Bioinformatics Summer School Report

Further Developing Duke's Wearable Infection Detection Platform

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Internship Organization: Duke university

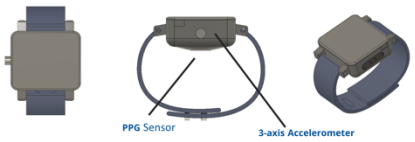
Introduction:

This project is an exciting opportunity to bridge the gap between technology and healthcare, with the potential to make a significant impact on people's lives. By harnessing the power of wearable devices, we aim to create a system that not only captures and processes health data in real-time but also translates this data into actionable insights. The integration of machine learning will enable us to detect early signs of health changes, potentially catching infections or other conditions before they escalate into more serious issues. Our work goes beyond just data collection it's about making this information accessible and meaningful to users. By focusing on UI/UX development, we ensure that the platform is intuitive, user-friendly, and capable of delivering critical health information in a way that is easy to understand and act upon. Ultimately, this project has the potential to empower users with timely health information, improving their well-being and possibly preventing severe health outcomes. It's a step toward a future where wearable technology plays a crucial role in proactive healthcare, offering users a better quality of life through early detection and intervention.

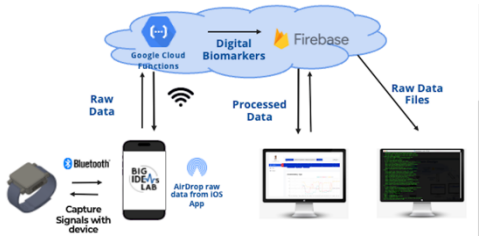
Materials and Methodology:

We develop an end-to-end data processing pipeline for a custom world device, the system design incorporates PPG sensors along with additional sensors integrated into the device.

The process begins with capturing signals using the device, followed by airdropping the raw data from the iOS application, this raw data is then processed through Google Cloud Functions and subsequently stored as digital biomarkers in Firebase. Finally, the processed data is delivered to the user via Firebase, ensuring a seamless data flow from signal capture to user access.



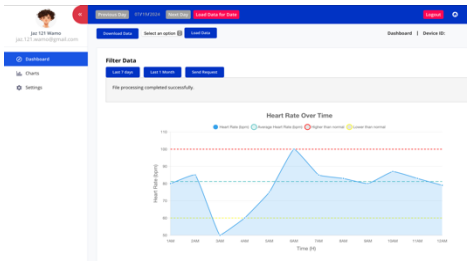
(Fig. 1): **Device Sensors**



(Fig. 2): **System Desing**

Results and Discussion:

Data Science:	Data Engineering :	Data Visualization :
•Developed Digital Biomarkers for: -Heart Rate & Heart Rate Variability using PPG data -Steps using Accelerometer & Gyroscope data	• Analyzed and Forecasted Google Cloud and Firestore Spending • Improved Cloud Functions.	• Integrated Front-End Functionality with Cloud Backend



(Fig. 3): **Web App usind interactive graph.**

Challenges and Solutions:

CORS Challenges with Sync Button:

Cross-origin resource sharing (CORS) includes a security mechanism to insure safe interaction between servers of different origins.

- error message.
- Same-Origin Policy
  - Server-Side Configuration.
  - Using Middleware.

Skills and Knowledge Gained:

During the summer program at Duke University, I worked on further developing Duke's Wearable Infection Detection Platform project with Data+ teams. I created interactive graphs with UI features for the dashboard and implemented a **Sync** button using HTTPS to send a JSON payload to the server endpoint on demand. also gained technical skills in wearable technology integration, API management, data processing, and applying machine learning for early infection detection. In addition, I developed my soft skills in communication, teamwork, problem-solving, and project management, preparing me for future collaborative projects.

Conclusion:

This experience provided hands-on experience with wearable tech, cloud platforms, and machine learning, while reinforcing the value of teamwork and user-centered design. This experience solidified my ambition to advance digital health solutions and inspired me to pursue future projects that merge technology with healthcare to make a meaningful impact.

Acknowledgments:

I would like to extend my sincere gratitude to **KAUST Academy** and **Duke University program "Data+ teams"** for providing me with the opportunity to participate in the summer program. Their support and resources were instrumental in my learning and growth, and I am deeply appreciative of the guidance and mentorship I received throughout this experience.