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Trackigue

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Advisor: Dr. Charles Kim

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Background

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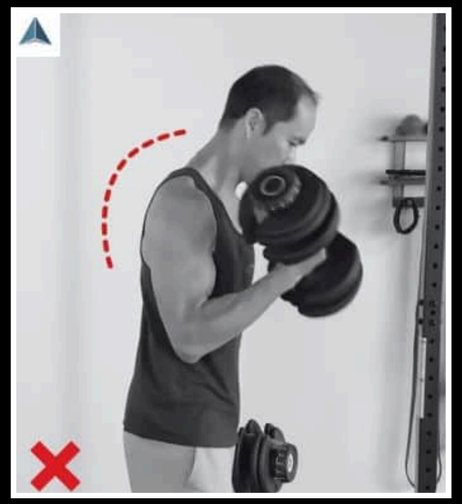
Need:
People are unaware of their physical limits which can cause unforeseen injuries and fatigue, not yet adequately addressed in the MedTech Sector.

Approach:
Our portable device leverages physiological signals to notify users when they are approaching their physical limit.



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Problem Formulation

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Problem Formulation

Goal:
Create a portable device leveraging physiological signals to notify users when they are approaching their limit. This way people can exercise freely, with a reduced risk of overdoing and injuring themselves.

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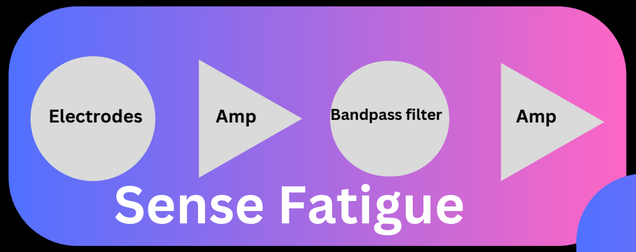
Design Requirements

Design Requirements



Battery Powered

Portable (Size and Weight)

Wireless

Power Efficient

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Items	Quantity
Size:	Smaller than 8x5x1 inches
Weight:	No Heavier than 61.3 g – (I propose a range of 62-250g
Heat emission:	Recommend 3 hours battery life
Power Consumption:	Recommend 3 hours battery life
Wireless	Use Bluetooth, so that device wirelessly communicates to phone within 10 feet?
Visually representative	Black or White
Continuous Monitoring and Predictive	Utilize a sampling rate of no less than 15Hz to measure heart rate and body temperature (indicators
Battery powered	Use less than 4 AA 1.5 volt batteries or is rechargeable

Predictive	than 15Hz to measure heart rate and body temperature (indicators
Battery powered	Use less than 4 AA 1.5 volt batteries or is rechargeable
Sense fatigue	Gives estimate of user's limits every 1 minute
Environmental Constraints	Prioritize modularity and quality wearable materials to maximize the product's predicted lifespan
Socio-Cultural Constraints	Some cultures don't prioritize exercising thus should still be sensitive enough sensors for everyday physical tasks
Compliance (Rules, Regulations, and Standards)	Subject to FDA General Controls Regulation, as a FDA Class 1 Medical Device under the General Physical Medicine subcategory

