AI and Parkinson's disease diagnosis

Detecting Parkinson's from breathing patterns

What is Parkinson's disease?

A neurodegenerative disorder that **affects the dopamine-producing neurons.**

Dopamine is involved in:
-   **Movement.**
-   **Mood.**
-   **Sleep.**
-   **Memory.**

Limitations of PD diagnosis

Current diagnosis based on **examination of your symptoms** and medical history.

Lack of **objective** and sensitive **metrics** increases cost of drug development.

Reduced pharmaceutical interest and **reduced progress**.

AI model based on breathing patterns. Why?

- A relationship between Parkinson's disease and breathing was noted as early as 1817, in the work of James Parkinson
- This link was further strengthened in later work

How are breathing signals collected

- Using a breathing belt worn on the person's chest or abdomen
- Using a radio device (with the appearance of a Wi-Fi router), that emits radio signals and analyzes their reflections

Breathing belt

Wireless sensor
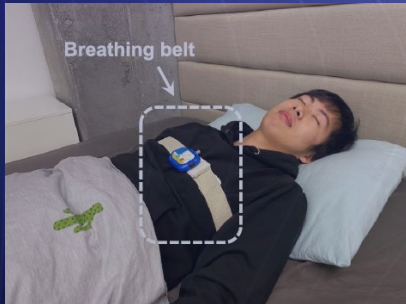
The model

- Datasets: collected by different institutions (Mayo Clinic, Massachusetts General Hospital)

- Neural network

- Features: normalized breathing signal
- Target: PD (Yes/No)

- Cross-validation (k=4)

Model results

One night of nocturnal breathing.
- Breathing belt.
  AUC: **0.889**. Sensitivity: **80.22%**. Specificity: **78.62%**.
- Wireless signals.
  AUC: **0.906**. Sensitivity: **86.23%**. Specificity: **82.83%**.

Combining several nights from the same individual.
- Wireless signals.
  Sensitivity and specificity: **100%**.

The model was also able to assess **severity** and **progression** of the disease.

Implications of the results

- New digital objective metric (biomarker)
- Reducing cost of drug development
- Early detection
- Extending care access for underserved communities

Limitations

- Studies with larger populations are required
- Mechanisms behind respiratory symptoms require further investigation