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# **Team 45: TI Project #3**

## **Bi-Weekly Update 2**

**Alyson Garlick, Diego Gumucio, Meredith McKean,  
Nicholas McNamara  
Sponsor: Matthew Krebs  
TA: Pranav Dhulipala**

# Project Summary

- A problem of older less expensive rower machines is that they lack features of higher end models and those from other types of equipment. These features keep the user engaged and focused on improving their overall fitness via **Functional Threshold Power**. FTP is a metric to maximize performance gains in the shortest span of time.
- To provide this experience, our subsystems will integrate on an Android application to connect to a Concept2 rower machine and provide:
  - A measurement of a user's FTP
  - Workouts consisting of seven different power zones
  - Recommendations based on their respective FTP
  - Storage for user's history local to the device.



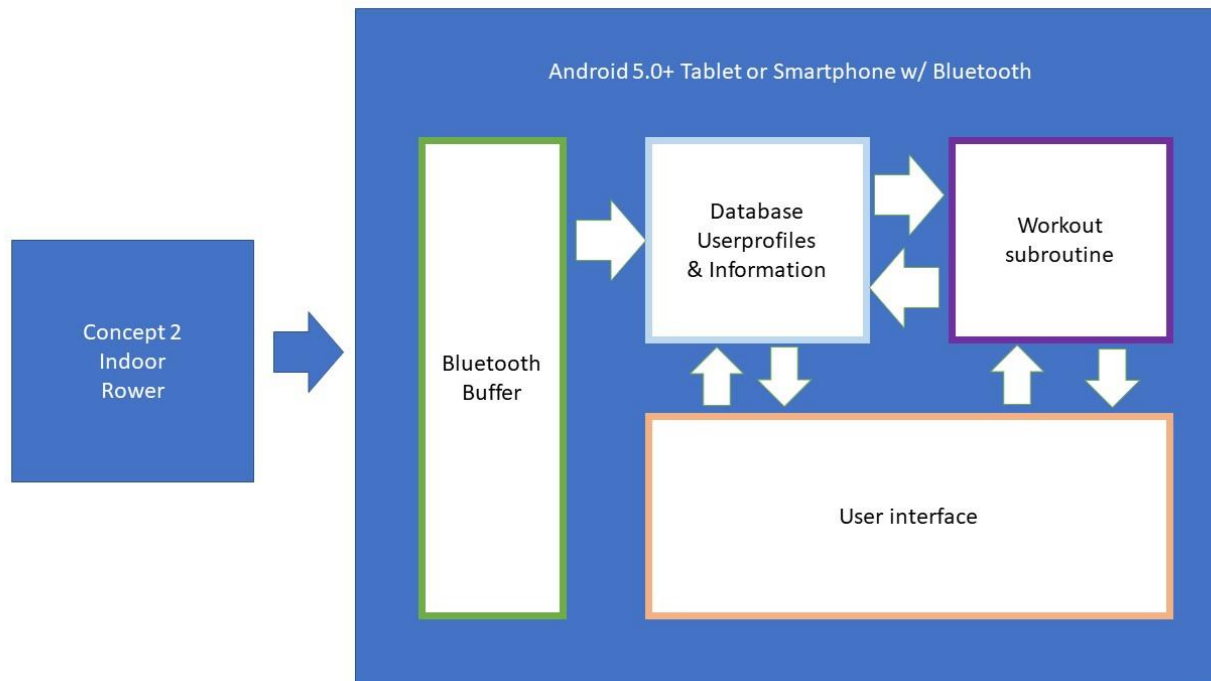
# System Overview

Alyson Garlick

Diego Gumucio

Meredith McKean

Nicholas McNamara



**Data Communication Subsystem:** Collects resistance, cadence, heart rate, and other data from Concept2 machine via Bluetooth

**Database Subsystem:** Manages and stores data for the Smart Rower, handles data transfer to subsystems.

**Workout Subsystem:** Responsible for creating the workout routines and calculating metrics to display through the user interface.

