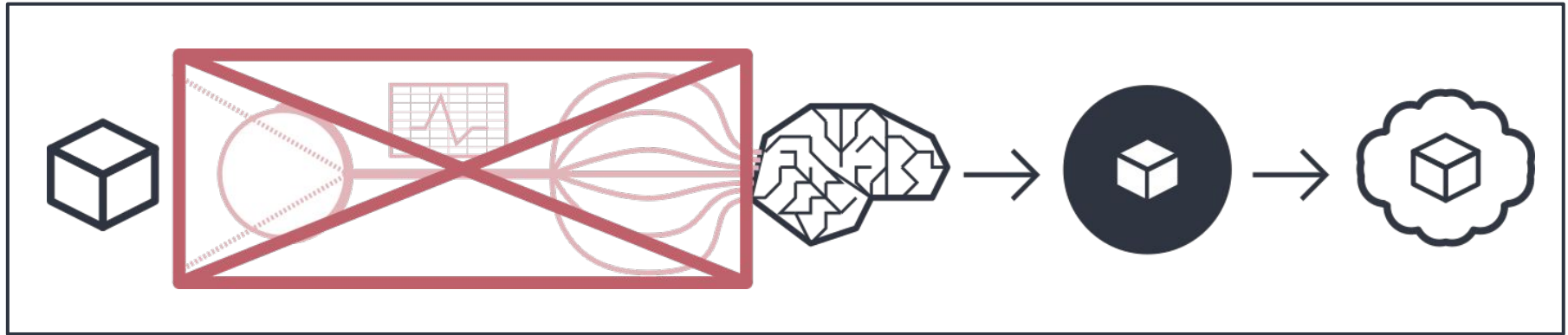
NORMAL VISION



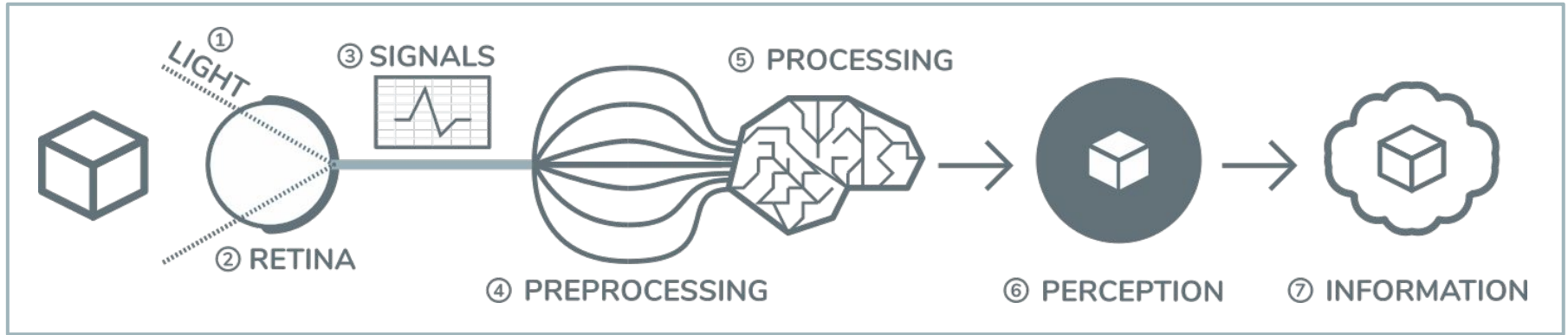
NORMAL VISION



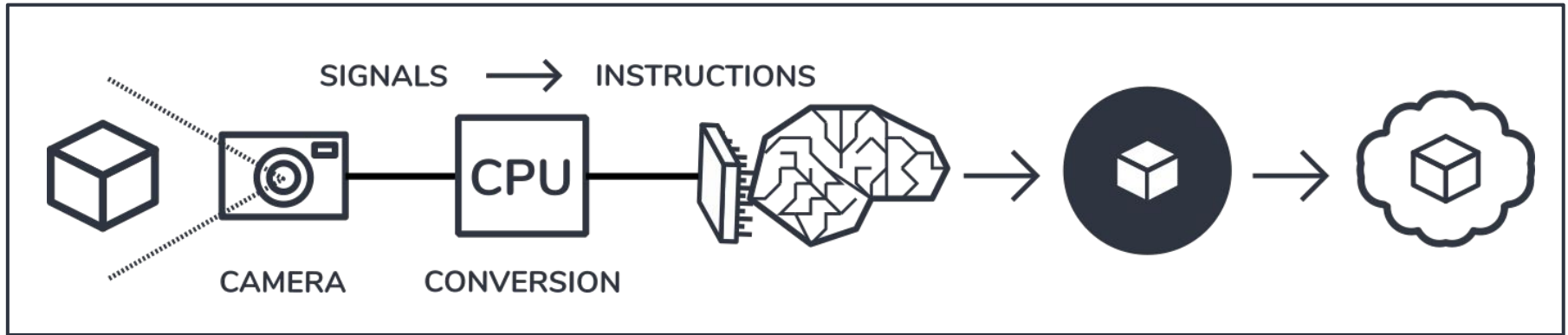
