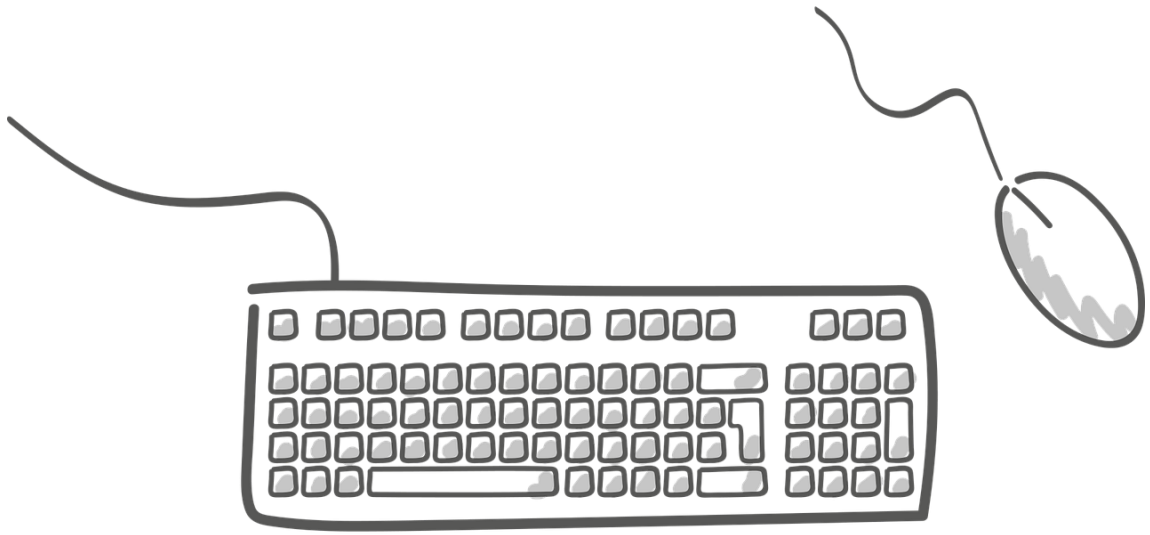
INTRODUCTION TO PSAW

Krzysztof Kutt, PhD
PSAW course, WFAIS UJ

IF YOU HAD A CHOICE, WHICH WOULD YOU PREFER?



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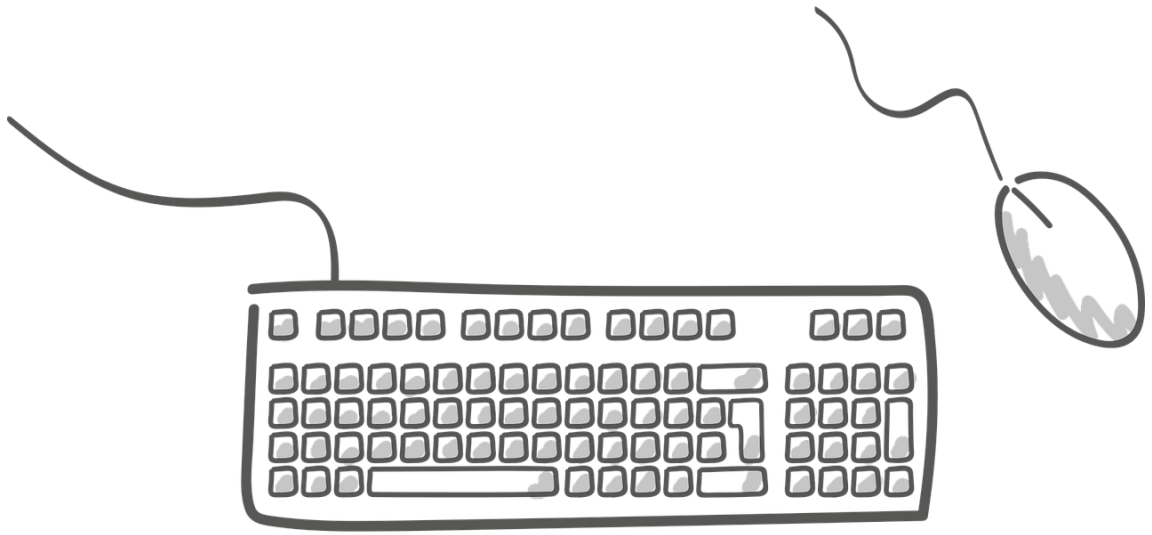


