

Big data analysis and AI/ML methods for brain conditions

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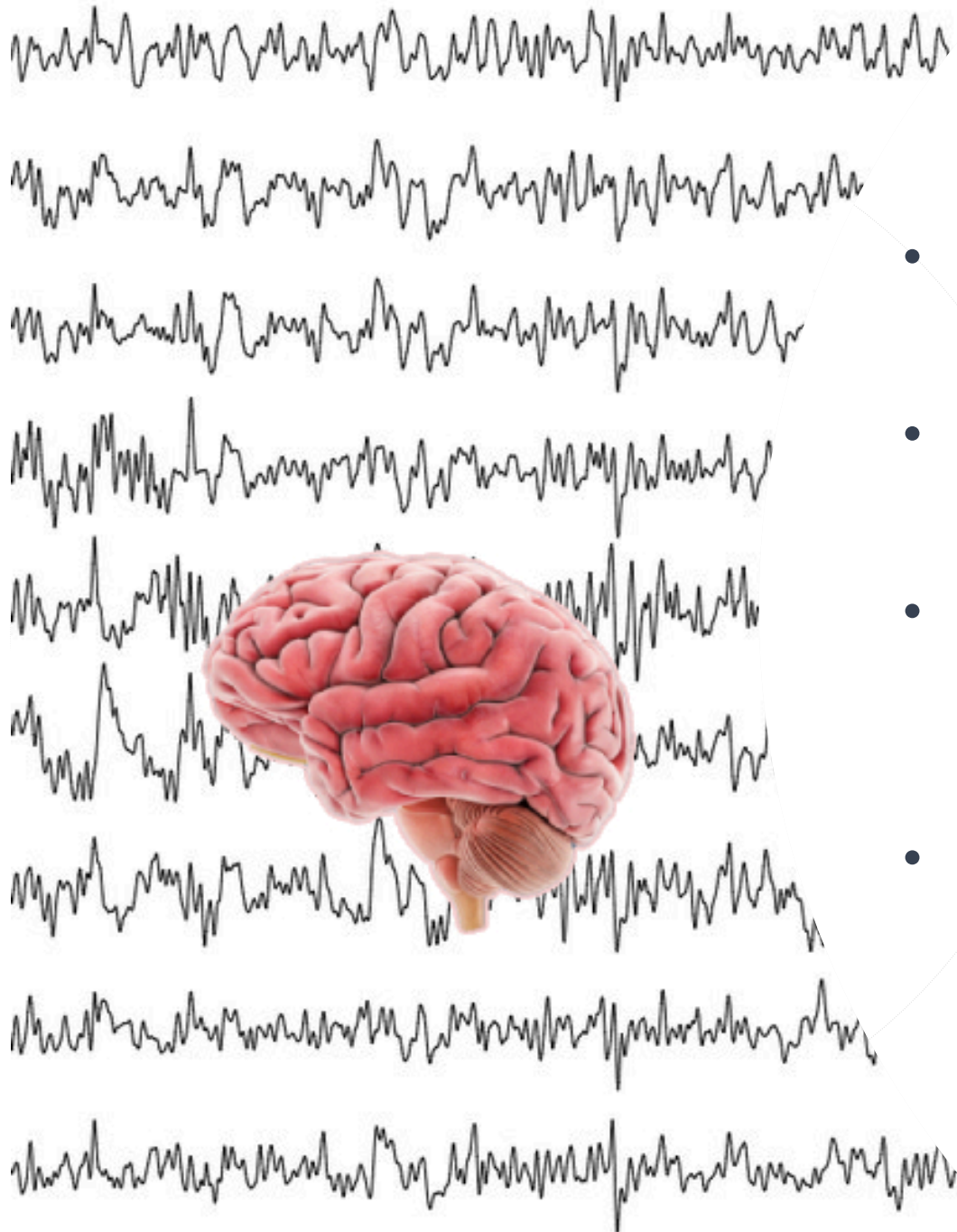




