Team Rehab Remote

Telerehab Patient Portal

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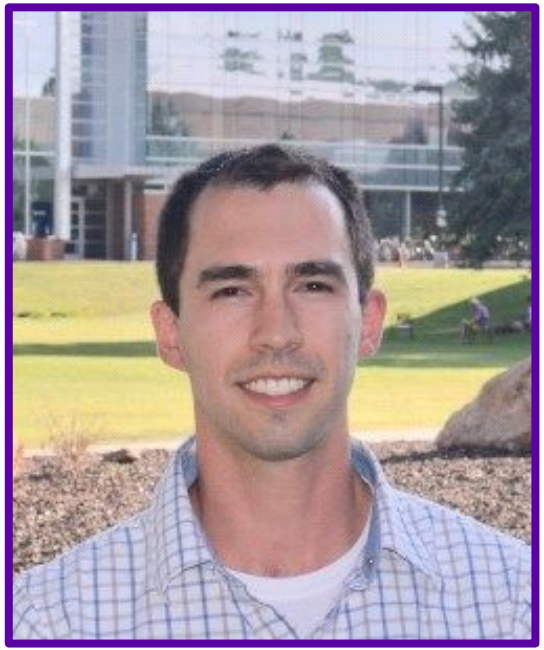


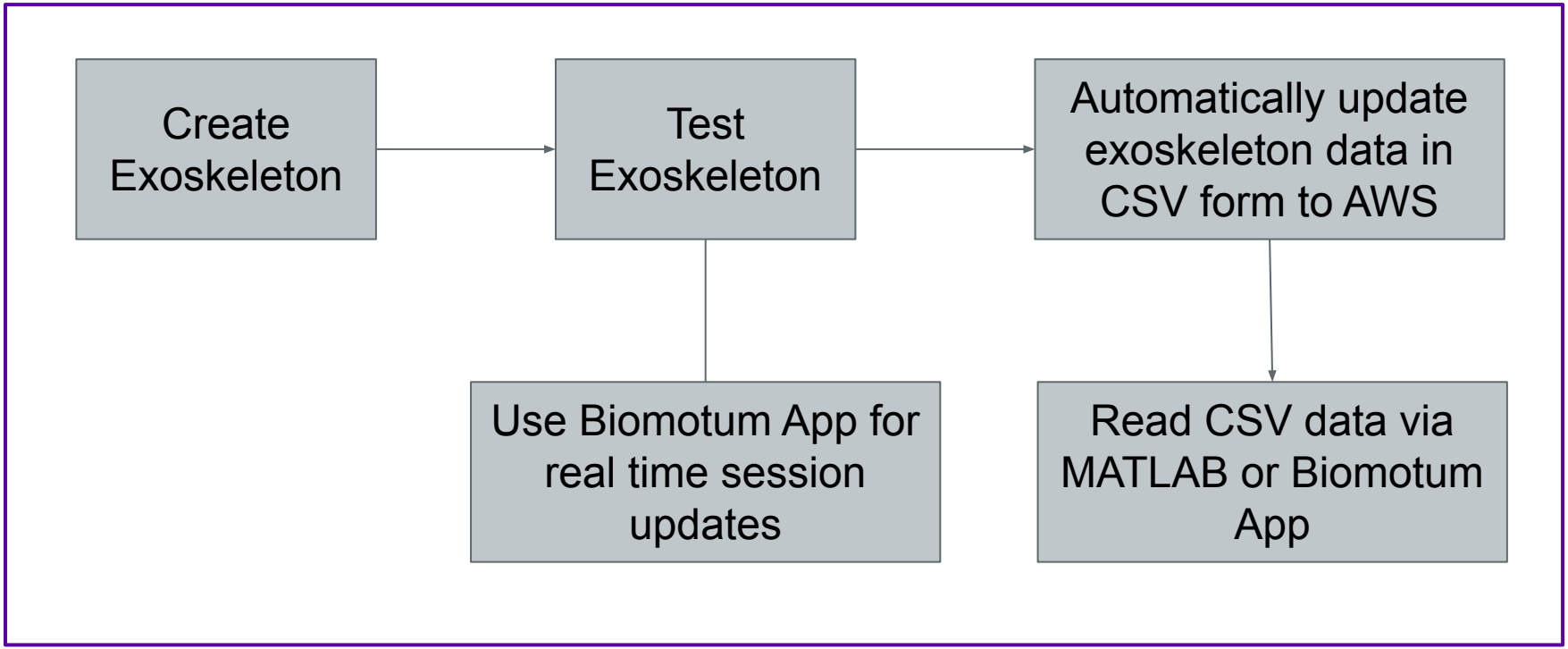
Our Client: Dr. Zachary Lerner

- Assistant Prof. for the Dept. of Mechanical Engineering
- Co-Founder of Biomotum
- Aides in the development of exoskeletons made by Biomotum

Introduction

- In the US, 1 in 345 children has cerebral palsy
- Cerebral palsy is a set of neuromuscular disorders effective around the time of birth