HUMAN-IN-THE-LOOP

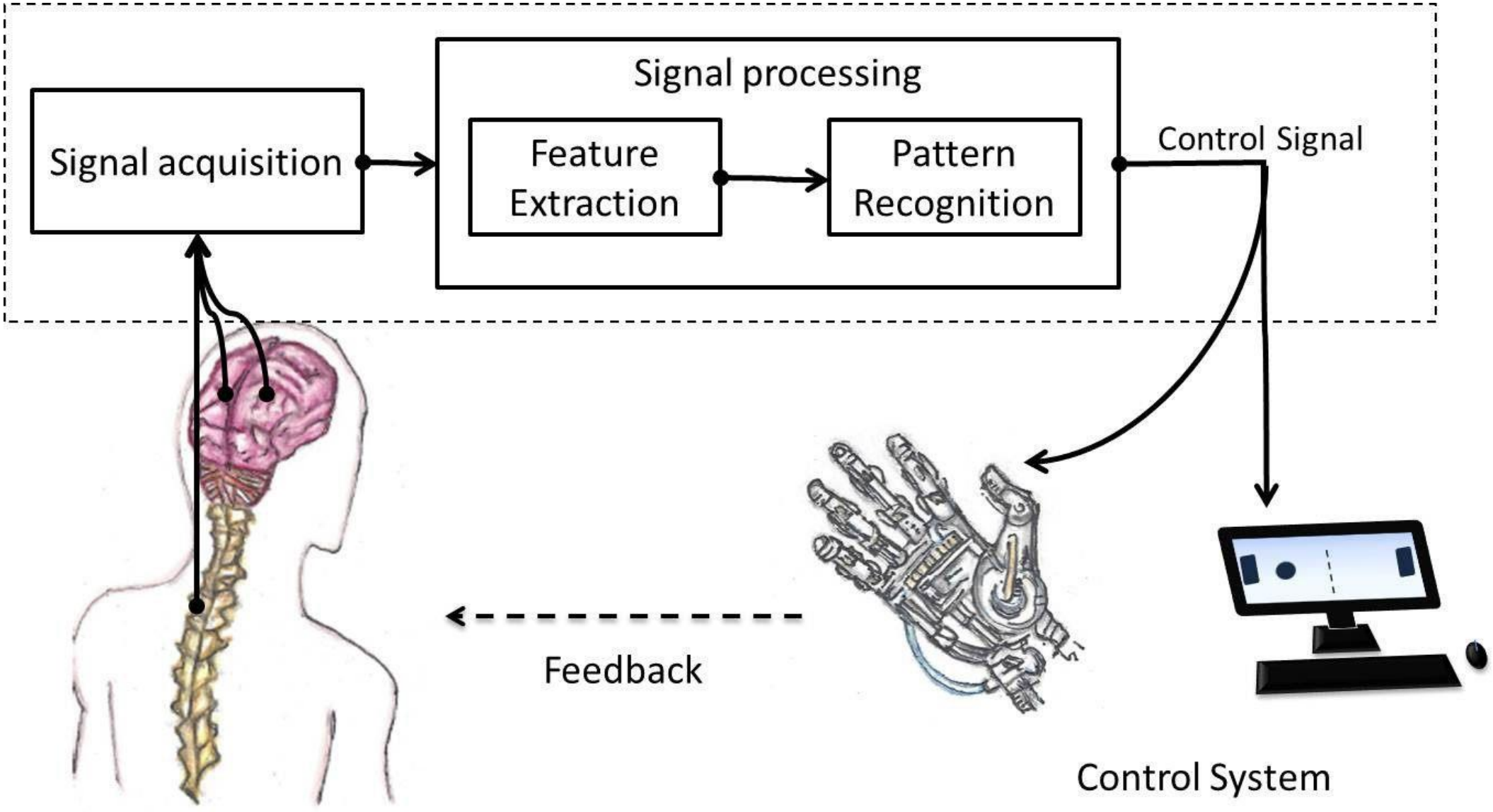
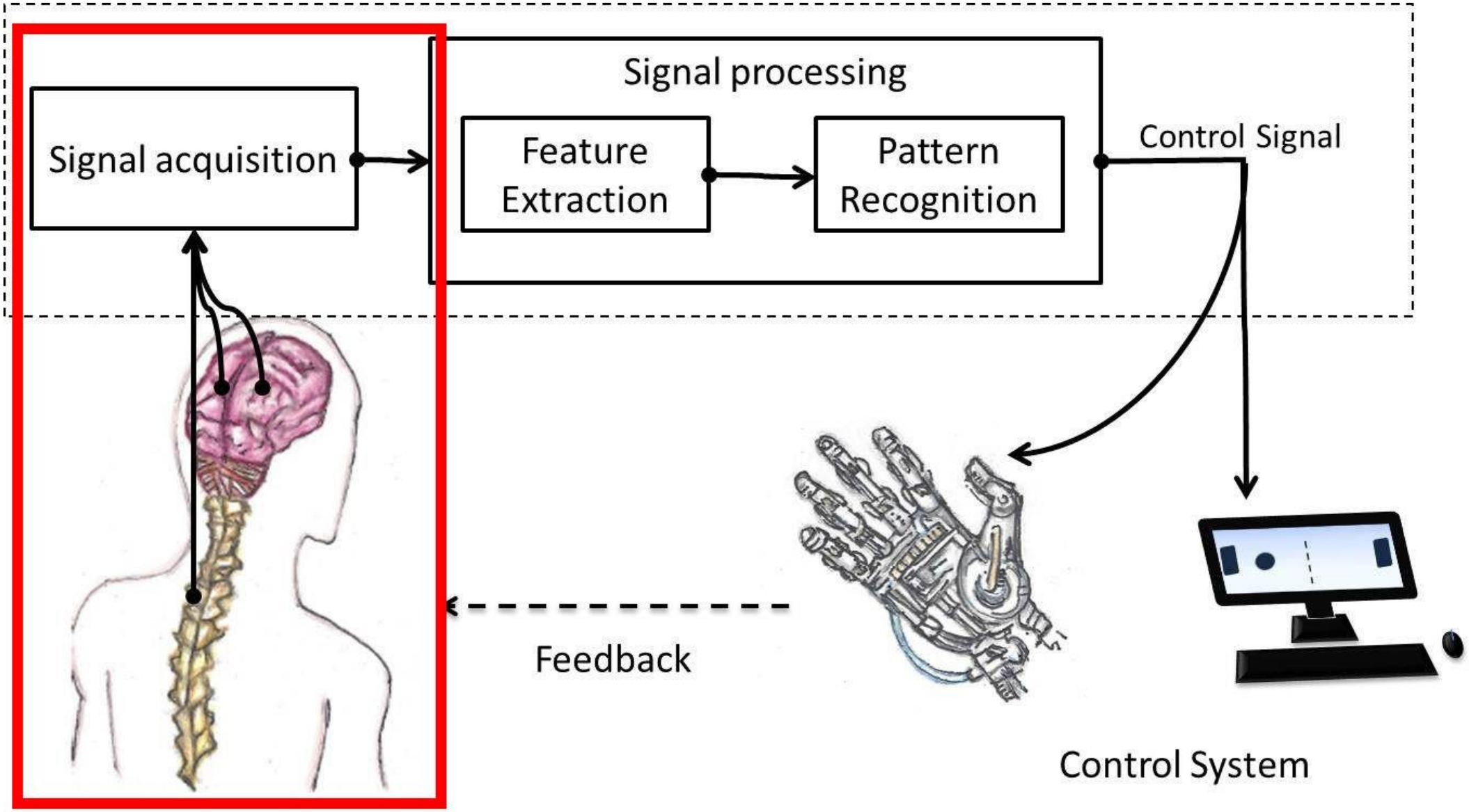


Image from Quora.