Motivation



Christina – Zoe



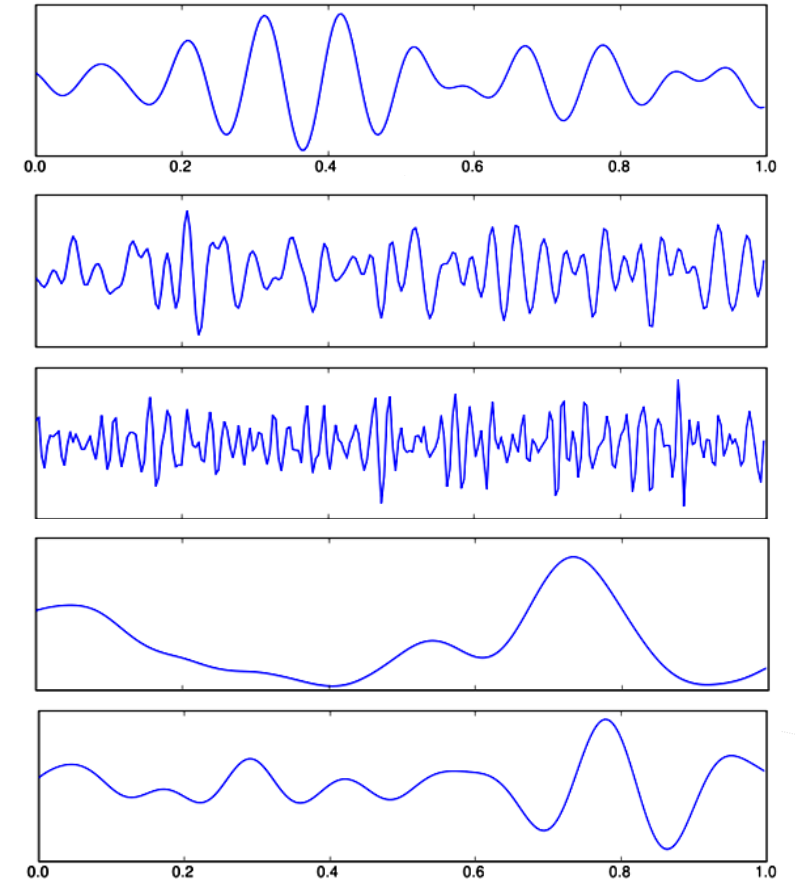
The Electroencephalogram

- EEG measures the electrical activity of the brain.
- Non-invasive way to capture and record the brain's electrical signals.
- Various techniques and algorithms can be applied to extract meaningful information from the EEG data.
- Mainly used to detect epilepsy and monitor Sleep disorders, Alzheimer's Disease, neurological and development disorders and many other brain conditions.

Brain Activity

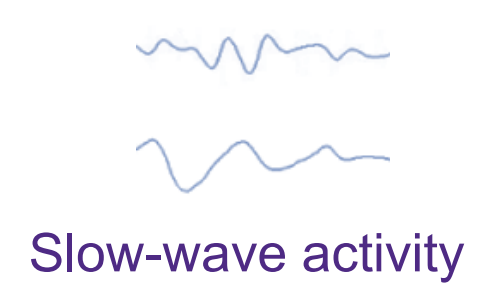
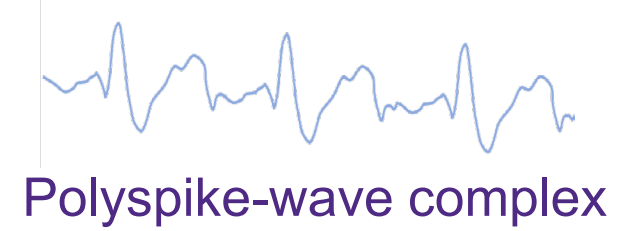
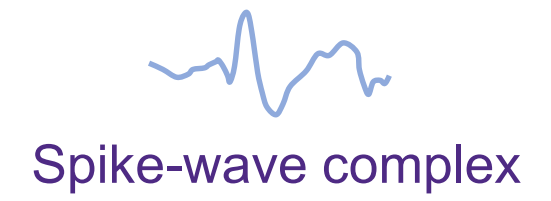
The Electroencephalogram