LOSS OF VISION



NORMAL VISION

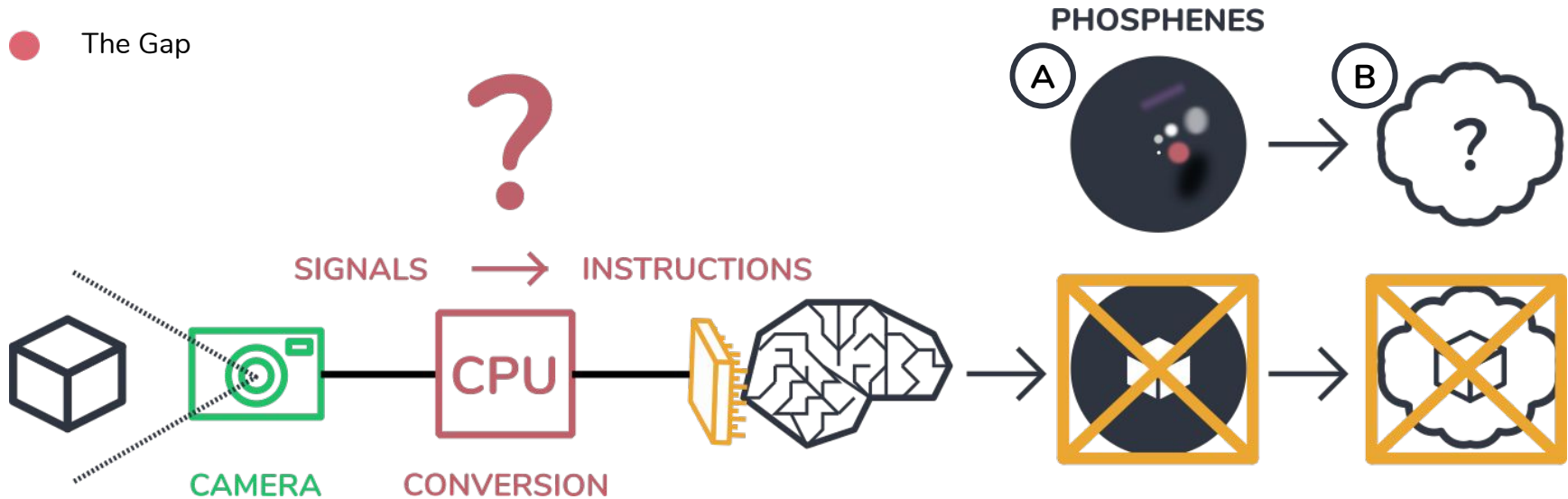
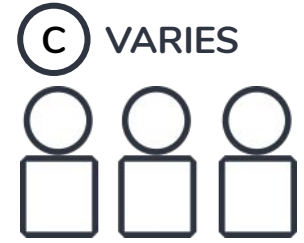