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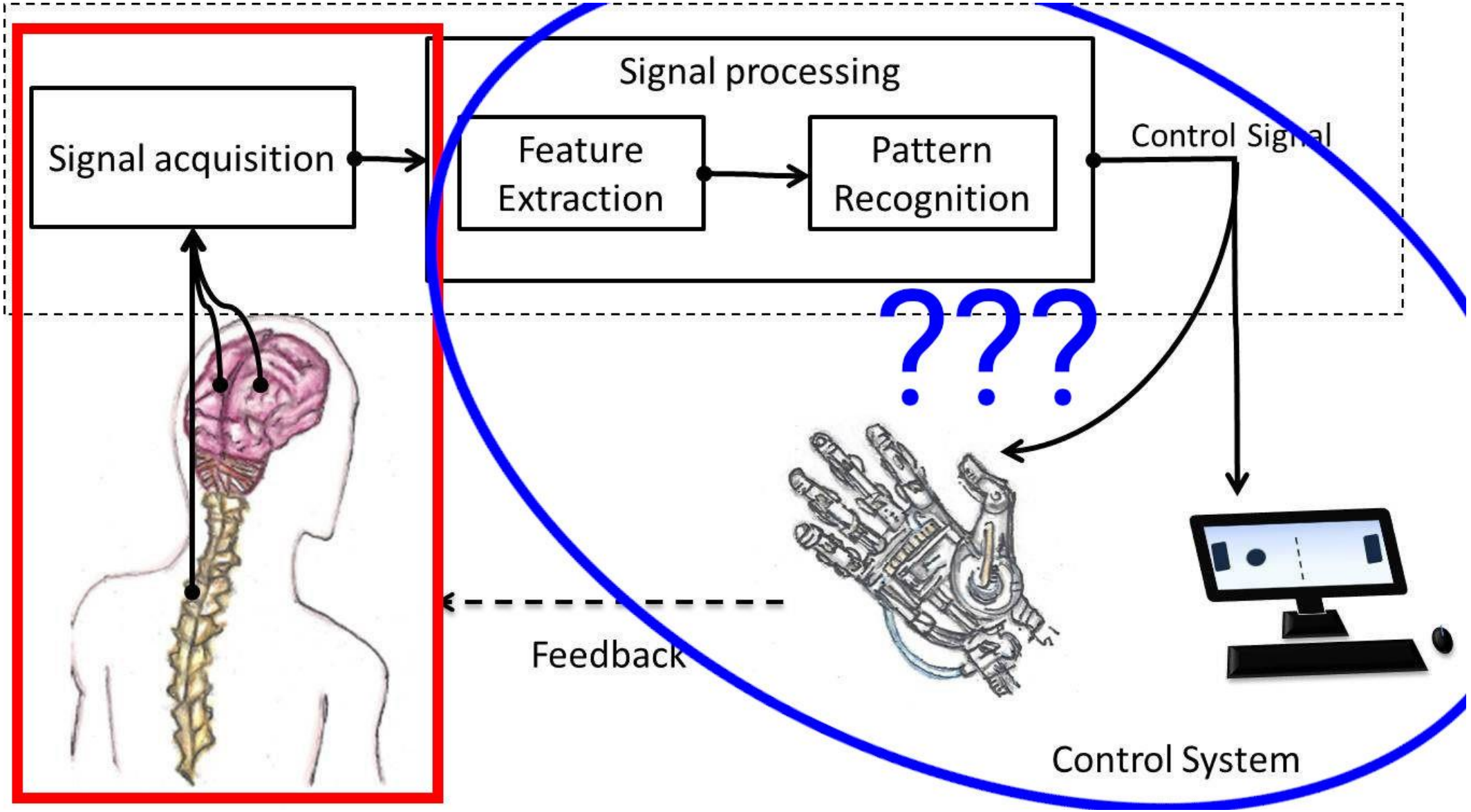

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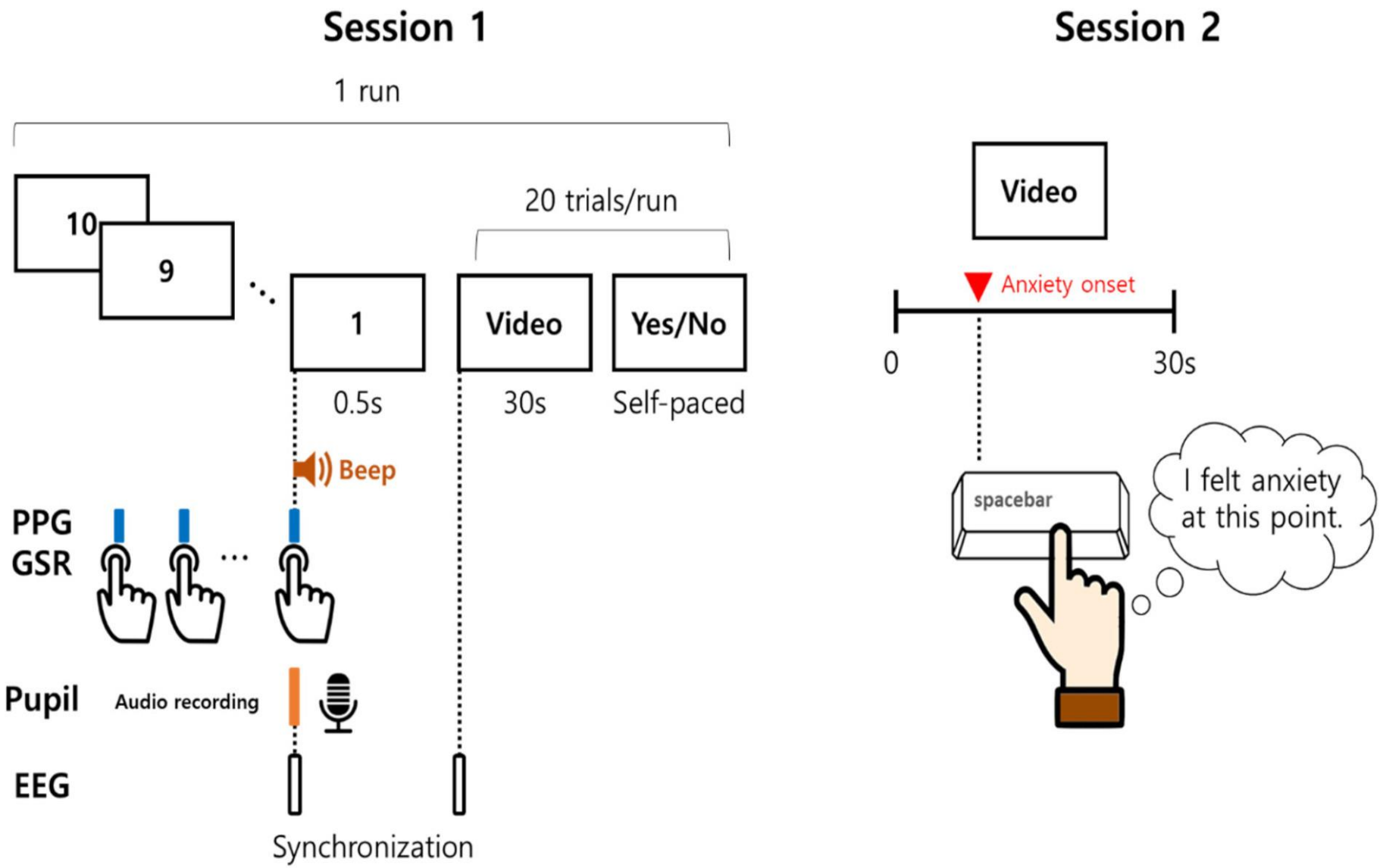