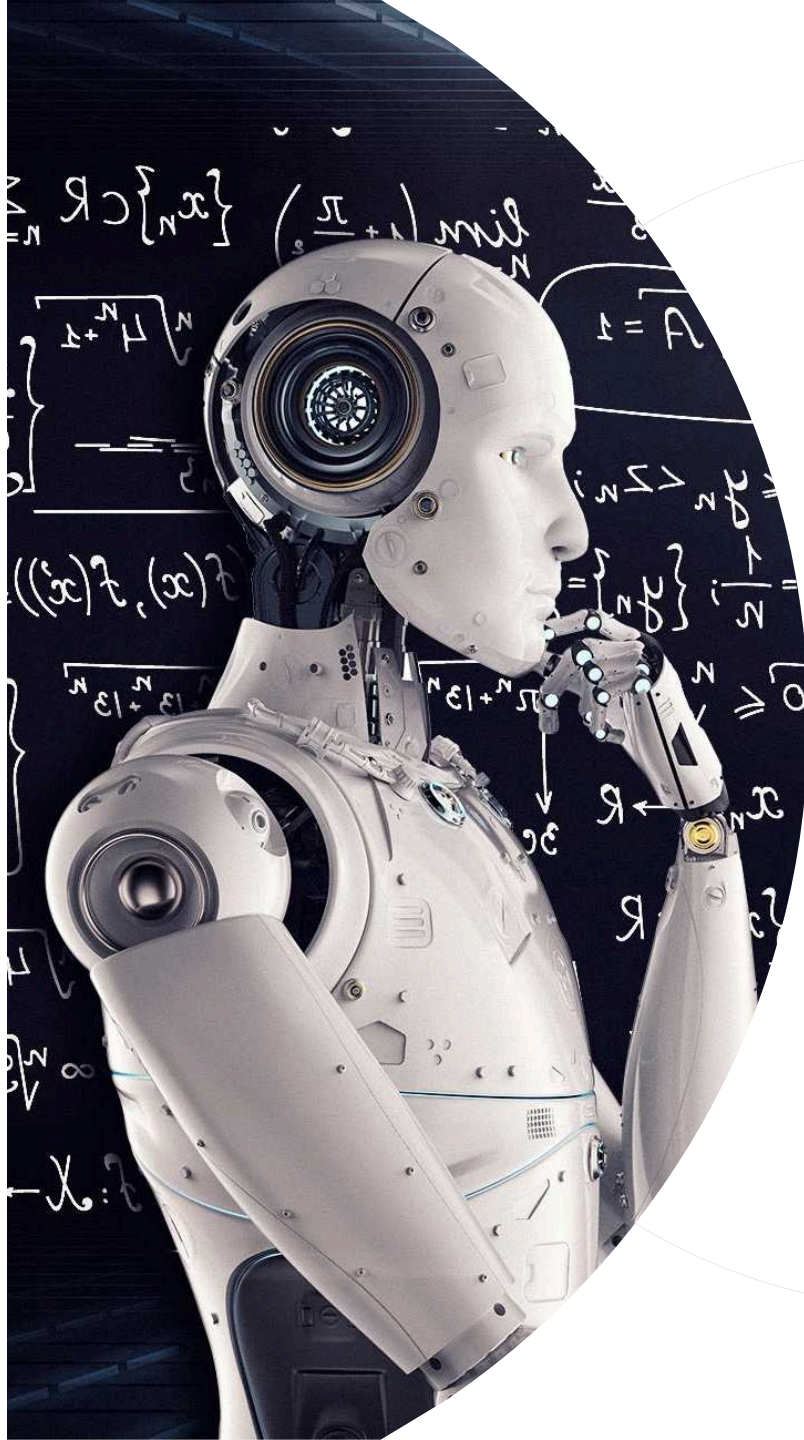
Rhythm	Frequency (Hz)	Amplitude (μ V)
alpha	8-13	30-50
beta	13-30	<20
gamma	30-50	10-100
delta	0.5-4	100-300
theta	4-8	<30