BIONIC VISION



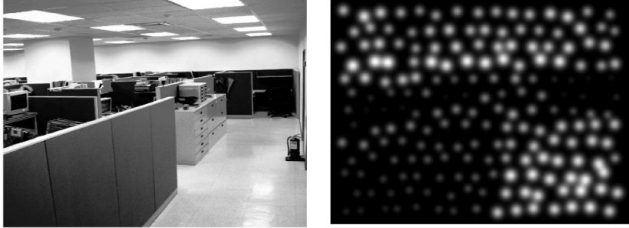
THE STORY SO FAR...

- Established
- Getting There
- The Gap

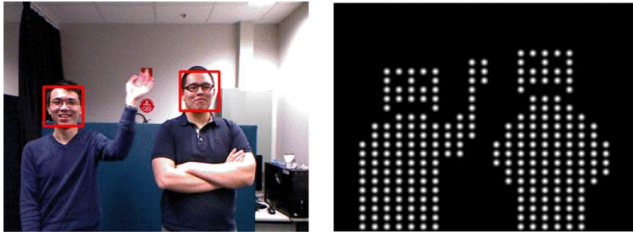
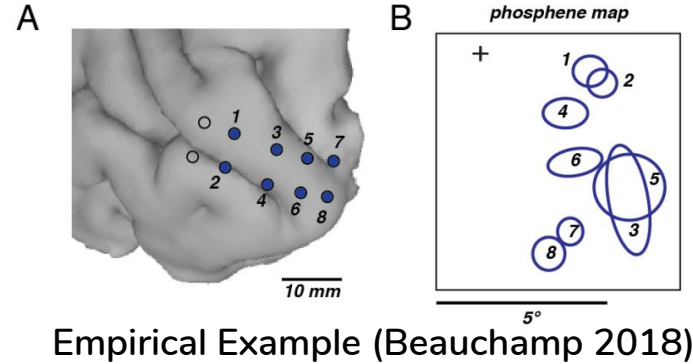


THE STORY SO FAR...

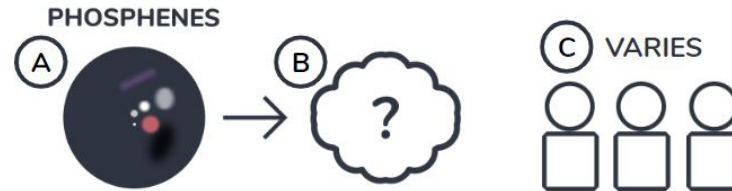
(simulated: expecting worse than this!)



