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Insights into Human Performance: Utilizing AI and Wearables for Personalized Health and Well-being Optimization

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Polaritás-GM Ltd.

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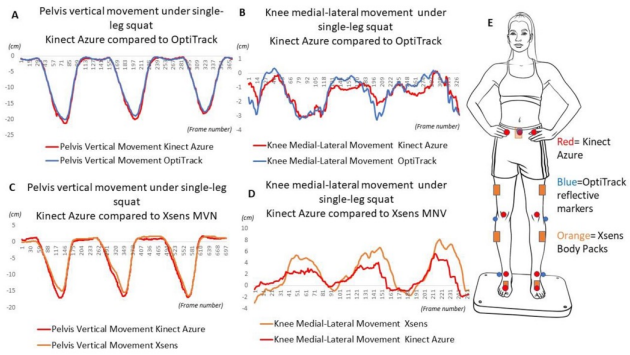
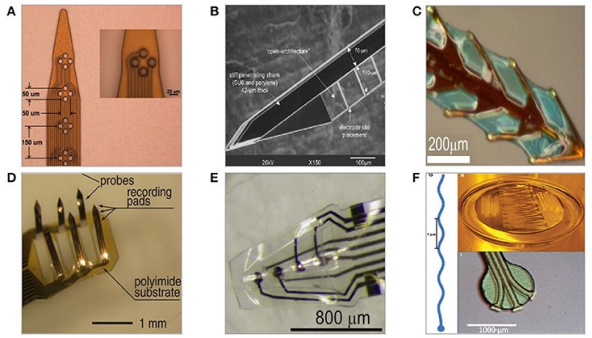
Lab Summary

- Research activities: wearable sensors, machine- and deep learning based sport analytics, computer vision

- Expertise:
  - Wearable and invasive sensor design and testing
  - Biomedical measurements from animals and humans
  - Machine learning, deep learning and computer vision for motion analysis and biological time-series processing
  - App design
  - Cloud infrastructure design



Uhlár et al., 2021,MDPI



Szostak et al., 2017, Frontiers in Neuroscience

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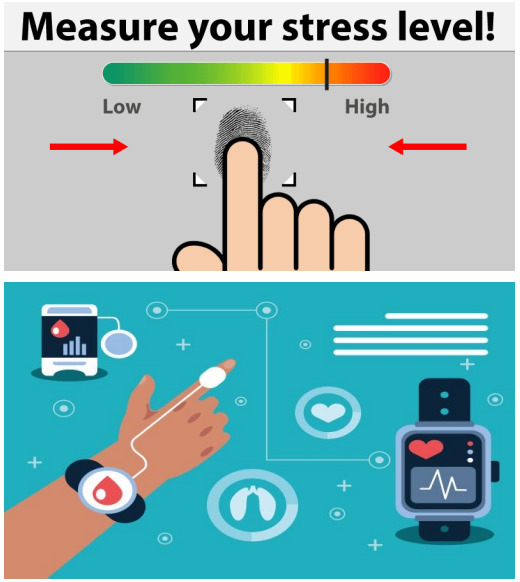
Topic for collaboration and for a Horizon Europe project

"Integrative Wearable Health Monitoring System for Stress Management and Well-being Enhancement"

- **Wearables (non-invasive and semi-invasive(skin penetration))**
  - Low-power ECG, HRV
  - Low-power accelerometer, gyroscope, magnetometer
  - Low-power EEG for long-term use (brain activity)
  - Low-power, miniature EMG (muscle activity)
  - BLE radio transmission
  - **Skin penetrating micro needle patch**
  - **Molecularly imprinted electrochemical sensors**
  - **Microfluidic channel integrated into a wearable**
  - **Integrated system with miniature footprint**

✓



https://medium.com/@hello.stresschecker/a-way-to-objectively-measure-stress-86a42fb7718f

- **Stress related biomarker research**
  - CORTISOL, sodium ion, potassium ion, pH, lactate, glucose etc.