**User Interface Subsystem:** Facilitates user interaction and accessibility of data, ensuring an intuitive experience.



# Project Timeline

Project Definition (completed 9/9)	Subsystem Designs and Testing (completed 12/2)	Integration of Database & Workouts and UI & Bluetooth (to complete by 2/12)	Final Integration (to complete by 3/3)	Front End Validation (to complete by 3/24)	Back End Validation (to complete by 4/12)	Demo and Report (to complete by 4/29)
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# Data Communication Subsystem

Nick McNamara

Accomplishments since last update 13 hrs of effort	Ongoing progress/problems and plans until the next presentation
<ul style="list-style-type: none"><li>• Discuss with user interface over activity</li><li>• Ordered Tablet Holder for Concept2 rower</li></ul>	<ul style="list-style-type: none"><li>• Make sure all Kotlin base objects/classes are accessible in Java as a library</li><li>• Validation of combined UI/Comm subsystem</li></ul>





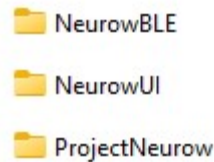
# UI Subsystem

Diego Gumucio

Accomplishments since last update 17 hrs of effort	Ongoing progress/problems and plans until the next presentation
<ul style="list-style-type: none"><li>• Nick's project has been turned from an app to a library for use in main Neurow project</li><li>• Project structure, dependencies in build file, and imports have been fixed</li></ul>	<ul style="list-style-type: none"><li>• Ensure full functionality when Kotlin methods are called in a Java UI environment</li><li>• Validation of UI &amp; Communications through Views</li><li>• RecyclerView up and running</li></ul>

# Data Comm + UI

- Currently stuck translating the Kotlin methods and objects to be called from Java UI
- Implement a listed menu from filtered results to initiate handshake
- A rough example of what we would like on the bottom right
- Continue to work with UI subsystem

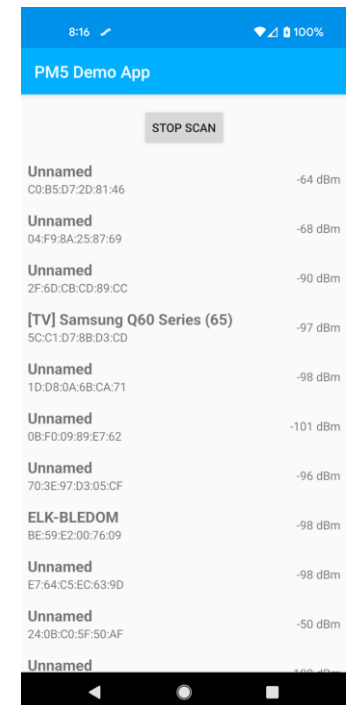


```

16
17 apply plugin: 'com.android.library' // set project as a library rather
18 apply plugin: 'kotlin-android'
19 apply plugin: 'kotlin-android-extensions'
20
21 android {

```

- Big focus on project structure
  - What will be a library
  - Where does everything fit
- Efforts currently into turning subsystems into callable Libraries
- Troublemakers: Manifests, gradle files, improper imports