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Solution Generation

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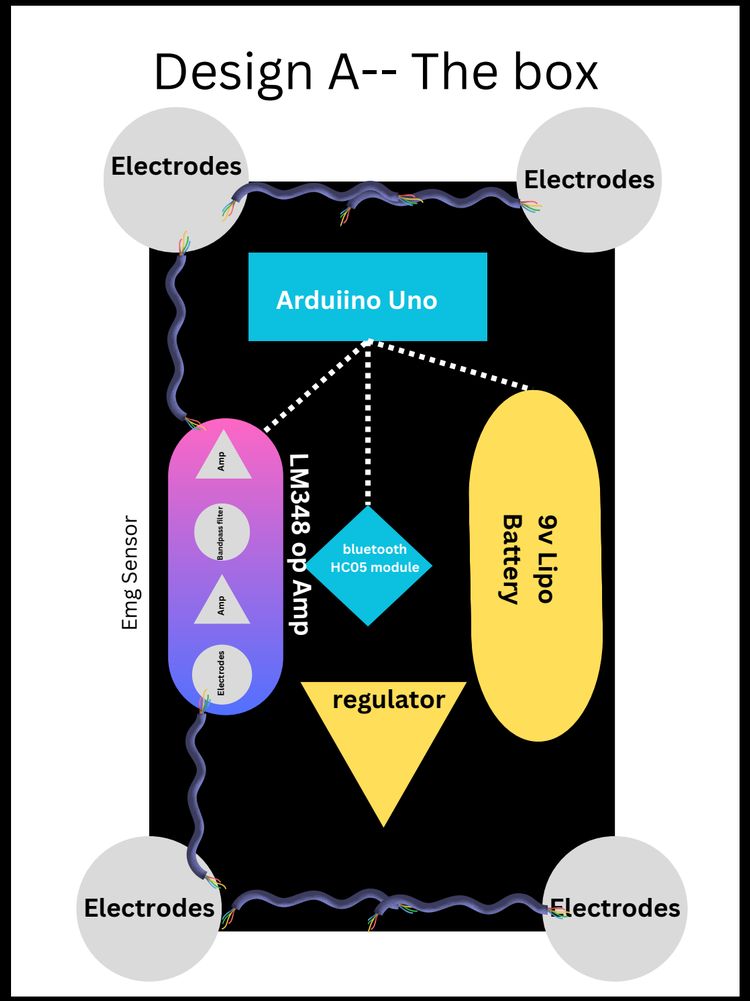
Solution Generation



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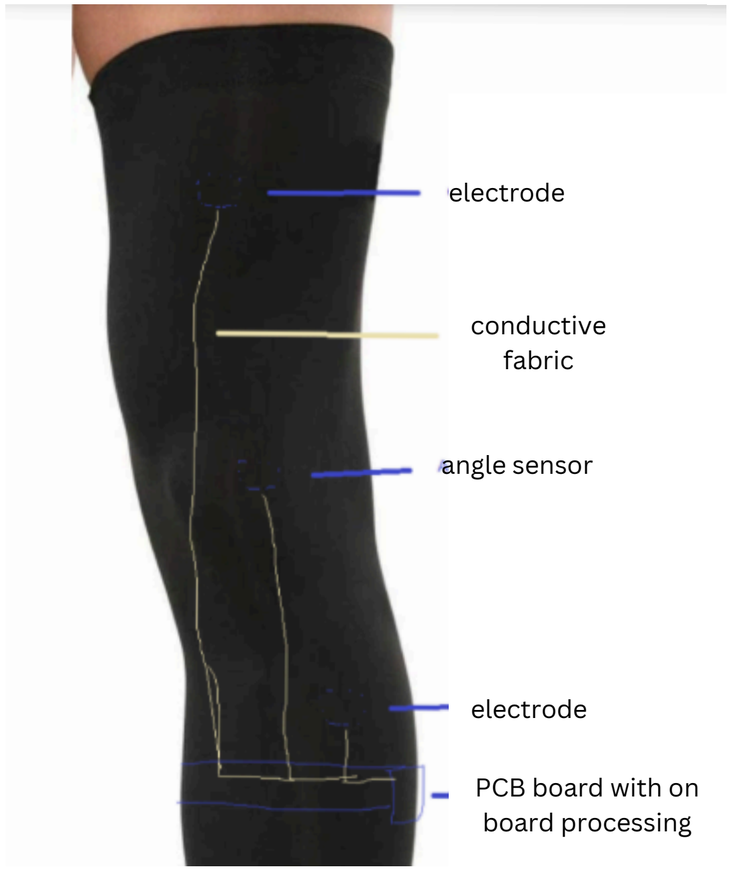
Solution Generation