Abnormal EEG recordings

The Electroencephalogram



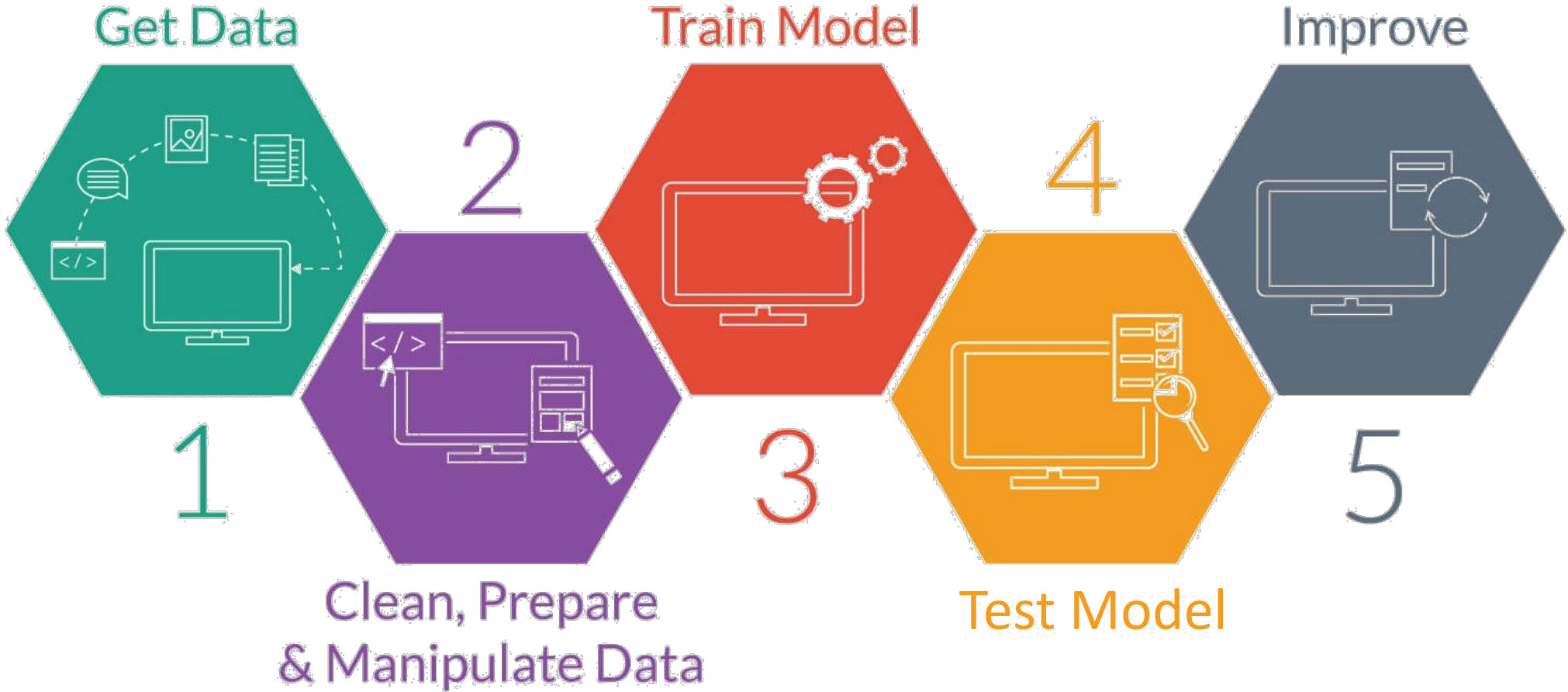


Machine Learning

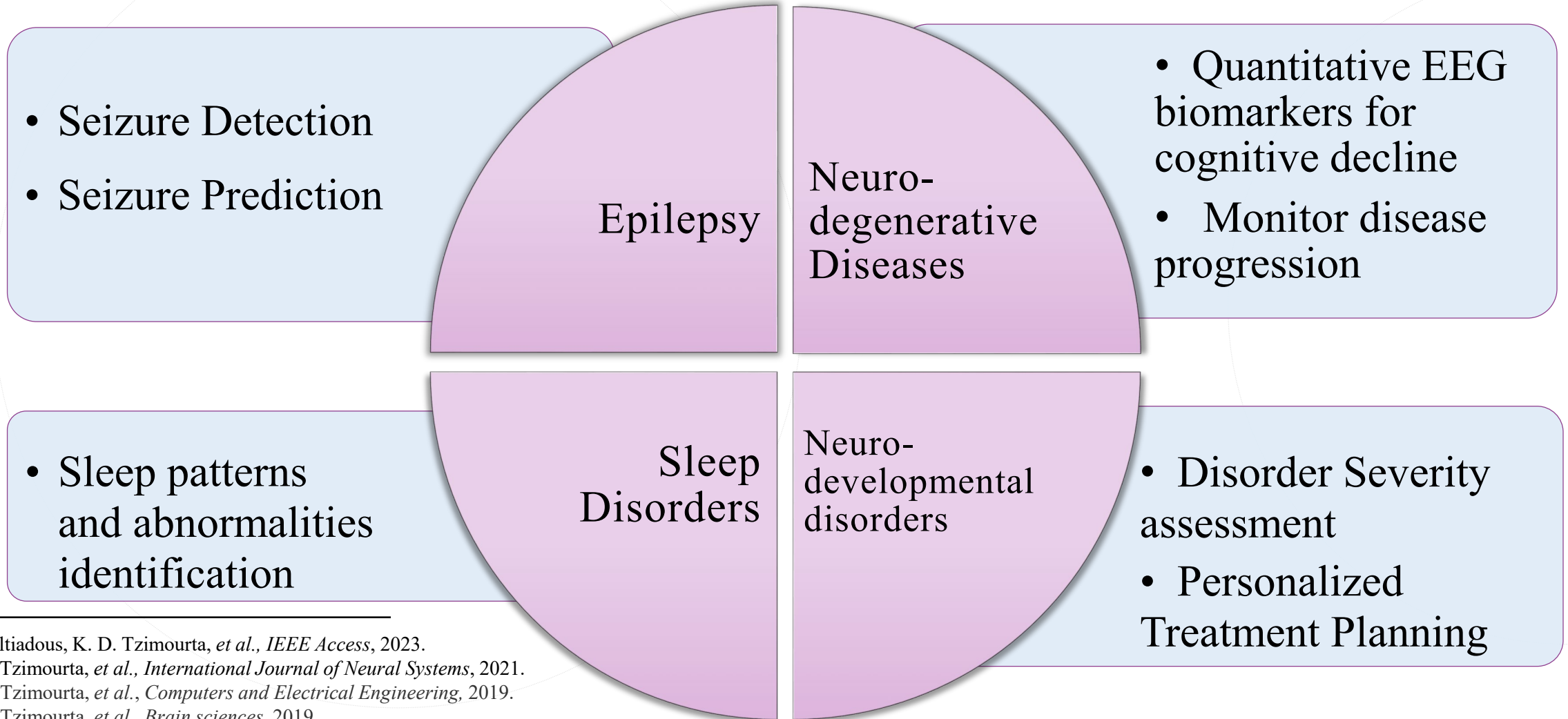
- Machine learning (ML) is a subfield of artificial intelligence (AI) that focuses on the development of **algorithms** and **models** that enable computers to learn and make predictions or decisions without being explicitly programmed.
- ML algorithms learn from data, identify patterns, and make informed predictions or decisions based on that data.