- **AI methods** for understanding individuals' stress factors and for automatized personal coaching

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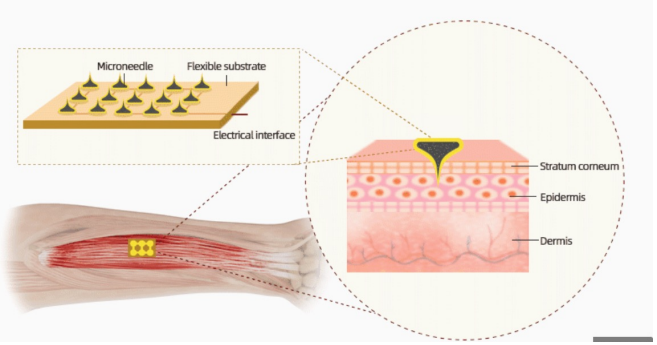
Ideal partners and expertise

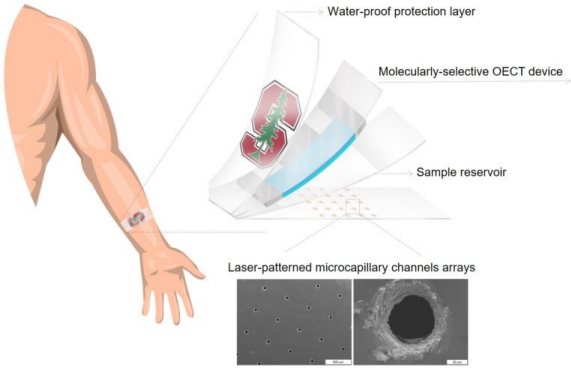
- **Sensor research**
  - Non-invasive and/or semi-invasive (skin penetration) sensor development
  - Thin-film device design and fabrication
  - Microfluidic devices research and integration into wearables
  - Molecularly imprinted electrochemical sensors
  - Expertise in miniature spectroscopy devices
  - Expertise in low-power electronics design
  - Expertise in circuit design for wireless data transmission
  - Access to Fab Lab and/or cleanroom
  - System integration

- **Biosignal processing**
  - Onboard FPGA data processing
  - Optimizing algorithms for low-power electronics processing

- **Biology**
  - Stress related biomarker detection from sweat and/or blood
  - Cortisol and other hormones (adrenaline, noradrenaline, thyroid), inflammation markers (C-reactive protein, IL-6)



https://www.embs.org/tbme/articles/towards-improving-the-quality-of-electrophysiological-signal-recordings-by-using-microneedle-electrode-arrays/



https://news.stanford.edu/2018/07/20/wearable-device-measures-cortisol-sweat/

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Teaching

Research, Innovation

PÁZMÁNY
Pázmány Péter Katolikus Egyetem
Információs Technológiai és Bionikai Kar

- IT, Bionics and AI (BSc, MSc, PhD)
- Significant Research Grants
- Startup Companies
- Research Labs
- Outstanding Researchers and Students

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SYNLAB

- SynLab is a leading medical diagnostics company operating across Europe.
- Offers a wide range of diagnostic services, including laboratory testing, imaging, and health screenings.
- Utilizes state-of-the-art technology and follows stringent quality standards for accurate and reliable results.
- Provides services for individuals, healthcare professionals, and corporate clients.
- Focuses on innovation, research, and personalized medicine to improve patient care.
- Collaborates with healthcare providers and institutions to enhance diagnostic capabilities and patient outcomes.
- Committed to excellence in healthcare, ensuring accessibility and efficiency in diagnostic services.

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Applied Research

Development, Innovations

Products

POLARITÁS-GM Kft.

1.6M USD (2022)
90-98% from export

Annual income

8

Significant R&D grant

~50 (every continent)

Countries where the product is sold at

5: (2004-2021)
+ 3: (2024 - 2032)

OLYMPIC GAMES (Omega, Swiss Timing)

3.2M USD

Capital reserve

CERTIFIED ISO 9001:2015 COMPANY

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THANK YOU!

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