Design B - Leg Sleeve



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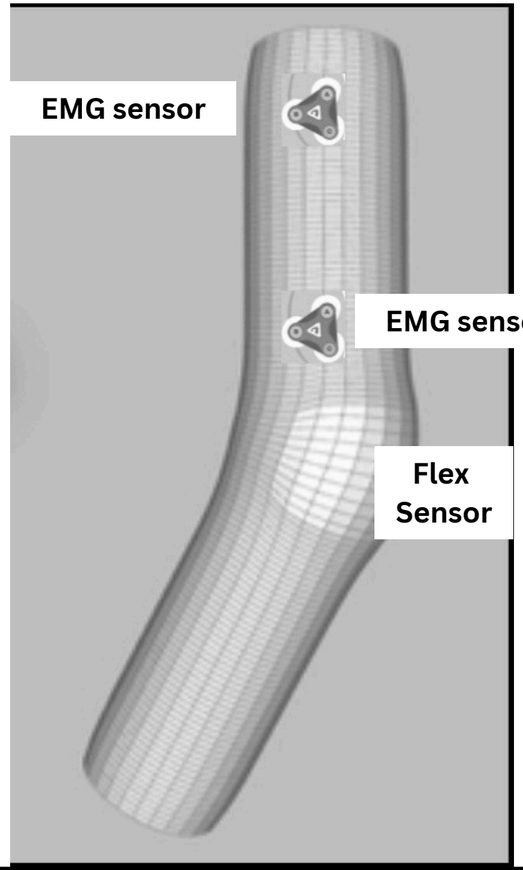
Solution Generation

Design C - Arm Sleeve



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Solution Generation

	PROS	CONS
Design A	• Portable, utilizing safe and affordable components • Multiple EMG signals can help maximize signal-to-noise ratio	• LED installed might instill unforeseen heat implications • Compact device so Emag. noise needs to be accounted for more
Design B	• Software considers both quantitively and qualitative data, instead of AI • Many athletes injure their leg so this targets a common problem area	• Unfamilar with using conductive fabric so implementation may be difficult • May impair a user’s movements in the leg depending on material
Design C	• Individual components obtainable and cheap • ESP32 IDE can be the already accessible Arduino IDE	• Create an app to feed aggregated summarized data from microcontroller • Does not satisfy temperature constraint

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	W	Design B	Score B	Agg. B	Design C	Score C	Agg. C
Size	3	Sleeve covers from thigh to calf	3	9	Forearm to Shoulder	4	12
Weight	4	Few components	3	12	15g	5	20
Heat	5	MCU on user is a concern	1	5	ESP32 on external of 2 sleeves	4	20
Power	1	Not a concern with ESP32	3	3	Not a concern with ESP32	3	3
Wireless	1	Easily done with ESP	4	12	Easily done with ESP32 bluetooth module	4	12
Visual	1	Interpretability of signals based on EMG placement	4	16	Interpretability of signals based on EMG placement	4	16
Monitoring	5	Computation done real time with ESP32	4	20	Computation done real time with ESP32	4	20
Battery	2	Not a concern powering esp32 at 3.3V	3	6	Not a concern powering esp32 at 3.3V	3	6
Sense Fatigue	5	Utilize signals from different parts of the leg	4	20	Utilize signals from different parts of the arm	4	20
Safety	5	Consider heat emission	1	5	Consider heat emission	4	5
Total:				108			**137**