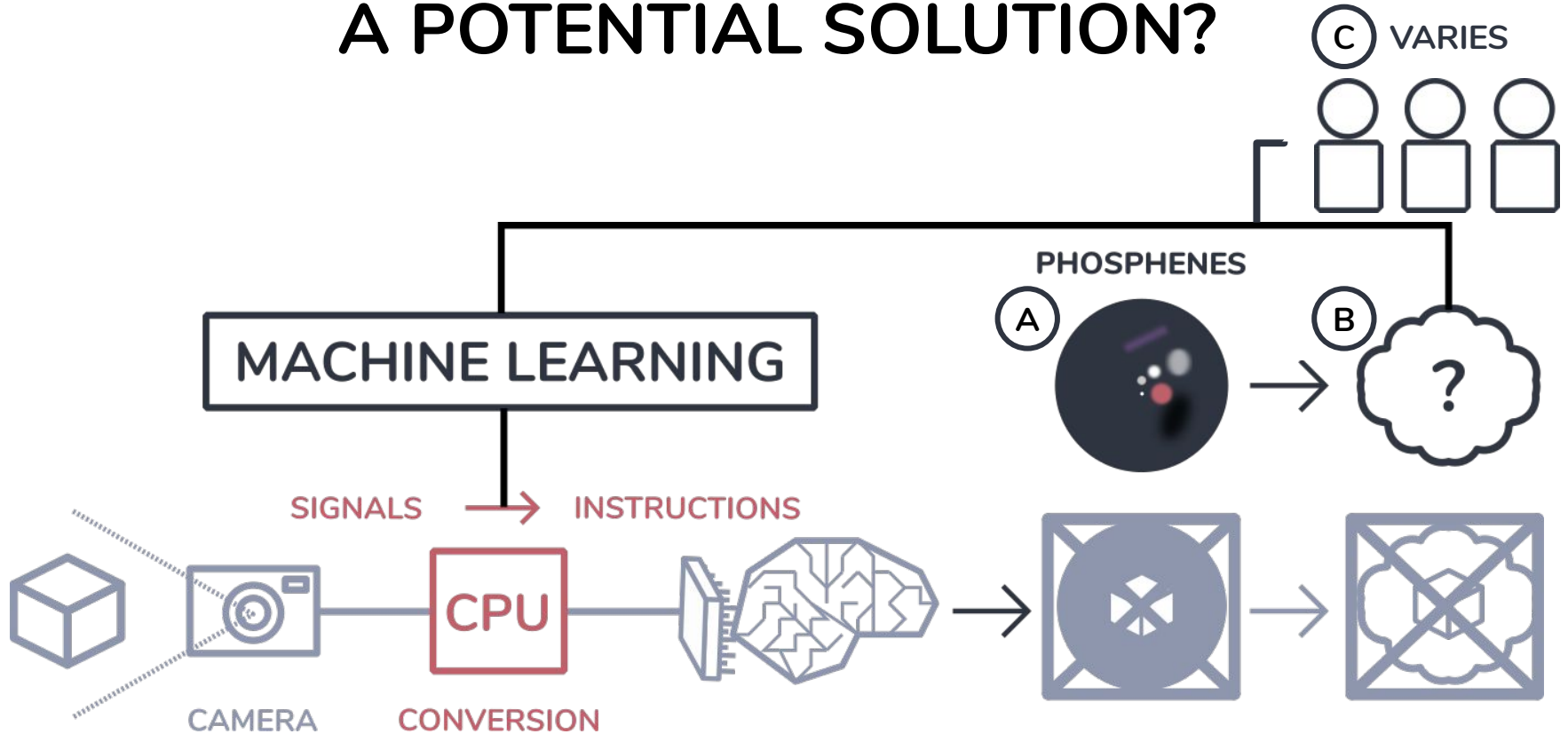
Brightness (Chen et al. 2009)



Transformative (Lui et al. 2012)



A POTENTIAL SOLUTION?