Source: S. Lee et al. (2020), Detection of Drivers' Anxiety Invoked by Driving Situations Using Multimodal Biosignals, Processes, 8(2), 155

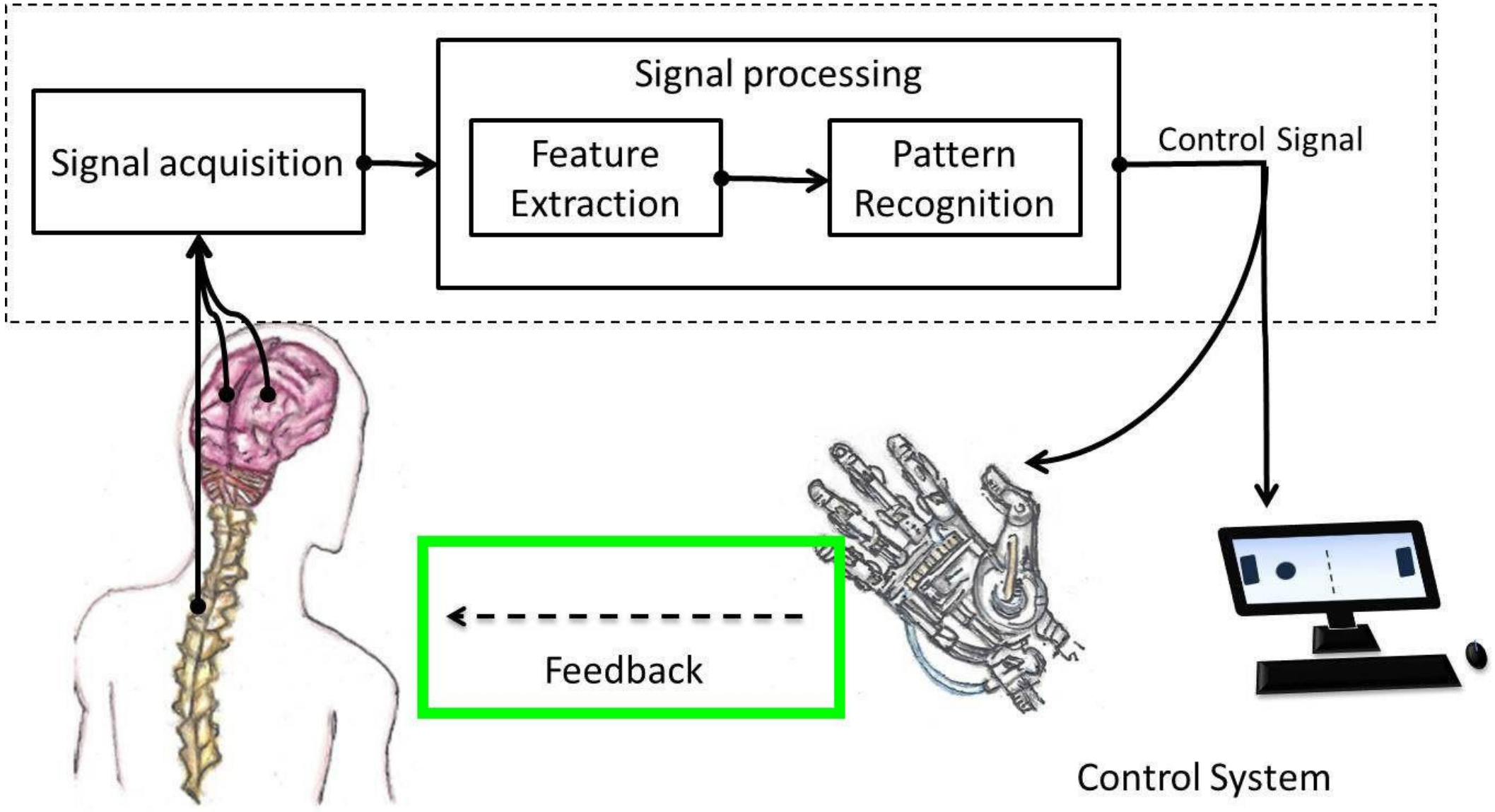


Image from Quora.

SIGNAL ACQUISITION

HOW TO GET THEM?

THERE ARE MEDICAL/RESEARCH CLASS DEVICES, BUT…

Image from Depositphotos.

… THEY ARE IMPRACTICAL (AND EXPENSIVE)

Image from Mail Online.

WEARABLES

WEARABLES

SIGNALS OVERVIEW

IT'S ALL ABOUT SIGNALS!

ELECTROCARDIOGRAPHY (ECG)

- **Setup?**
  Electrodes placement?
  Analog-Digital Converter parameters?