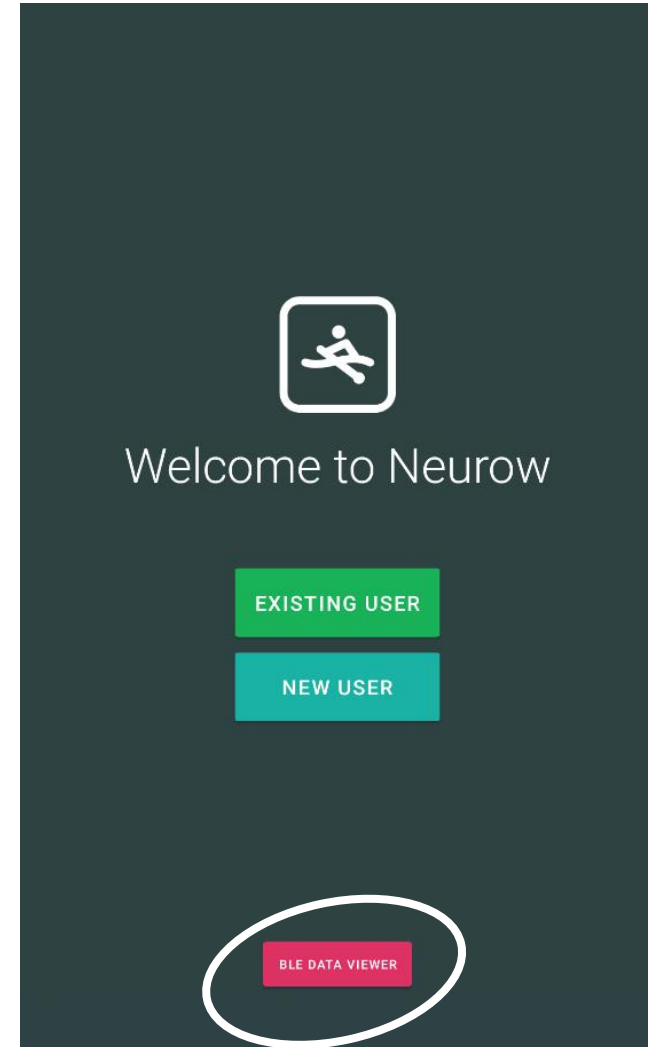
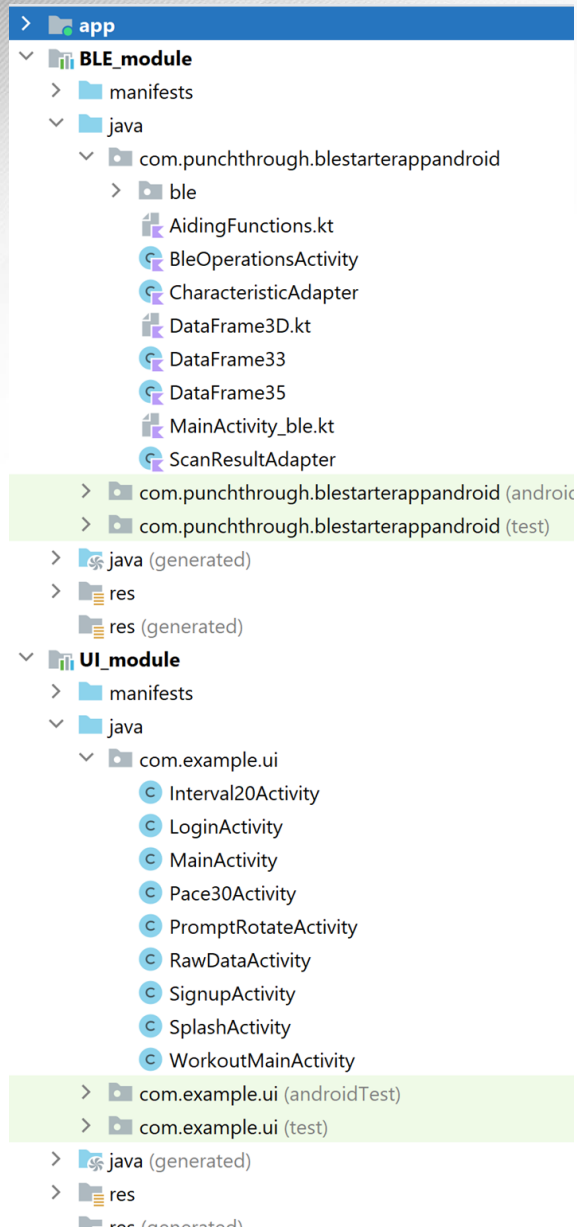
BleExtensions.kt C:\Users\ldgumu\AndroidStudioProjects\NeurowUI\app\src\main\java\com\example\neurowble 8 problems

