

**Title of Project:** Wireless Sensors and Devices for Multivariate Biosignals Monitoring

**Name of Company:** iKinesia Inc.

**Organization type:** For profit

**Address:** 42 rue Gabrielle-Roy, Verdun, QC, H3E 1M3

**About the company (max 200 words):**

iKinesia Inc. is a Canadian startup established in 2018, co-founded by two PhD graduates of McGill University's Biomedical Engineering, with the vision of translating their research into clinical applications for the benefit of patients and to improve the health of general and professional populations.

iKinesia's mission is to reshape assessment and augmentation of human motor skills through a symbiosis of AI, model-based design, systems engineering, and precision medicine to improve well-being and revamp health and performance outcomes.

Our vision is to be the one-stop source for translational software solutions for medical devices and data analytics software as a service (SaaS) intended for assessment, monitoring, and augmentation of human neuromuscular motor skills.

Our approach is based on objective and quantitative assessment of human's neuromuscular health and performance through fusion and analysis of multi-modal data from wearable sensors, portable medical robotics for neuromuscular assessment, and muscle elastography or other medical imagery.

**Name, title and contact info of company contact:**

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Chief Executive Officer

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**The country and city where the project will be hosted:** Montreal, Quebec, Canada

**Estimated length of the project:** (4 to 6 months) OR (6 months to 1 year)

**Preferred start date:** As soon as possible (expected to be March 2021).

**Describe the project (max 300 words):**

In many clinical applications and research settings, it is important to continuously acquire multiple biosignals that quantify inter-related physiological processes like neuromuscular and cardiorespiratory systems. These include biosignals such as ECG, EMG, Oxygen saturation, body movement and orientation, among others. Analysis and fusion of these biosignals helps with objective assessment of the underlying biomedical system and gaining insight into its performance and pathologies, diagnostic decision making, predicting the course of a disease, and monitoring treatment. Traditionally, biosignals have been recorded in lab environments using restraining wired sensors in controlled conditions. This impedes the person's normal activity and cannot describe the underlying physiology during activities of daily living.

Wireless wearable devices can record and monitor real-time data *in vivo*; they are non-invasive and unobtrusive. They include different types of miniaturized sensors that can be integrated into textile

fibers, clothes and elastic bands or directly attached to the human body. The sensors can seamlessly transmit the data to a mobile phone or a nearby computer via wireless communication protocols (e.g., Bluetooth, ZigBee, Wi-Fi). Some of these sensors can have analog outputs. These analog signals must be conditioned and converted into digital streams. The digitized data from all the sensors are aggregated, synchronized, and transmitted wirelessly to a base station for (a) long-term storage in a (cloud-based) database and (b) further real-time and offline processing, analysis, modeling, and fusion to extract actionable information/insight.

The overall goal of this project is to develop a wireless system prototype for real-time acquisition of multivariate biosignals. The specific objectives of this project are to 1) integrate the sensors with analog signal conditioning and A/D modules (if needed); 2) aggregate and synchronize the data from multiple sensors; 3) transmit the data via wireless protocols to a nearby computer; and 4) develop power management solutions for the system.

**Number of positions available:** 1

**Preferred Institutions:** Polytechnique Montréal, McGill University, Concordia University, ÉTS

**Required expertise / skills (max 200 words):**

General areas of expertise / skills:

- Wireless communication and protocols (especially for medical devices)
- Embedded coding; embedded system development and testing
- Digital and analog signal conditioning and processing

Responsibilities:

- Study datasheets of electronic components and communication protocols/standards.
- Study scientific/technical publications.
- Design and integrate analog front-end circuits with the sensors of the system.
- Integrate wireless communication modules into the system.
- Write firmware code for microcontroller for real-time processes.
- Test the prototype.

Desired disciplines: Electrical, Computer, or Biomedical Engineering; or other related disciplines.

Minimum Requirements:

- Bachelor's degree
- Solid experience with software/firmware programming, Microcontrollers, electronics.
- Proven experience with real-time programming.
- Excellent communication skills, ability to read, analyze and interpret common scientific and technical journals.
- Demonstrated ability to work and lead within a team-based project environment.

Preferred Requirements:

- Master's degree.
- Experience with biomedical sensors and instrumentation.
- Effective communication of technical information through presentation, preparation of technical documentation and manuscripts.

- Attention to detail and dedication to high-quality, results-oriented output.
- Previous experience working in industry.
- Experience in regulated medical software products.

**Language requirement:** English