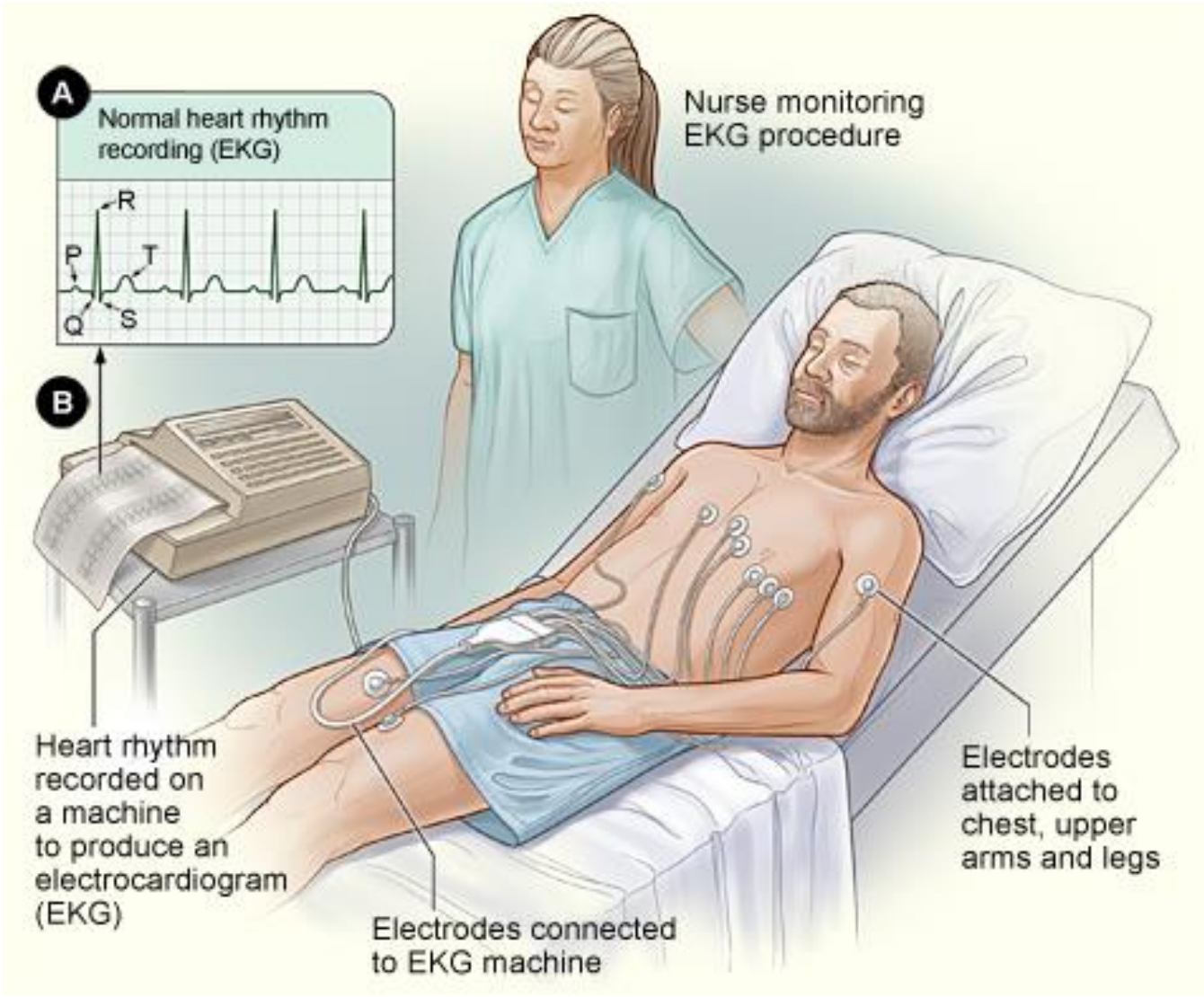
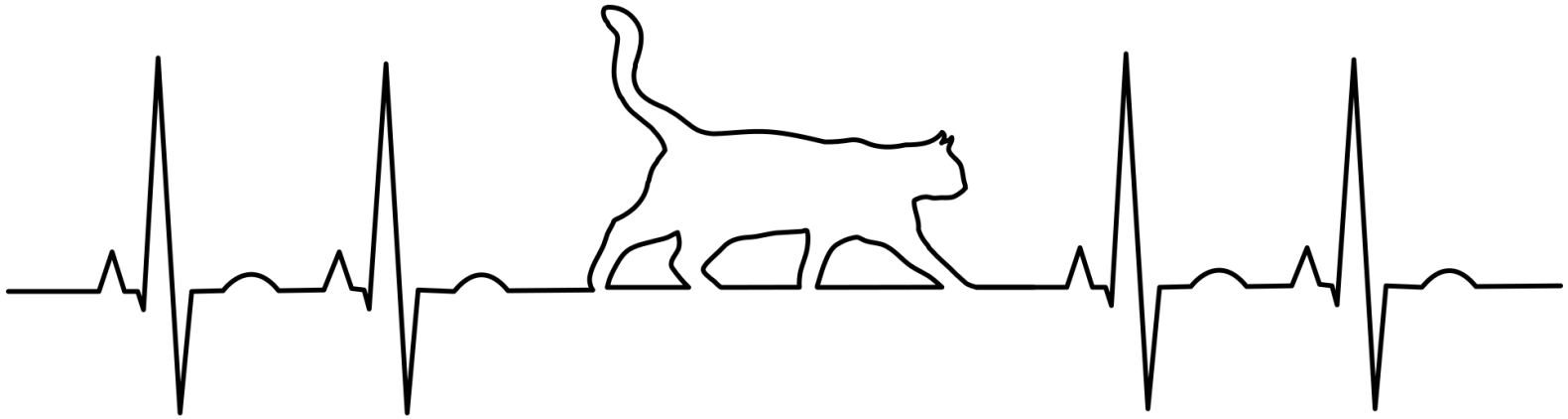


Image from Wikimedia Commons.

ELECTROCARDIOGRAPHY (ECG)

- **Setup?**
  Electrodes placement?
  Analog-Digital Converter parameters?
- **Quality of the signal?**
  Common artifacts?



ELECTROCARDIOGRAPHY (ECG)

- **Setup?**
  Electrodes placement?
  Analog-Digital Converter parameters?
- **Quality of the signal?**
  Common artifacts?
- **Useful features?**