- Around 58.9% of children can walk independently
- Biomotum created exoskeletons to aid in the rehabilitation process

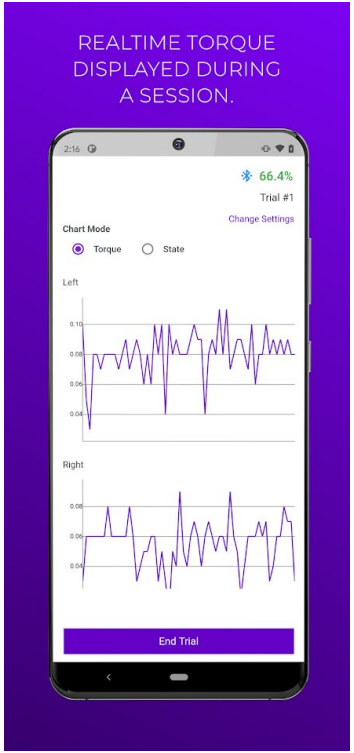
Biomotum Workflow

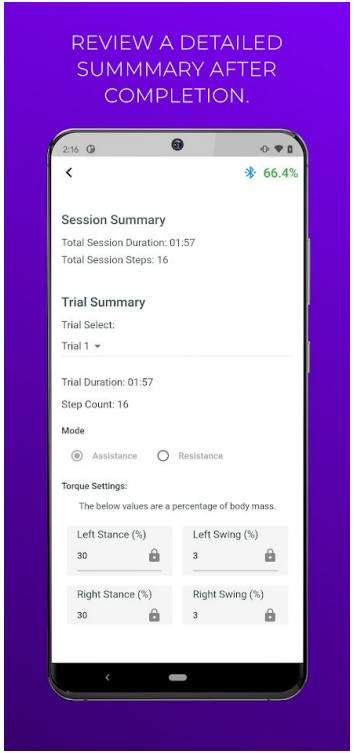


Problem Statement

Current situation

- Phone application is in place to collect information from the current trail
- Data shown is hard to interpret
- No web application is available for clients to view or download the collected data





Problem Statement Cont.