Machine Learning Process

Machine Learning



EEG Analysis with Machine Learning techniques ⁸

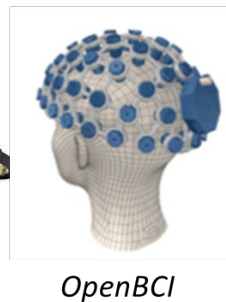
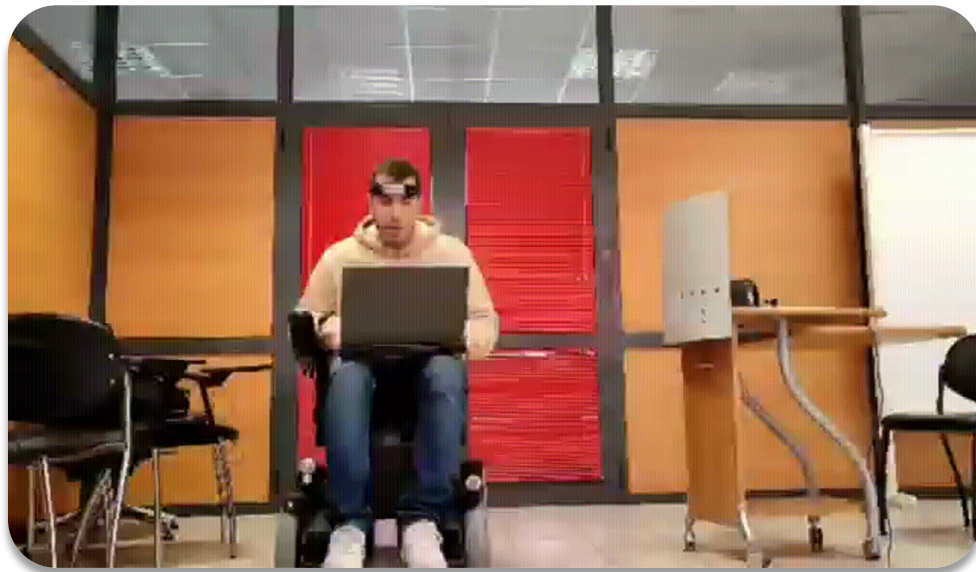


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Brain Computer Interfaces

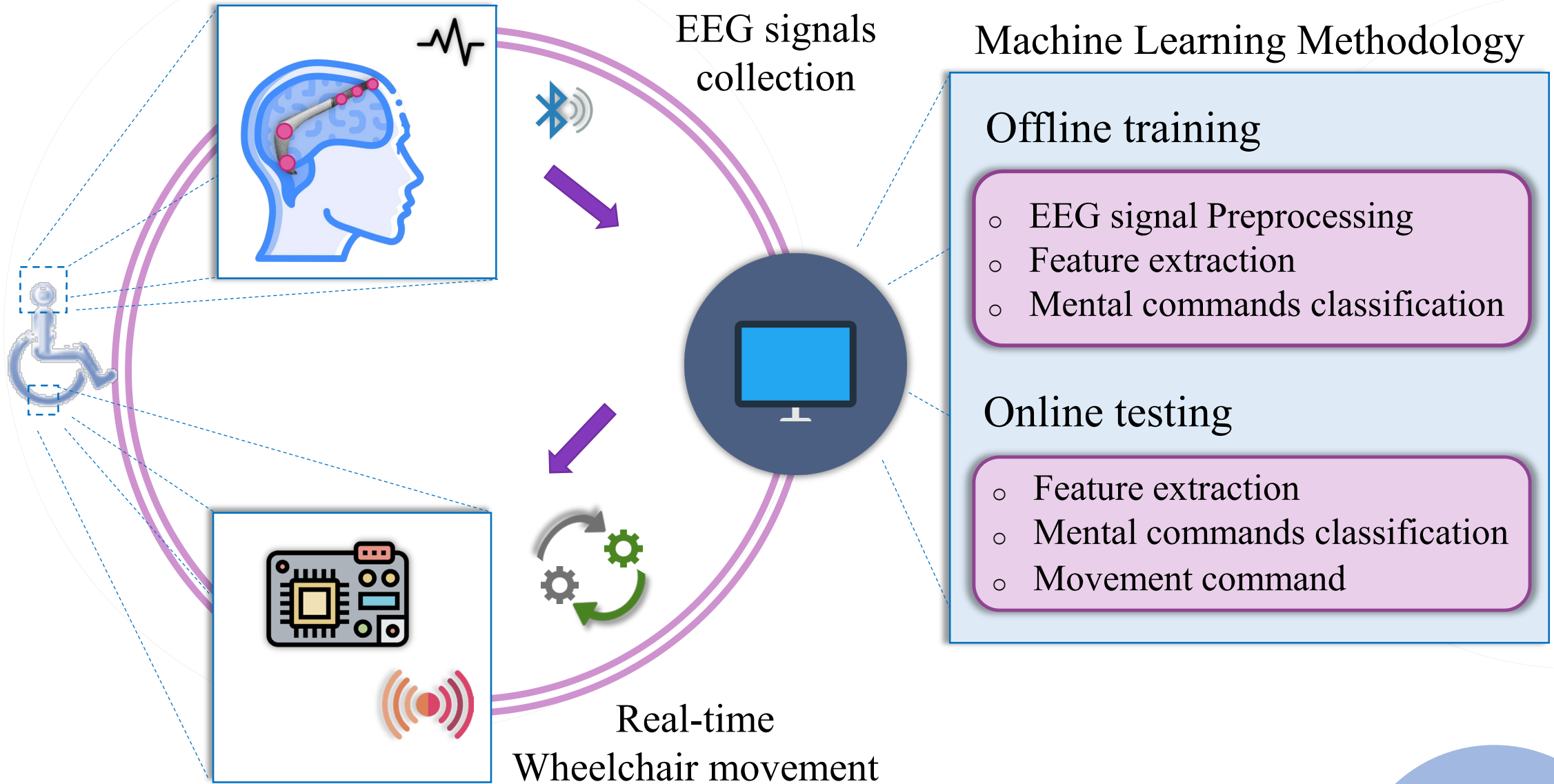
- A technology that enables direct communication between the human brain and an external device, such as a computer or a prosthetic device, without using traditional means like muscles or peripheral nerves.
- BCIs are designed to interpret brain activity and convert it into actionable commands or information.