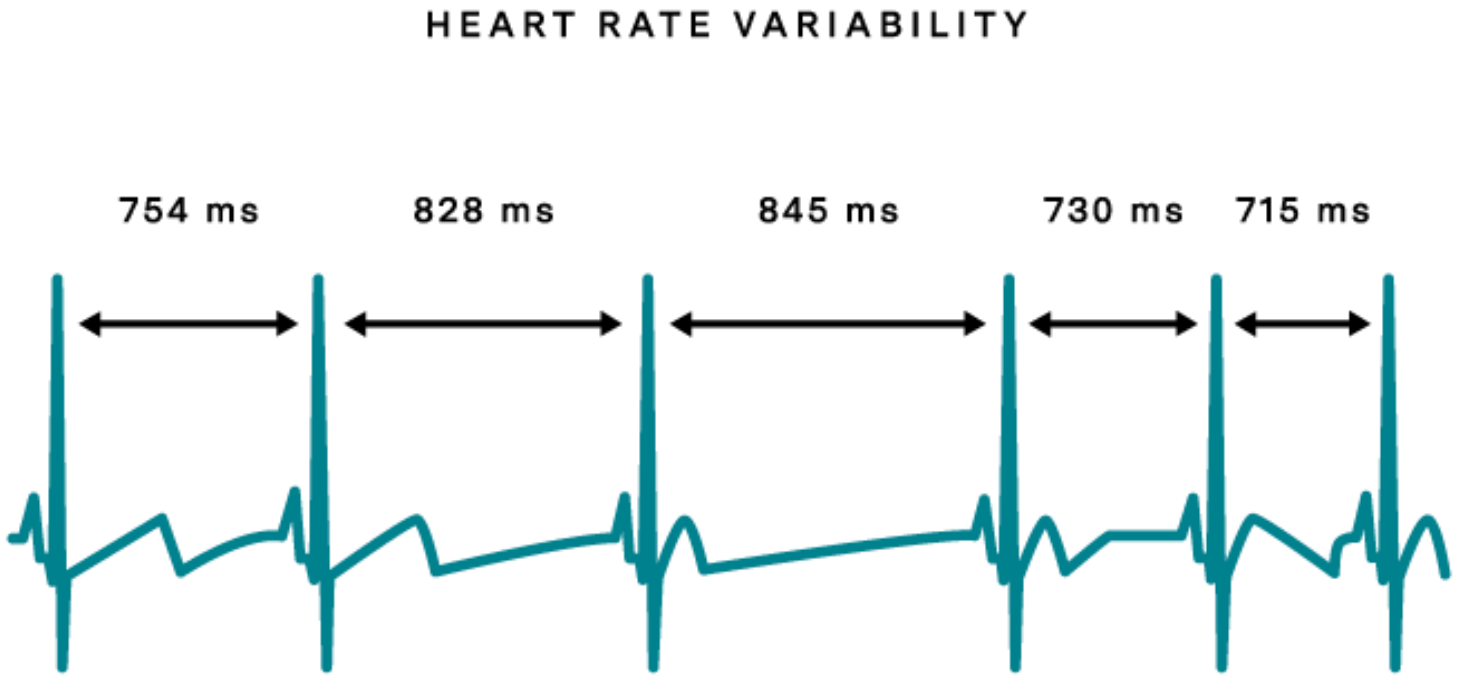


Image from Oura.

ELECTROCARDIOGRAPHY (ECG)

- **Setup?**
  Electrodes placement?
  Analog-Digital Converter parameters?
- **Quality of the signal?**
  Common artifacts?
- **Useful features?**
- **What else?**
  There are also PPG (photoplethysmography) and ABP (arterial blood pressure)

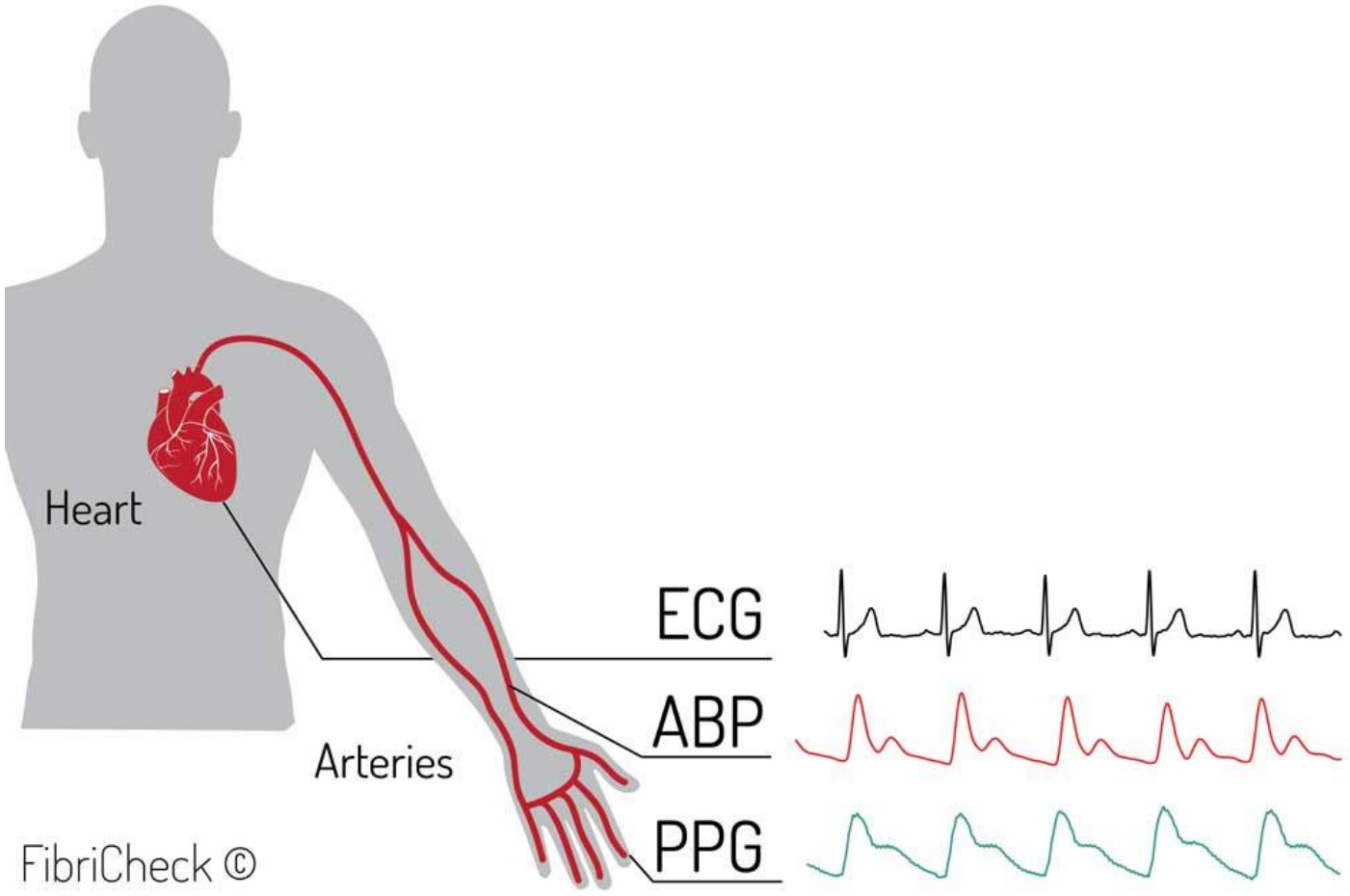


Image from FibriCheck.

