# Comprehensive AI Architecture

Date: 10/23/2022

## 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 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.

## Project Team and Stakeholders and roles and responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| **Roles** | **Name** | **Major responsibilities** | **Contact (Email and/or Phone)** |
| Project owner | Linh Le | Provides details for the project. Oversees each phase leading up to milestones. Helps answer questions through email and meetings. Helps with the code for processing data and the four basic models. | lle13@kennesaw.edu |
| Team leader | Talia Brooks | Communicates with the project owner. Records documentation. | tbrook71@students.kennesaw.edu |
| Team members | Aaron Bemis | Working on parsing the raw data. Incorporating the other components of location and weather data as members complete those areas. Helping with documentation. Server setup and connectivity. Updating documentation. Ran the processing job to create an object for the models. Ran the LSTM and 1DCNN models 20 times each with four sets of parameters. | abemis@students.kennesaw.edu |
| Lauren Bailey | Researching information on current products. Writing code for our monitor. Building and updating database to process data. | lbaile53@students.kennesaw.edu |
| Alex Boyett | Working with adding supplemental data to the raw data. | aboyett8@students.kennesaw.edu |
| Jack Morris | Contributing and updating data, code, and writing. Updates Capstone website. Works on collaboration tool. | jmorr123@students.kennesaw.edu |
| Advisor / Instructor | Donald Privitera | Facilitate project progress; advise on project planning and management. | dprivit2@kennesaw.edu |

## Project website

<https://jakatakz.github.io/it4983capstone/>

## Scope

## Final Deliverables

1. A comprehensive dataset on heart rate during exercises with environmental information like temperature, humidity, geographical routes, included. Each of the four models ran with four sets of parameters. Five runs per parameters set. Average error of the five runs.
2. A trained deep learning architecture that utilizes the person’s info during exercises as well as environmental information to monitor and predict heart rates.
3. Complete source code and documentation.
4. Research Report
5. Final Peer evaluation
6. Individual performance reflection
7. Progress reports
8. Video(s)
9. Video Presentation
10. References
11. Tutorials/Manuals
12. Final report
13. Survey
14. Peer evaluation
15. Capstone website showcase
16. Department presentation

Timeline

8/16/2022 to 11/23/2022 or 12/1/2022

## Milestones and Timelines

#1 - By 9/25/2022 - Data cleaning and preparation.

* Pull in Endomondo data that includes geographical data and weather data.
* Combine all the collected data into a single file.
* Clean that data and prepare it for modeling.
* Deliver a sample of 1,000 exercises to our sponsor to start the next phase which is building the models for the AI portion.

#2 - By 10/23/2022 - Initial Modeling

* Kick off meeting is scheduled for Monday September 26th at 5:00pm
* Construct deep learning models.
* Predict heart rate during exercise.
* Provide an average error rate after five runs for a particular set of parameters

#3 - By 11/20/2022 - Model Evaluation

* Test and finetune the models that are developed from Milestone 2.
* Compare the developed model with other well-known methods to test accuracy.
* Prepare for final presentation.

## Future milestone meetings date/time

Every 2 weeks from August 29th, 2022 at a specified time a week before meeting. Next meeting September 12th, 2022.

## Collaboration and Communication Plan

Microsoft Teams, GroupMe App, GitHub, KSU student email, a database, and D2L. Microsoft Teams meeting with Professor Linh Le (Sponsor) every 2 weeks at a specified time at least a week before the meeting.

Direct responses will be addressed within no more than 24 hours, more likely 12 hours or less.

## Project Risks

1.) Milestone objectives completion delayed/unreachable – All Team members

Response: Communicate with stakeholders before due-date if it is unreachable to figure out appropriate response and reallocate responsibilities and effort to the critical path.

2.) Meetings with sponsor are unable to be obtained – At least 2 Team members.

Response: Reschedule as soon as possible.

3.) Project Website problems – Jack Morris

Response: Host on another platform.

4.) Project tasks are not being fulfilled on time due to sickness, laziness, etc.

Response: Communicate with the team member, the team member should be responsive first, communicate with the team. Distribute tasks as needed to make up for lost time. If necessary, possible escalation to Instructor communication.

5.) Advanced models running time exceeds the duration of this course/Milestone 3.

Response: Communicate with professor and sponsor to limit the scope for Milestone 3 if necessary or set up more servers to be able to run more than 5 models at a time.