Data Processing

- Organize the data to constraints needed

Visualization For the Patient

- Easy to Understand
- Appealing

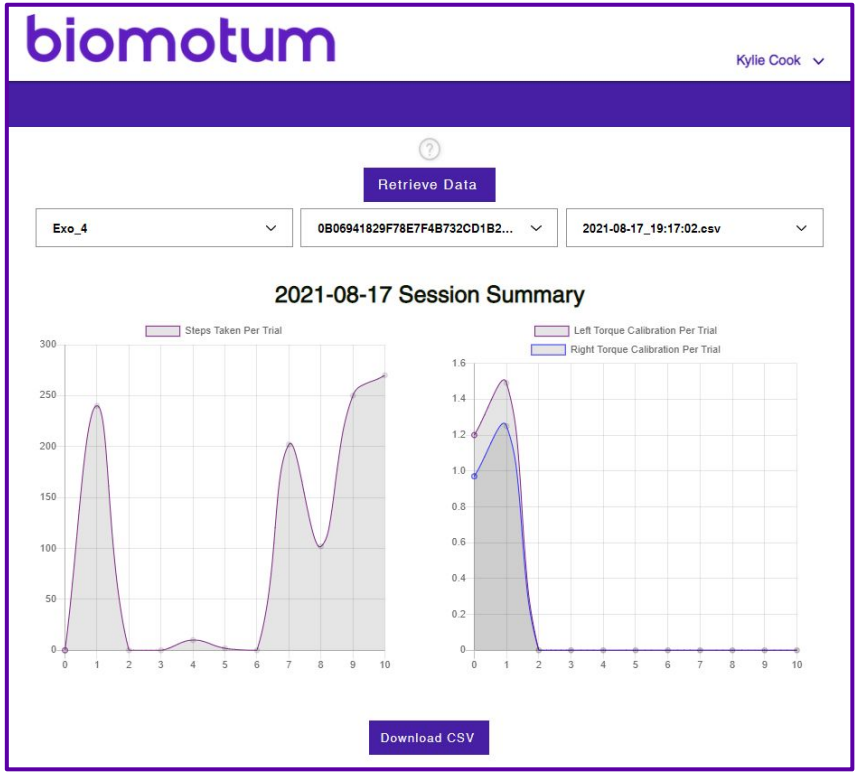
	TStep	1	2	3	4	5	6
0	RTorque	-0.07	0.02	-0.09	-0.07	0	-0.04
1	RSetP	0	0	0	0	0	0
2	RState	0	0	0	0	0	0
3	LTorque	0.02	-0.02	-0.18	-0.15	-0.01	0.03
4	LSetP	0	0	0	0	0	0
5	LState	0	0	0	0	0	0
6	Voltage						
7	ErrorCount						
8	StepCount	0					
9	LFsr	0	0	0	0	0	0
10	RFsr	0	0	0	0	0	0
11	Biofeedba	0					
12	Biofeedba	0					
13	Biofeedba	0					
14	Marks	0	0	0	0	0	0
15	Left Torqu	1.13					
16	Right Torq	0.93					