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Top Solution

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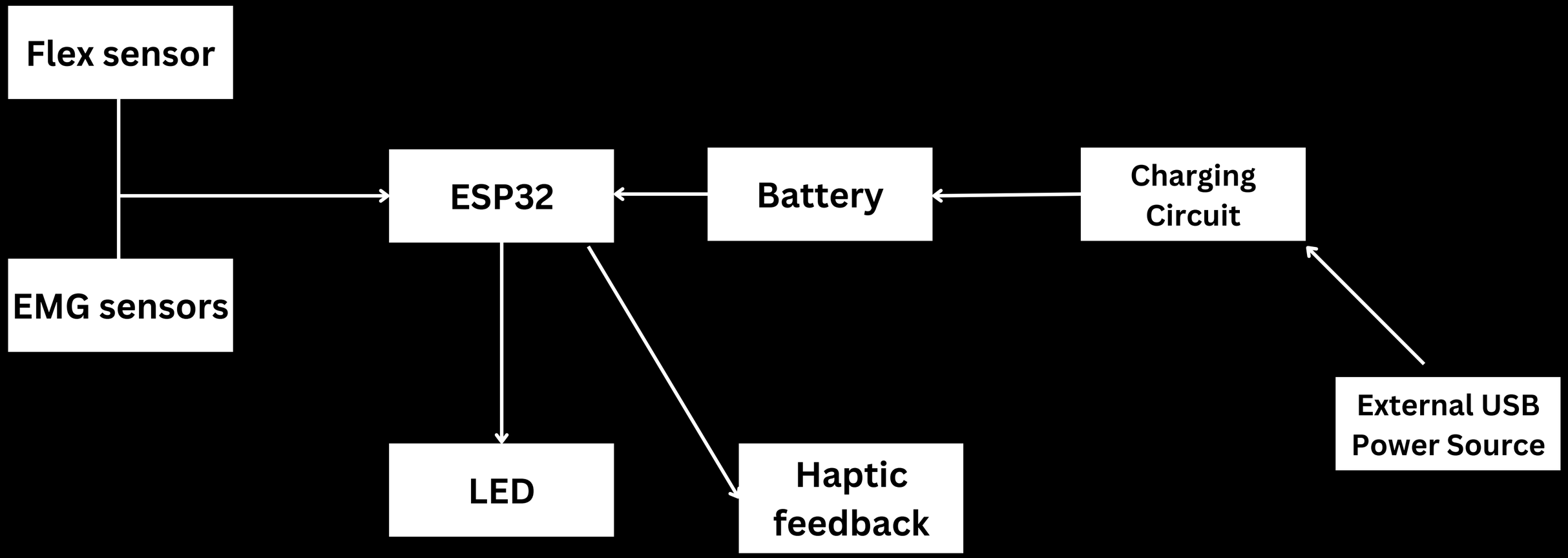
Hardware



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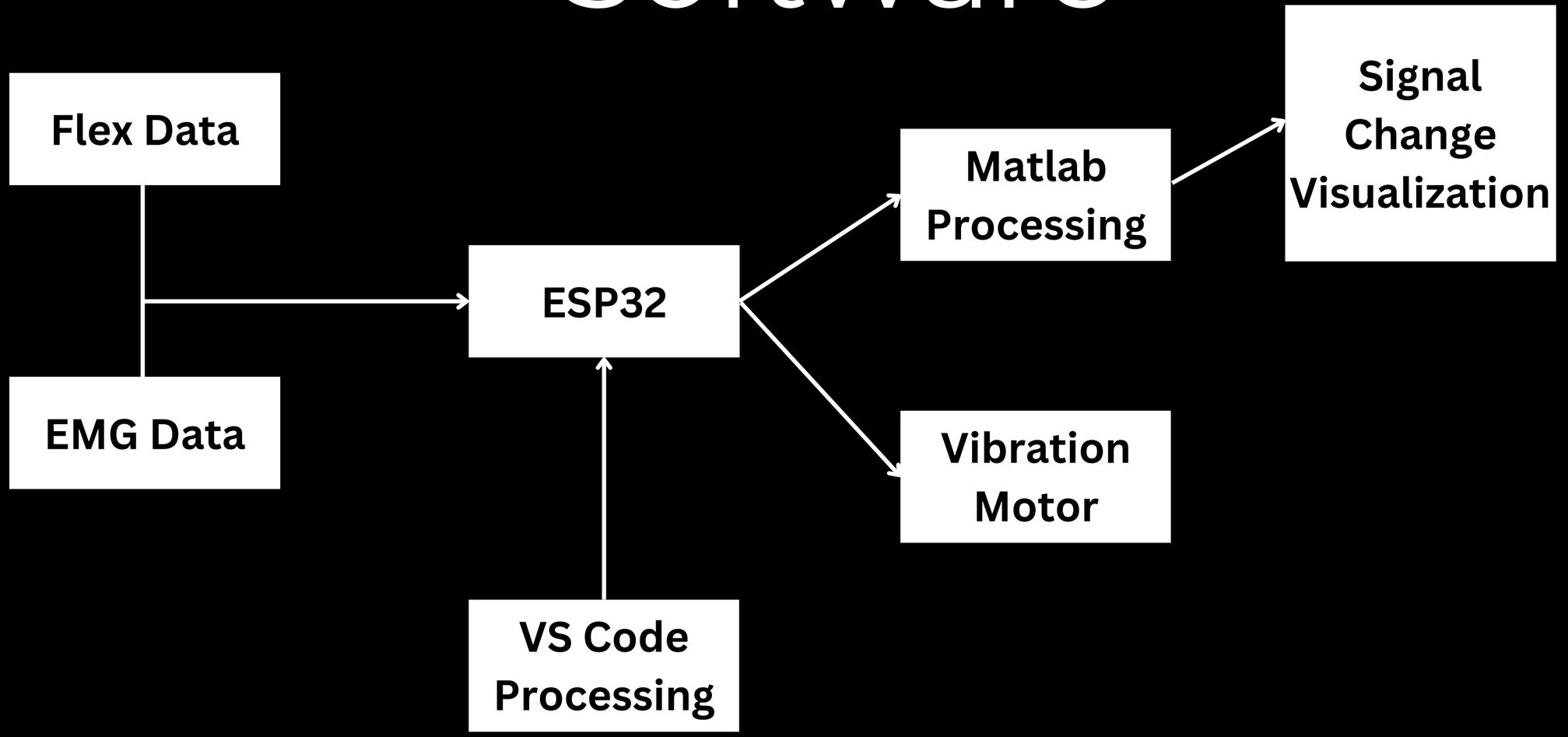
Software



