

# EMG Driven Autonomous Wheelchair

Senior Design Project



Coach:  
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## INTRODUCTION

There are many people who experience accidents and injuries that cause permanent paralysis, which is an extremely life changing event because it makes people lose their independence. We aim to empower paralyzed individuals with our smart wheelchair that is controlled using the mind.

## PROBLEM STATEMENT

Empower individuals with chronic Tetraplegia to regain independence through innovative solutions

## PROJECT IMPACT

Our project aims to revolutionize mobility for those with paralysis globally. By offering a comfortable alternative to existing solutions, we empower independence. Introducing EMG-controlled wheelchairs also sparks innovation and job growth. Additionally, we may reshape market dynamics by redefining value.

## CONCEPT OVERVIEW

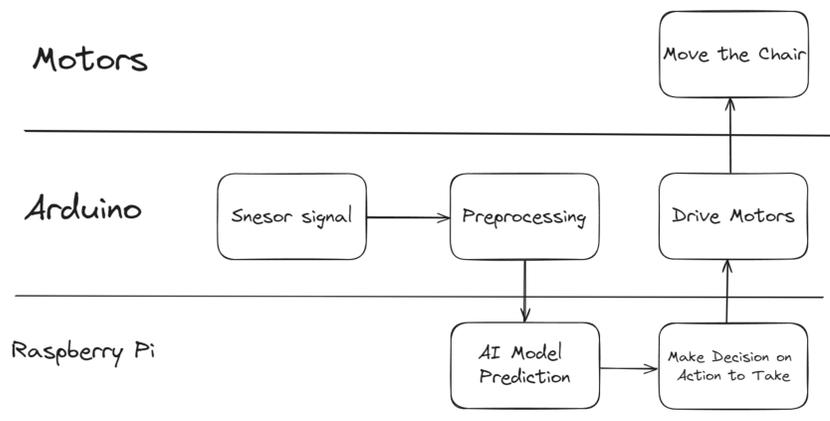


Figure 1: System Overview

## PROTOTYPE DESIGN

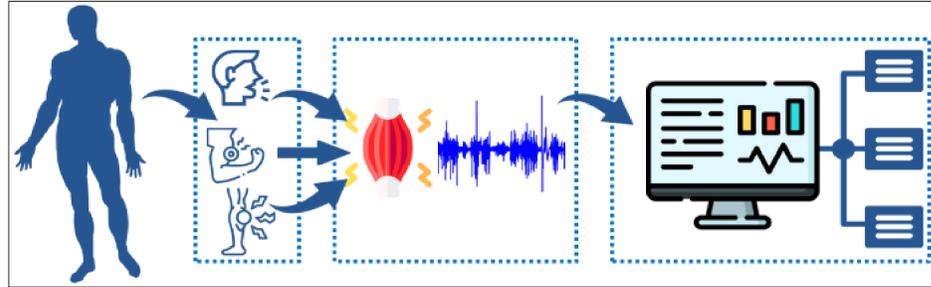


Figure 2: Signal Processing

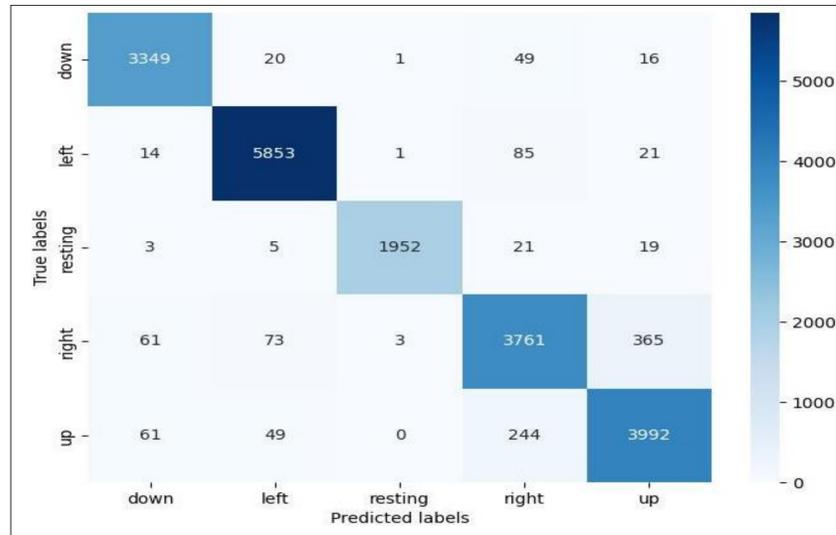


Figure 3: Confusion Matrix

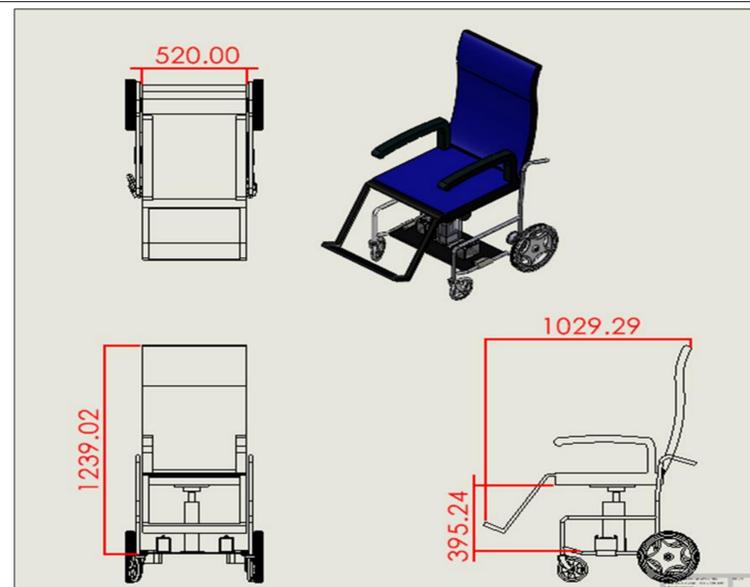


Figure 4: CAD Design

## CONSTRAINTS

- Safety:** Ensuring user safety, especially with battery use.
- Reliability:** Building a dependable structure for daily use.
- Power Consumption:** Managing energy efficiently.
- Lack of Data:** Collecting EMG signal data efficiently.
- Cost:** Balancing innovation with affordability.

## TARGET SPECIFICATIONS

- EMG AI Model:** Achieve **75% accuracy** for predictable behavior.
- Response Time:** Target **100ms** for prompt actions.
- Power Consumption:** Limit to **500W** for extended use
- Degrees of Freedom:** Ensure **4 Degrees** for user comfort.
- Sampling Rate:** Maintain at least **250 Hz** for quick response
- Weight Capacity:** Support up to **70 kg**

## VALIDATION

- EMG AI Model:** we achieved **94% accuracy**.
- Response Time:** The AI model achieve **10 ms** latency.
- Power Consumption:** After testing, the maximum consumption is **443W**.
- Degrees of Freedom:** it has **4 degrees** of freedom.
- Sampling Rate:** we achieved **900Hz** Sampling Rate.
- Weight Capacity:** After testing, it supports **75 kg**.

## CONCLUSION

The project successfully developed a mind-controlled wheelchair for individuals with chronic Tetraplegia, exceeding technical goals. This innovative solution has the potential to revolutionize mobility for individuals with paralysis, empowering them to regain independence and improve their quality of life.

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