## Risk Management

Make sure everyone is aware of each piece that is being worked on. Make sure everyone has access to the code, raw data, databases, servers etc. There must be some notice of absences and a plan to cover certain aspect in those cases. We are working to keep the group updated each step of the way. Sharing and communication are going to be the key pieces to carry this project to completion.

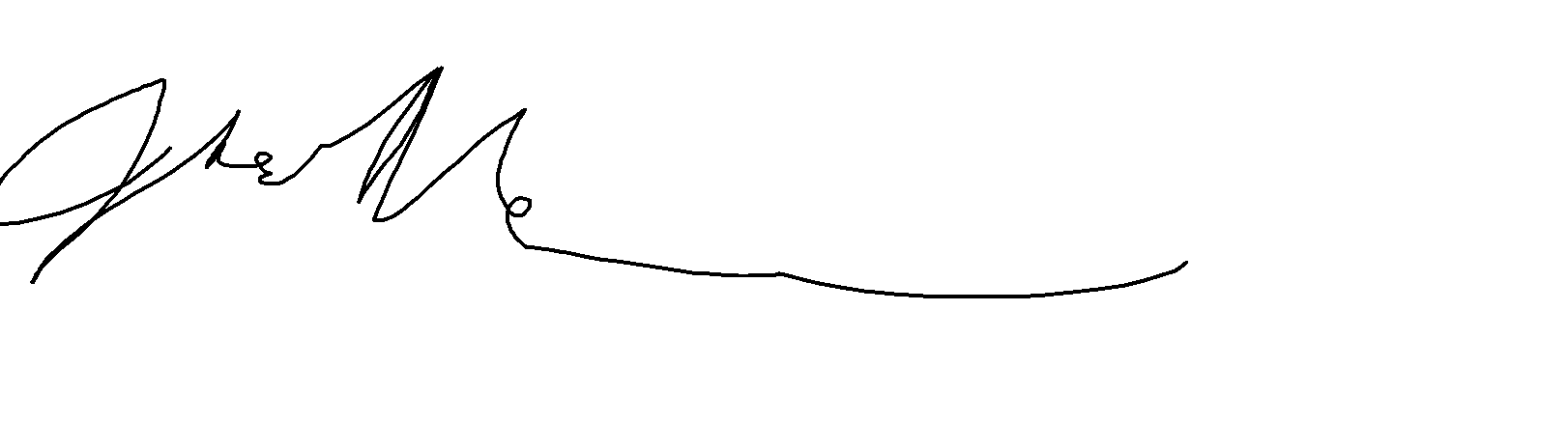
## Change Management

All team members can query the group for some type of group change where the entire group will review the change and alter the group accordingly.

## Project Schedule and Tasks Planning

See the Gantt chart file attached.

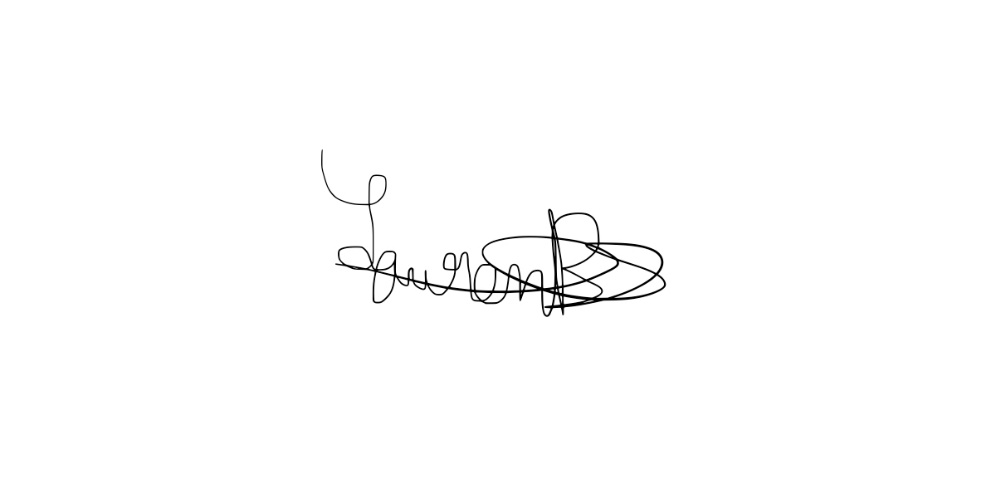
## Signed by:



## Jack Morris



Aaron Bemis



Lauren Bailey

Talia Brooks

Alex Boyett