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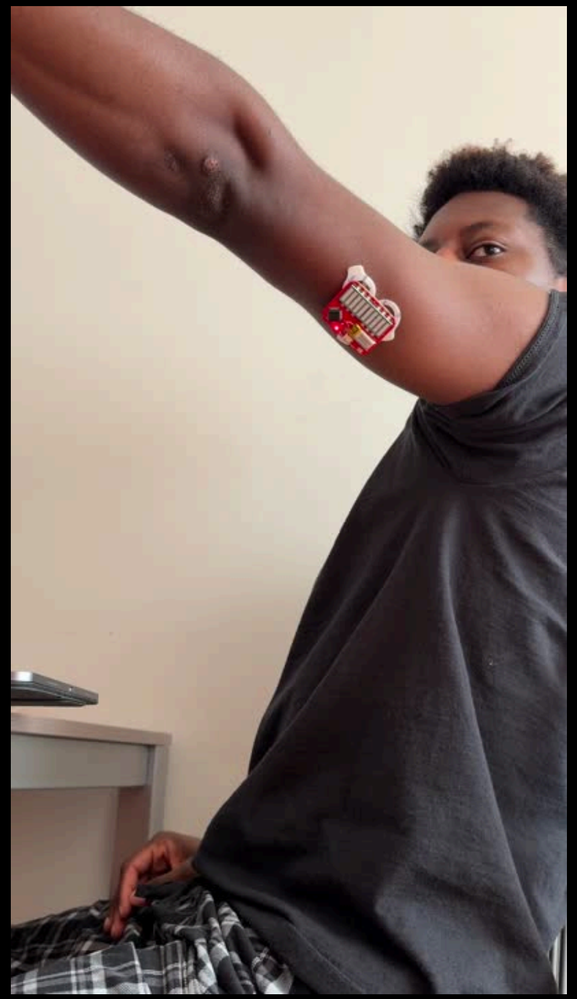
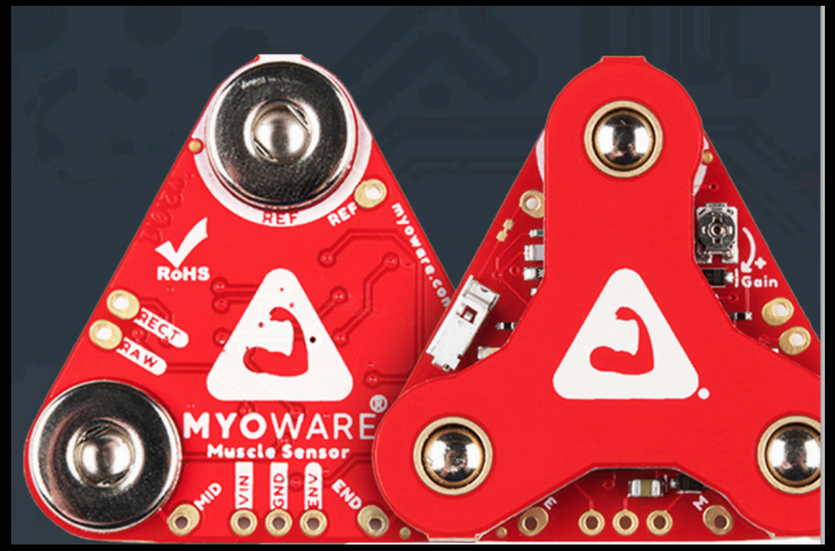
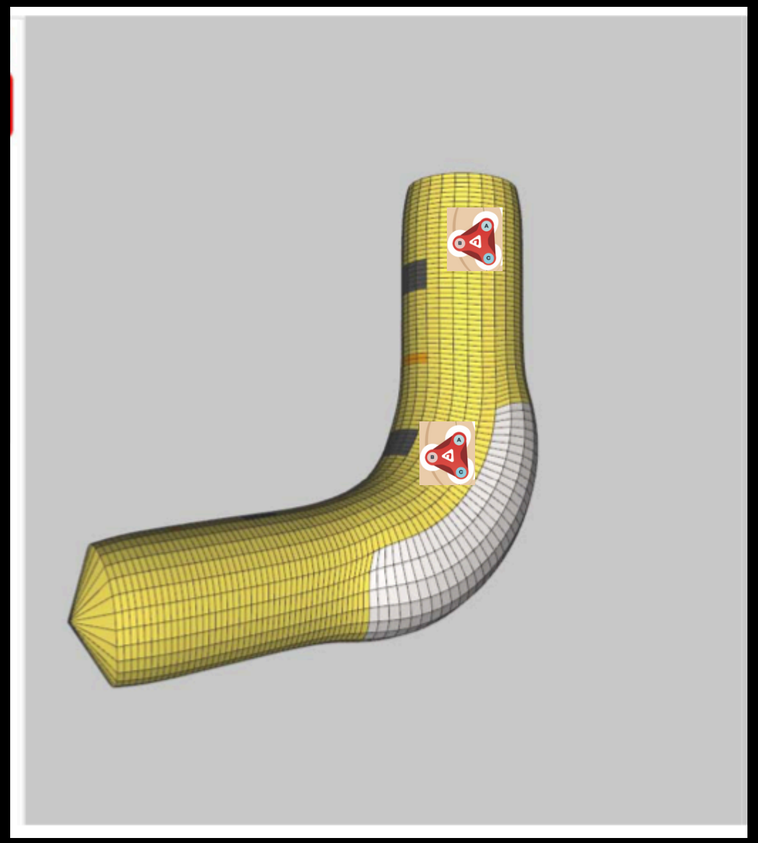
Top Solution Demo