EEG & Machine Learning



Intelligent EEG-based Wheelchair control System

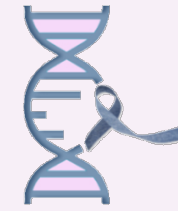
EEG & Machine Learning





Neurological Symptoms

- Seizures
- Sleep disorders
- Intellectual disability
- Developmental delay
- Speech and language impairments
- Behavioral issues
- Wide, short skull (brachycephaly)
- Hypotonia

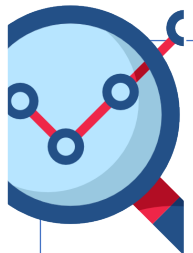


KLEEFSTRA SYNDROME

What are the characteristic EEG patterns and how do these correlate with specific cognitive and neurological symptoms associated with Kleefstra Syndrome?

How can machine learning help individuals with Kleefstra syndrome?

Kleefstra Syndrome



Diagnosis and Early Detection



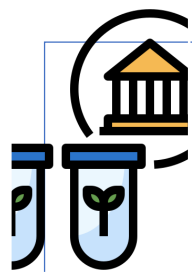
Treatment Optimization



Behavior Monitoring and Support



Assistive Technologies

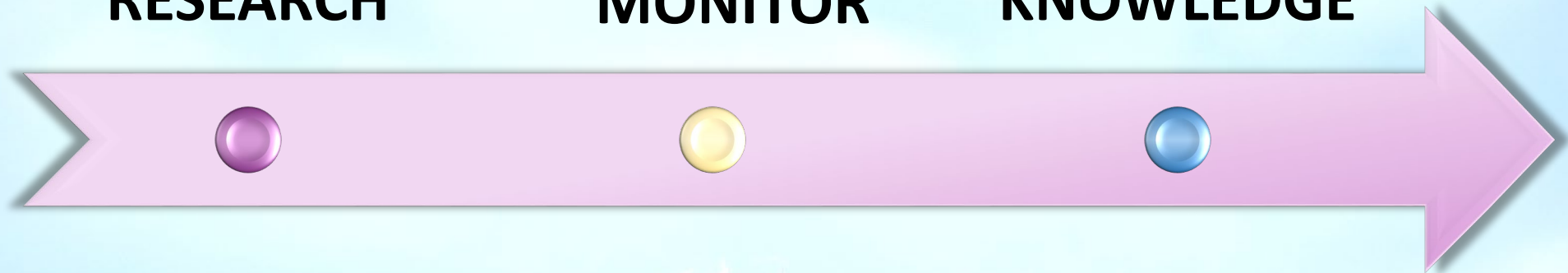


1. Biorepositories

RESEARCH

MONITOR

KNOWLEDGE



Gain insights into specific patterns of brain activity

Monitor brain condition and assess treatment efficacy

Understand the underlying mechanisms of Kleefstra Syndrome

Conclusion



References

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Thank you!

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