- ⚠️ 'toUpperCase(Locale): String' is deprecated. Use uppercase() instead. :132
- ⚠️ 'toUpperCase(Locale): String' is deprecated. Use uppercase() instead. :132
- ⚠️ Package directive does not match the file location :17
- ⚠️ Should be replaced with 'equals(..., ignoreCase = true)' :132
- ✖️ Typo: In word 'INDICATABLE' :87
- ✖️ Typo: In word 'Indicatable' :101
- ✖️ Typo: In word 'Cccd' :131
- ✖️ Typo: In word 'timberlog' :140



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# Database Subsystem

Meredith McKean

Accomplishments since last update 17 hrs of effort	Ongoing progress/problems and plans until the next presentation
<ul style="list-style-type: none"><li>• Workout subsystem has obtain exact copy of my demo app (currently running)</li><li>• Completed 38 new/improved methods in preparation for integrating with Workout Subsystem</li><li>• Researched on how to integrate Android Studio Projects into one github repository</li></ul>	<ul style="list-style-type: none"><li>• Fully integrated with Workout Subsystem</li><li>• Plan and prepare 45 min presentation with sponsor</li><li>• Clean github repository</li></ul>

# Database Subsystem

Meredith McKean

```

getTime_33()
getTime_35()
getInterval()
getPower()
getTotal_cal()
getSplit_pace()
getSplit_power()
getSplit_cal()
getLast_split_time()
getLast_split_dist()
getDist()
getDrive_len()
getDrive_time()
getStroke_rec_time()
getStroke_dist()
getPeak_drive_force()
getAvg_drive_force()
getWork_per_stroke()
getStroke_count()
  
```

```

getPastTime_33()
getPastTime_35
getPastInterval()
getPastPower()
getPastTotal_cal()
getPastSplit_pace()
getPastSplit_power()
getPastSplit_cal()
getPastLast_split_time()
getPastLast_split_dist()
getPastDist()
getPastDrive_len()
getPastDrive_time()
getPastStroke_rec_time()
getPastStroke_dist()
getPastPeak_drive_force()
getPastAvg_drive_force()
getPastWork_per_stroke()
getPastStroke_count()
  
```

All methods added or adjusted were tested for functionality through my 403 demo app



# Workout Subsystem

Alyson Garlick

Accomplishments since last update 16 hrs of effort	Ongoing progress/problems and plans until the next presentation
<ul style="list-style-type: none"><li>● Outlined needed methods for database integration</li><li>● Ongoing integration with database subsystem</li><li>● ReadMe file updated</li></ul>	<ul style="list-style-type: none"><li>● Finish integration with database by next week</li><li>● Validate integration next week with fake datasets</li><li>● Register team for showcase</li><li>● Write history prediction methods</li></ul>



# Execution Plan

	1/23/23	1/30/22	2/6/23	2/13/23	2/20/23	2/27/23	3/6/23	3/13/23	3/20/23	3/27/23	4/3/23	4/10/23	4/17/23	4/24/23	Date
Status Update 1	Completed														1/25/23
Github Reorganization	Behind Schedule	Behind Schedule													2/3/23
Bluetooth/User Interface Integration	In Progress	In Progress	In Progress							Not Started					2/10/23
Database/Workout Intergration	In Progress	In Progress	In Progress							Completed					2/10/23
Status Update 2			In Progress							Behind Schedule					2/8/23
Validation of Initial Integration				Not Started											2/17/23
Dry Run Presentation with Sponsor				Not Started	Not Started	Not Started									2/13/23
Integrate the Two Systems				Not Started	Not Started	Not Started									3/3/23
Status Update 3					Not Started										2/22/23
Design Blitz Participation						Not Started									3/4/23
Status Update 4							Not Started								3/8/23
Integration Debug							Not Started	Not Started	Not Started						3/24/23
Front End Validation							Not Started	Not Started	Not Started						3/24/23
User Interface Polishing								Not Started	Not Started	Not Started					3/31/23
Database Encryption									Not Started	Not Started					3/31/23
Status Update 5										Not Started					3/29/23
Back End Validation										Not Started	Not Started	Not Started			4/12/23
Corner Case Validation										Not Started	Not Started	Not Started			4/12/23
Final Presentation												Not Started			4/12/23
Demo and Poster Preparation													Not Started	Not Started	4/26/23
Final System Demo														Not Started	4/26/23
Project Showcase														Not Started	4/28/23
Final Report														Not Started	4/29/23