ELECTROMYOGRAPHY (EMG)

- **Setup?**
  Electrodes placement?
  Analog-Digital Converter parameters?
- **Quality of the signal?**
  Common artifacts?
- **Useful features?**
- **What else?**

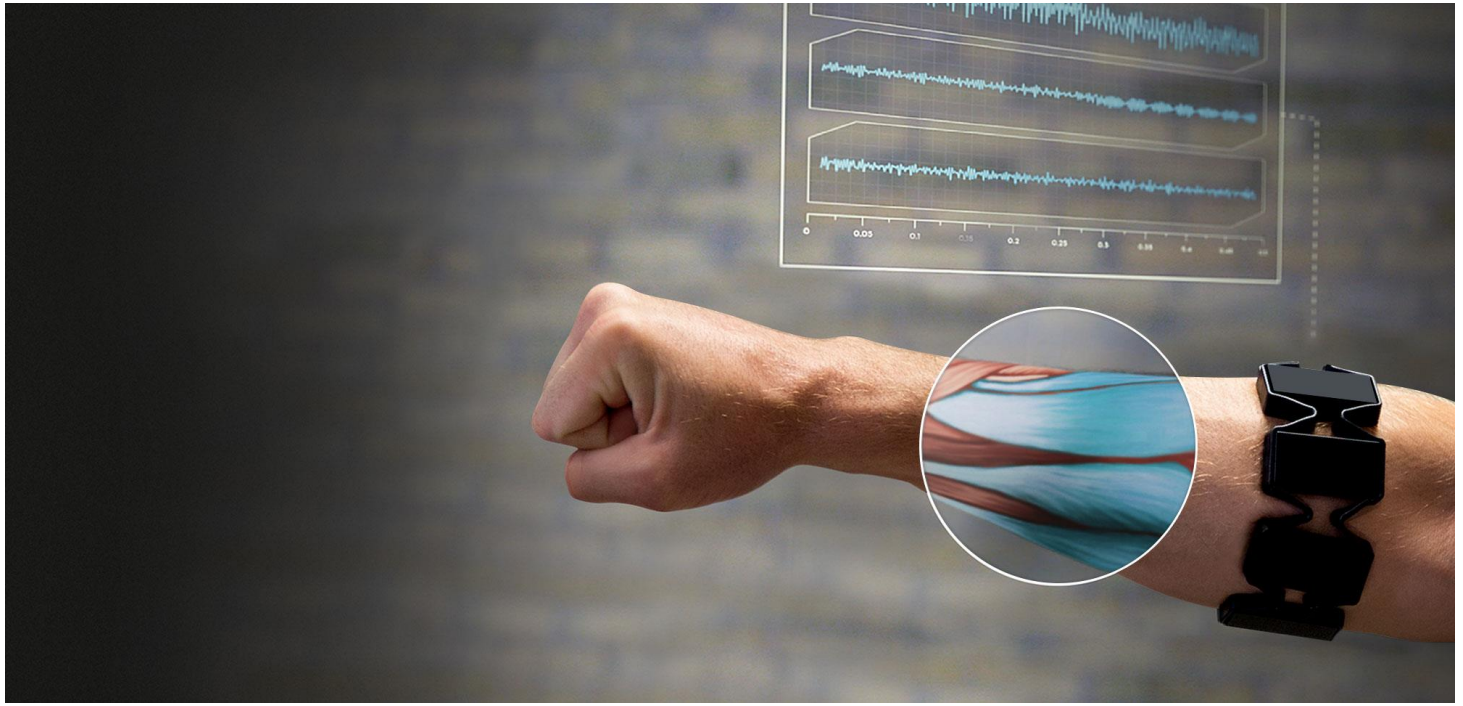


Image from Myo.

ELECTRODERMAL ACTIVITY (EDA)

- **Setup?**
  Electrodes placement?
  Analog-Digital Converter parameters?
- **Quality of the signal?**
  Common artifacts?
- **Useful features?**
- **What else?**

Image from Wareable.com.

ELECTRO-ENCEPHALOGRAPHY (EEG)

- **Setup?**
  Electrodes placement?
  Analog-Digital Converter parameters?
- **Quality of the signal?**
  Common artifacts?
- **Useful features?**
- **What else?**

