# Comprehensive AI Architecture to Monitor and Predict Heart Rate during Physical Exercises

## Project owner/sponsor and contact

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## Project overview

Heart rate monitoring provides numerous benefits. For example, a person’s heart rate can be tracked during physical exercise so that they can be warned when it gets too high. The development of wearable devices has made heart rate monitoring become much easier than before. However, data analytical models that are used for this task are still relatively limited. With such motivation, this project aims to develop a deep learning method to track and predict the heart rate of a person in very close future (i.e., the next few minutes) during exercising. Besides data from wearable devices, information like weather (temperature, humidity, etc.), geography (longitude, latitude, altitude), is also incorporated to improve the prediction accuracy. We will start from the Endomondo dataset that includes information on exercises like moving speeds, heart rates, and geography coordinates. The project milestones are as follows:

1. Data cleaning and preparation: Incorporate the Endomondo data with weather information. Clean and transform the merged data for modeling
2. Initial modeling: construct deep learning models to predict heart rate during exercises based on the generated data from milestone 1. ***The sponsor will work closely with the students in this phase***
3. Model evaluation: test and finetune the models that are developed in milestone 2. Also compare the developed model with other state-of-the-art methods in terms of accuracy. Prepare for final presentation.

## Major expected outcomes and deliverables

* A comprehensive dataset on heart rate during exercises with environmental information like temperature, humidity, geographical routes, included.
* A trained deep learning architecture that utilizes the person’s info during exercises as well as environmental information to monitor and predict heart rates.
* Complete code and documentation.

## Type of work (estimation)

* Mostly development/programming: 60% (mainly Python with TensorFlow)
* Research and writing: about 40%

## Courses/Skills/knowledge involved

* Python
* Database (mainly merging data)
* Pandas, NumPy, TensorFlow *– will be supported by sponsor*

## Number of teams and students

Up to four (4) teams of 3 to 5 students

## Other requirements (such as meetings)

* Would like to meet every two weeks at least.
* The project can be done with a virtual team without any physical meetings or access to on-campus resources.

## Reference

* Endomondo dataset: <https://sites.google.com/eng.ucsd.edu/fitrec-project/home>