AIMS

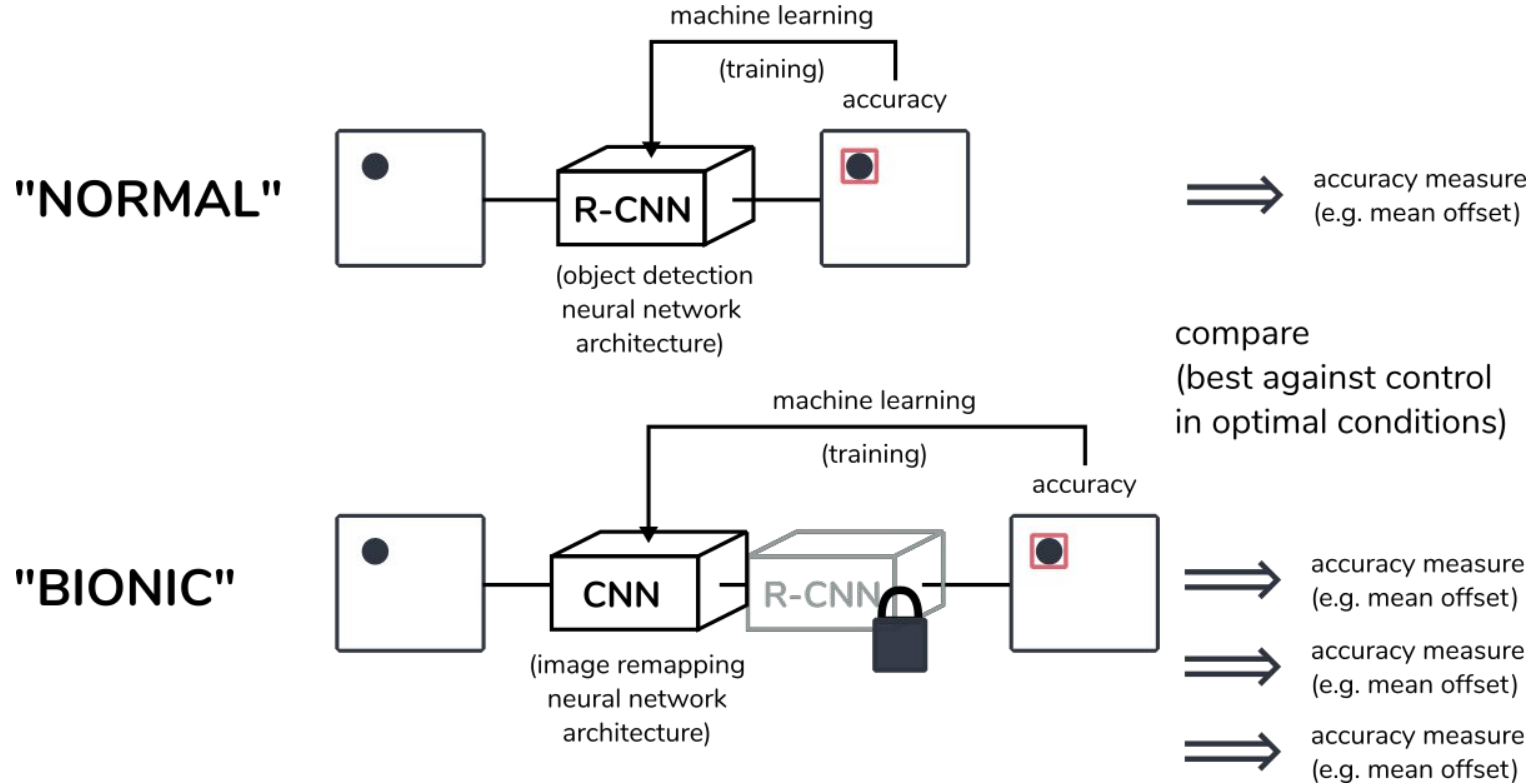
- 1) **Develop a model** for optimising image conversion based on task performance using machine learning techniques.
- 2) **Determine experimentally** if machine-learned image conversion improves performance compared to a no-information control.
- 3) **Determine experimentally** if machine-learned image conversion improves performance compared to existing bionic vision conversion methods.

HYPOTHESES

- A)** Machine-learned image conversion improves task performance compared to a no-information control.
- B)** Machine-learned image conversion improves task performance compared to existing bionic vision conversion methods.

METHOD (AIM I)