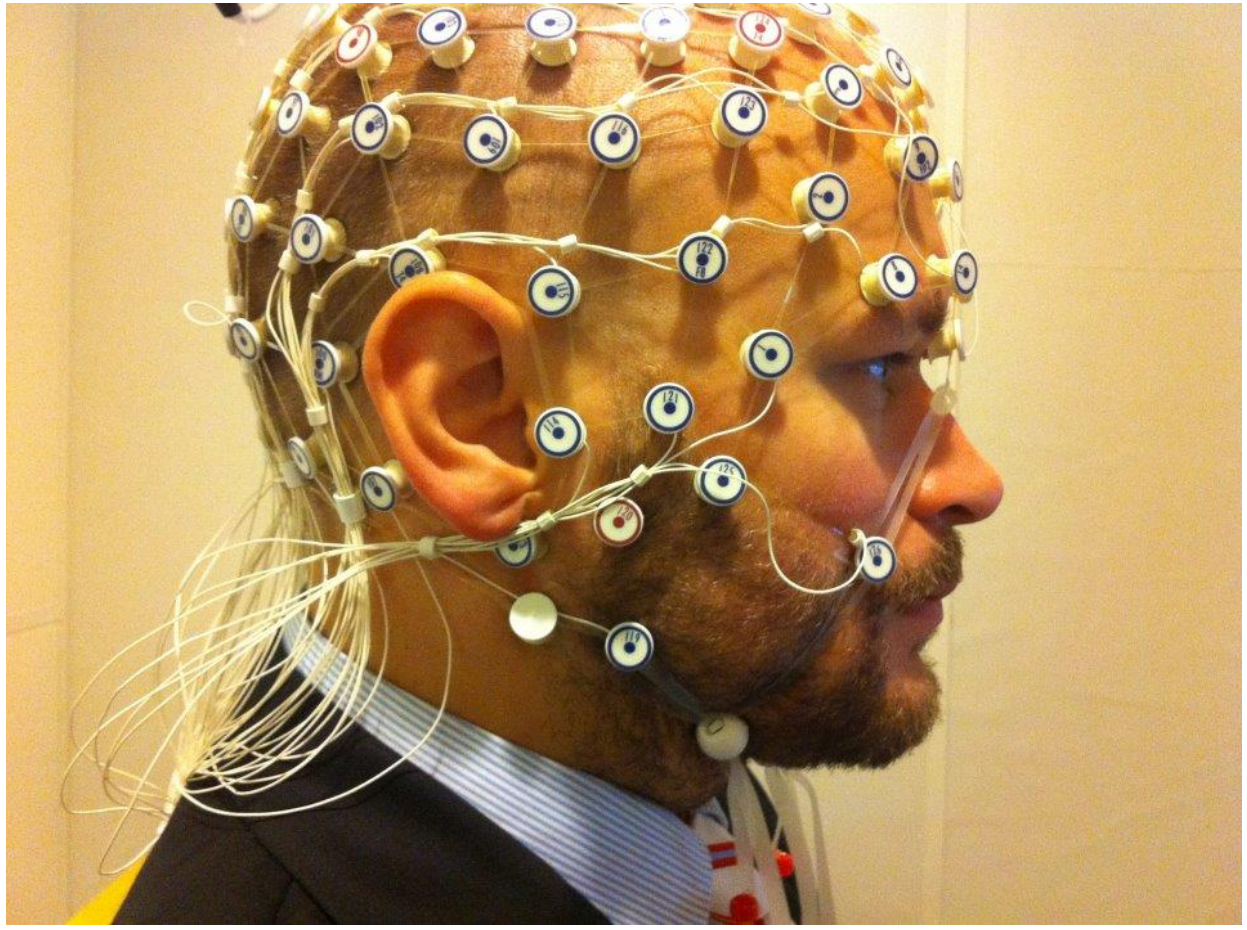


Image from Wikimedia Commons.

THERE ARE EVEN MORE!

- Facial expressions, body posture, gestures
- Electrooculography (EOG)
- Eye tracking
- Accelerometer & gyroscope
- Speech
- …

Image from Big Think.

COURSE ORGANIZATION

WHAT, WHEN AND HOW?

COURSE ORGANIZATION

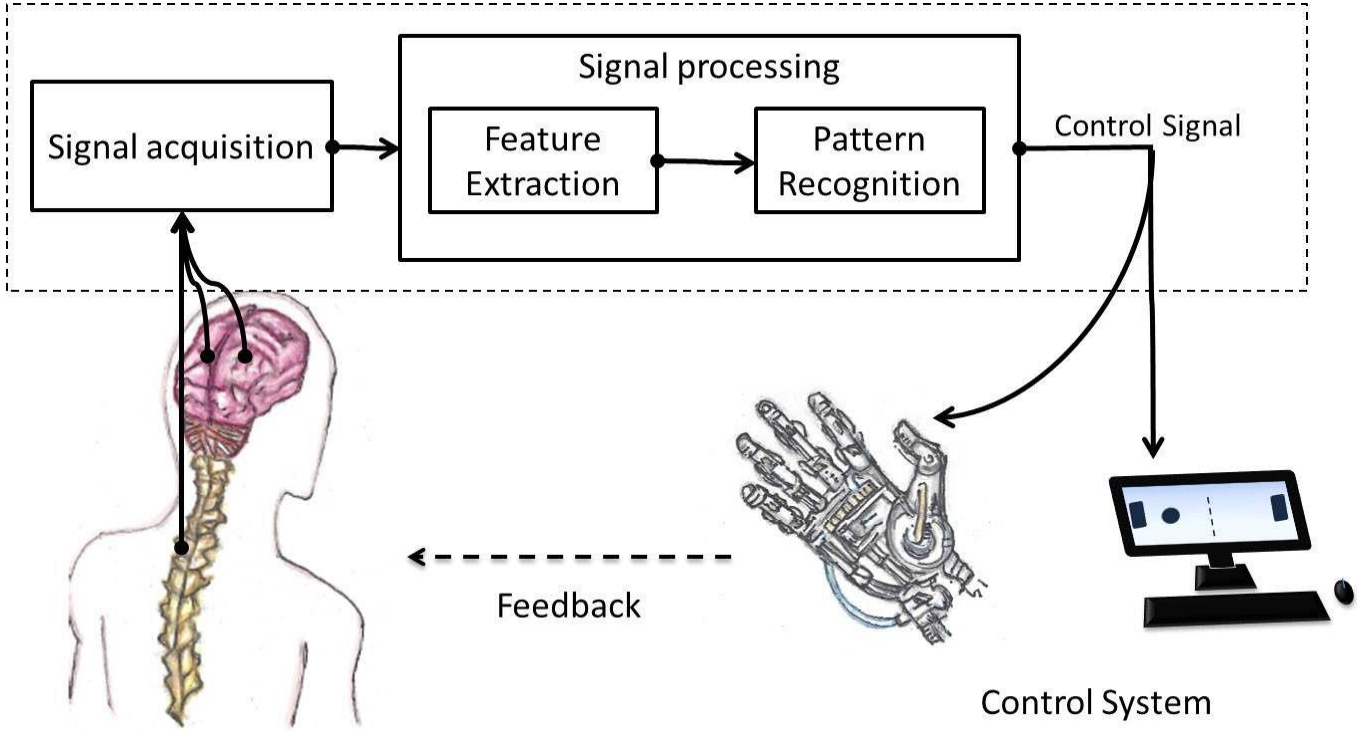
https://wiki.iis.uj.edu.pl/courses:psaw:start

- Schedule
- Grading rules
- Learn more!

OUTLINE

Course outline

1) Introduction (1)
2) Experimental research methods (2-3)
3) Models: statistics and machine learning (4-6)
4) Devices (7-9)
5) Signals and their features (10-14)
6) Summary (15)



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Lab structure

1) Prepare for the lab
2) Test (3 questions x 1.5 EXP)
3) *Short lecture*, Q&A
4) *Measurement time*
5) Practice session
6) *Advanced practice*
7) Learn more!

PYTHON? JUPYTER NOTEBOOK?

LET'S MOVE TO THE FIRST PRACTICE SESSION!

KEEP CALM AND ASK QUESTIONS!

GEIST Research Group: https://geist.re/
Krzysztof Kutt: https://krzysztof.kutt.pl/