# Validation Plan

Paragraph #	Test Name	Success Criteria	Methodology	Status	Responsible Engineer(s)
N/A	BLE PM5 Connection	Device UUID on Application	Check BLE Callback object for successful connection	UNTESTED	Diego & Nick
N/A	Successful Characteristics subscription	Display Dataframe Units on Application	Call properties of Dataframe object for successful connection	UNTESTED	Diego & Nick
N/A	Time delay between HR data displayed (start to finish)	Heart Rate value displayed in UI falls within 1 second of value displayed on Bluetooth interface	Use a timer and visual judgement	UNTESTED	Diego & Nick
N/A	Database Storage	Storage of running bluetooth data in database	After connecting database to bluetooth, database will store all necessary data for calculation after a workout run	UNTESTED	Meredith & Nick
N/A	Calculations and Database Match	Workout subsystem runs with connected database subsystem	Connect the workouts with the database to test workouts function with gathering data from the database	UNTESTED	Alyson & Meredith
N/A	Workout Functionality with Bluetooth Data Stream	Workout functions and calculations are correct with real time data streamed into the database	Connect bluetooth to workouts and database and run workout methods to test functionality still performs	UNTESTED	Alyson & Nick
N/A	User Accounts connection with User Interface	Successfully able to create an account with app	Connect database subsystem with user interface subsystem	UNTESTED	Diego & Meredith
3.2.1.1	Display Five Workouts	All user interface elements are correctly displayed for each of the five workout options	All items are legible and selectable through the android debugging feature	UNTESTED	Alyson
3.2.1.2	Collect Data from Concept2	Data is collected from the Concept2 with every stroke pulled within 20 meters.	Connect the app to the Concept2 and begin data collection and steadily increase distance until 20m is met	PASSED	Nick
3.2.1.3	User Profile Storage	User profiles with corresponding workout history and FTP value shall be saved in the database	Create user, do FTP workout to get value, and complete two other workouts to see if the user, their FTP, and their history is saved correctly	UNTESTED	Meredith
3.2.2.3	Mounting	Smart Rower tablet is held up using the device holder.	Try and mount the tablet with the device holder and perform a workout to test the stability	UNTESTED	Nick
3.2.3.2.1	Data Output	Smart Rower displays four workout routines along with calculated FTP based power zones	Use the workouts on the app to test correct data display functionality and user experience	UNTESTED	Diego
3.2.4.1	Pressure (Altitude)	Smart Rower performs correctly in varying altitudes ranging from 0-12,000 ft above sea level	Use the app in different altitudes to verify correct functionality	UNTESTED	Full Team
3.2.4.2	Thermal	Smart Rower performs correctly in temperatures ranging from 0 to 35 degrees celsius	Setting ambient temperature to 0-32 degrees Celsius	UNTESTED	Full Team
3.2.4.3	Rain	Smart Rower runs while inside without wet conditions	Use the Smart Rower indoors in dry conditions	UNTESTED	Full Team
3.2.4.4	Humidity	Smart Rower runs while in humidity ranging from 30-50%	Use the Smart Rower indoors in humidity ranging from 30-50%	UNTESTED	Full Team
3.2.5.1	Failure Detection	Application displays generic failure flag	Introduction of a failure to connect flag from bluetooth	UNTESTED	Nick
3.2.5.2	Recovery	App displays error message and goes to home screen upon an incorrect user profile or invalid user input	Input an incorrect user profile and invalid user input to test whether app displays error message and goes to home screen	UNTESTED	Diego
N/A	Full System Demo	A user of the app is able to use all workouts and functionality of the app without issues or errors	A team member connects the tablet to the Concept2, creates a profile, and does all available workouts. They then connect/log back in to do more workouts and test user memory features.	UNTESTED	Full Team





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**Thank you for listening!**