Solution Review

- Web based user-portal

Key Requirements

- Graphical Display
- Administrative and User Login
- Filter options

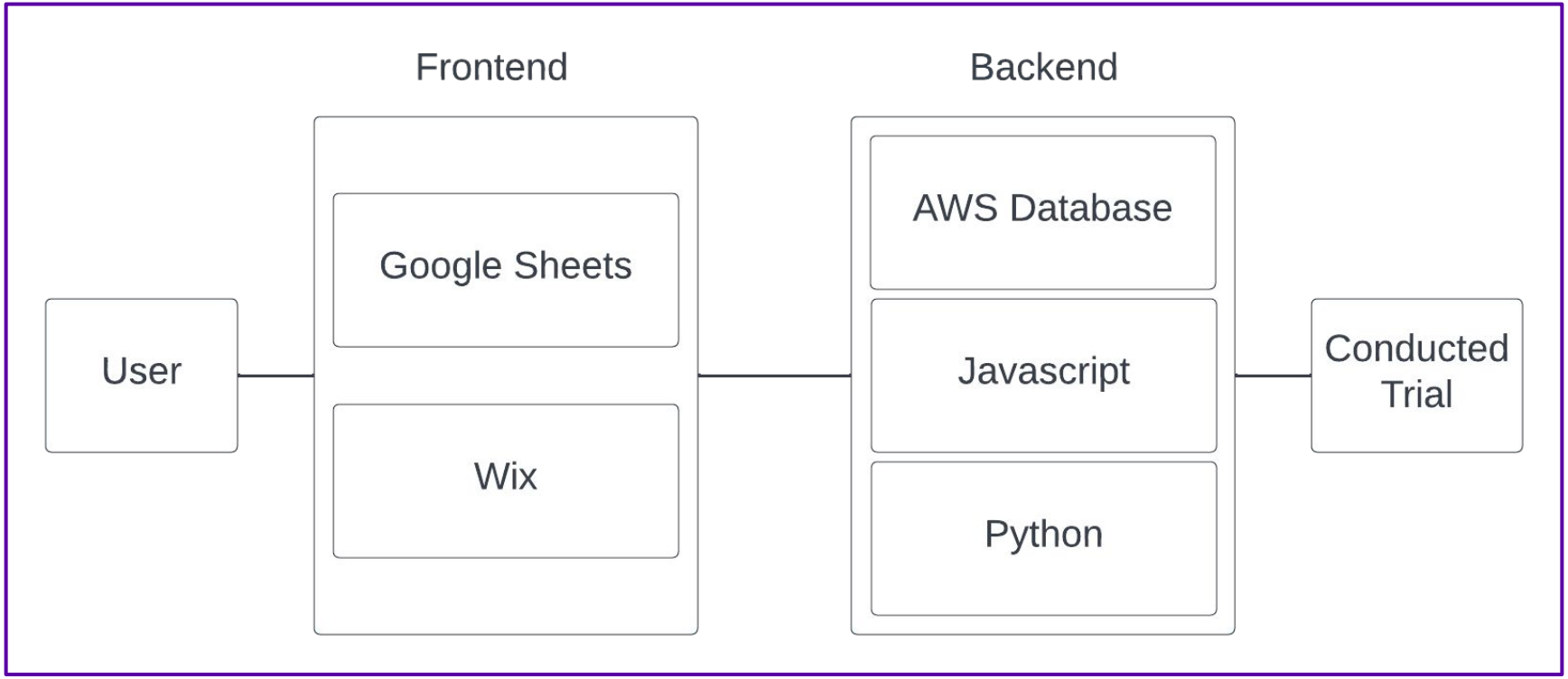


Requirements & Specs Review

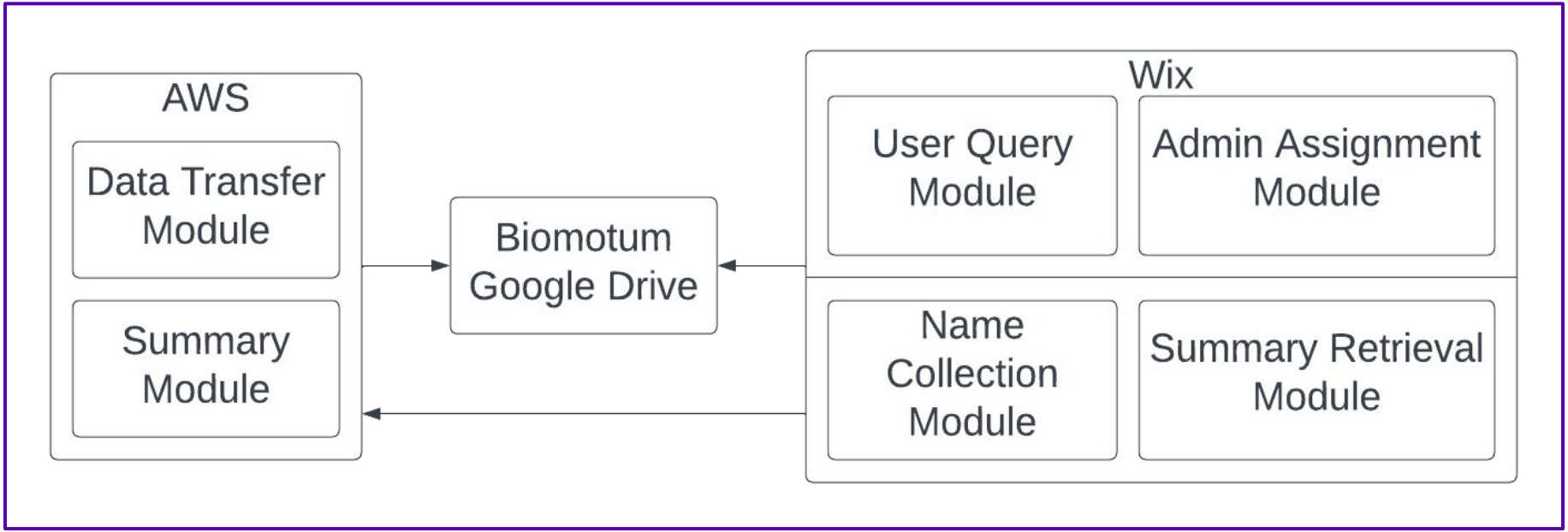
Requirements were gathered through multiple meetings with our client:

- User Requirements:
  - Users and administrators can see their individual data
  - Data is provided in graphical form as well as original CSV (Comma-Separated Values) form
  - Users can access different groups/filters (by exoskeleton -> user -> trial)
  - Data can be collected for offline use
  - The user interface is simple and easy to understand
- Key Requirements:
  - User Account System (With username and password database / AWS data connection)
  - Data Visualization
  - Hierarchy of Data
  - Downloadable Data

Architecture Overview

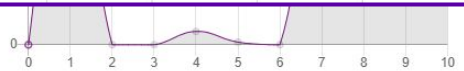


Implementation Overview



Prototype Review

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	TStep	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1
2	RTorque	0.04	0.09	-0.02	0.03	-0.03	0.05	-0.03	0.07	0.01	-0.03	0.15	-0.01	-0.01	0.08	-0.02	-0.0
3	RSetP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	RState	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	LTorque	0.23	-0.17	0.25	0.05	-0.06	0.07	-0.19	-0.21	0.04	-0.21	-0.1	0.11	0.08	0.09	0.05	-0.0
6	LSetP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	LState	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	Voltage																
9	ErrorCount																
10	StepCount	6															
11	LFsr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12	RFsr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13	Biofeedba	0															
14	Biofeedba	0															
15	Biofeedba	0															
16																	



Download CSV

Challenges and Resolutions

Challenges	Resolutions
Ensuring Data is kept up to date	Script that continuously checks AWS and transfer it to google drive
Data Hierarchy selection	Collect folder names from AWS S3 file manager bucket and match folder names to selected hierarchy section (Exoskeleton -> User -> Trial)
Creation of graphs from AWS data	Summarize folder data within google sheets and graph the data using HTML chart.js library

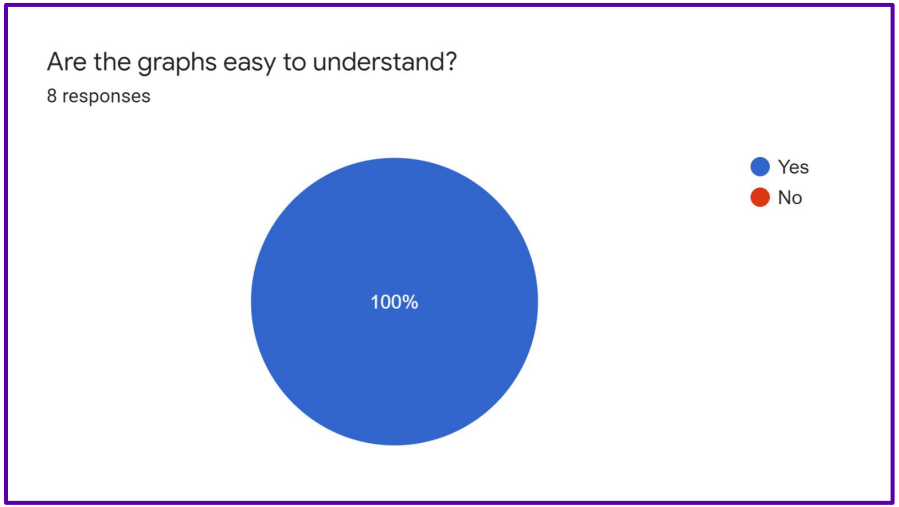
Testing

Testing Type	Description
Unit Testing	Test each function individually on front end and back end
Integration Testing	Ensure everything works together
Usability Testing	Get feedback from Biomotum employees