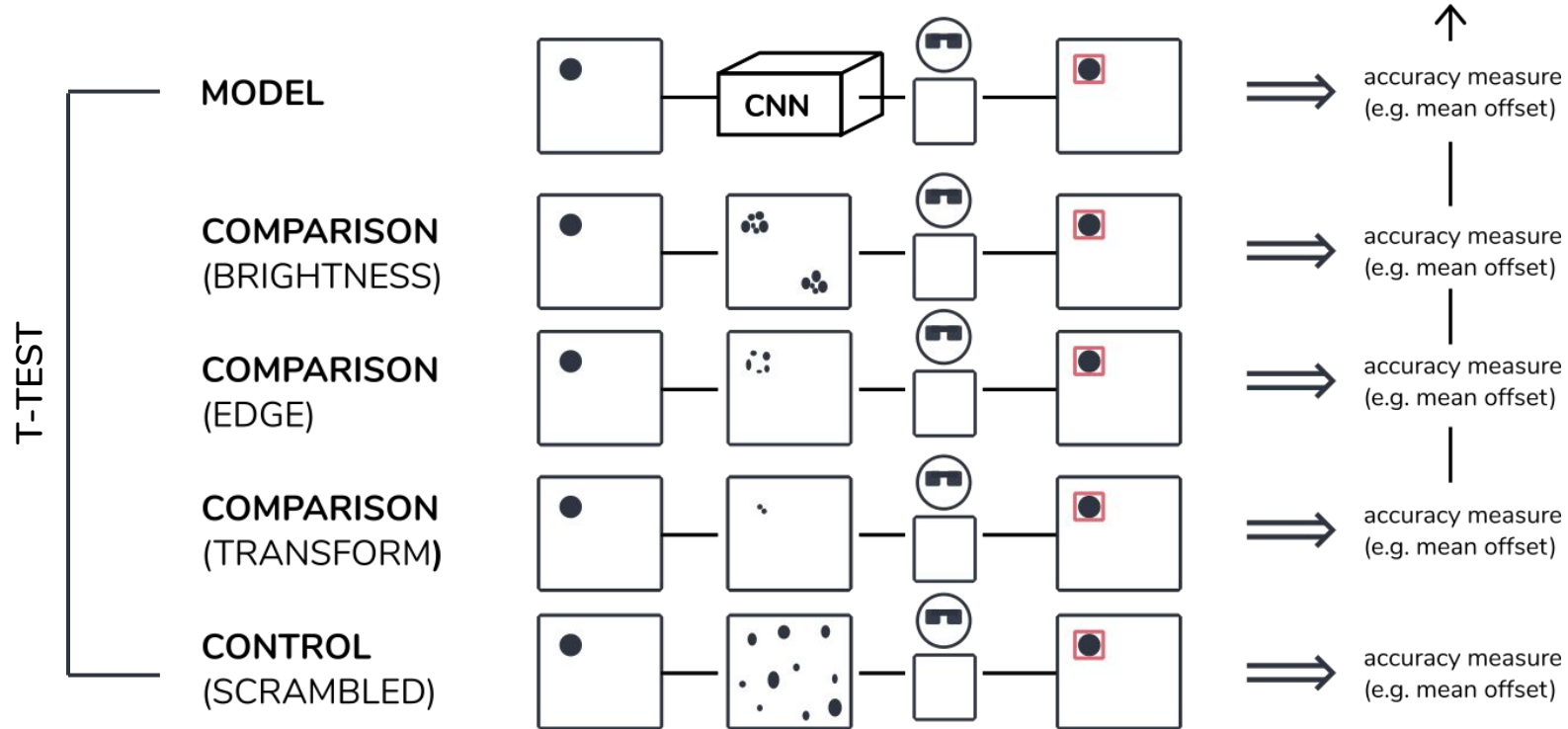
APR | MAY | JUN | JUL



METHOD (AIM II / III)

JUL | AUG | SEP | OCT

All with TRAINING phase and TESTING phase



Current bionic vision image processing is based on presumptions on percepts.

A percept-agnostic framework to learn image processing would be flexible for anyone.

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BACKUP SLIDES



Courtesy of Monash Vision Group

Chen, S., Suanning, G., Morley, J. and Lovell, N. (2009). Simulating prosthetic vision: II. Measuring functional capacity. *Vision Research*, 49(19), pp.2329-2343.

Lui, W., Browne, D., Kleeman, L., Drummond, T. and Wai Ho Li (2012). Transformative Reality: Improving bionic vision with robotic sensing. *2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society*.

Beauchamp, M., Bosking, W., Sun, P., Foster, B., Niketeghad, S., Pouratian, N. and Yoshor, D. (2018). Dynamic Electrical Stimulation of Sites in Visual Cortex Produces Form Vision in Sighted and Blind Humans.

Image References