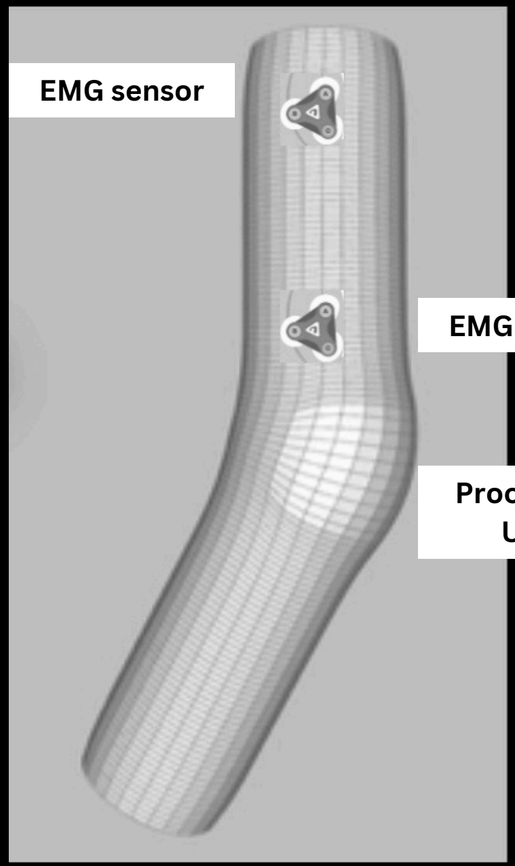
Demo:





Top Solution Blueprint





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Conclusion

- Muscle Selection
- Exercise Selection
- Noise Concern

Invest in us Today!

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