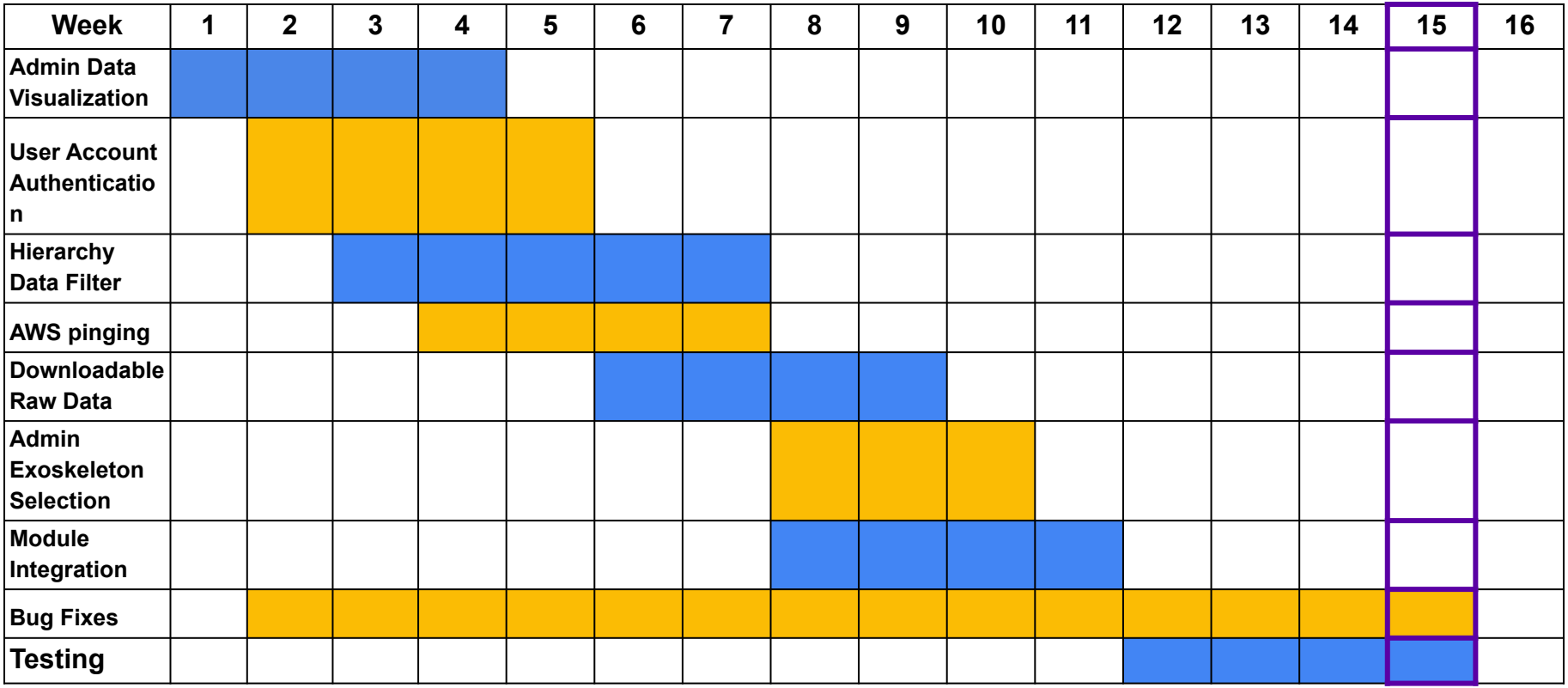
Usability Testing

- Testers: Biomotum Employees
- Feedback delivered through Google Forms survey

Recommended Changes
The hash ID under "User" is very long, and for a big list of people it'll take a ton of time to find the exact hash.
Good, having easy access to exo data is very handy. Seems like there's some still some bugs to work out though.



Schedule - Gantt Chart



Future Work

- A visualizer with interactive graphs and plots, and summary statistics
- A “smart” tool to score and track a user’s rehabilitation progress (steps taken, training time)
- Generate Clinical Trial summary reports

Conclusion

Rehabilitation with visual motivation!

Questions?