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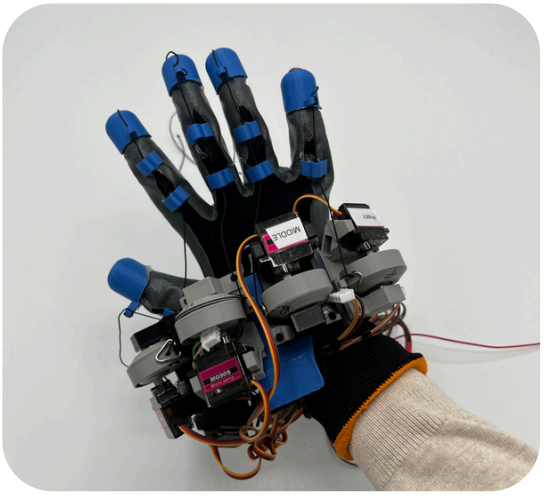
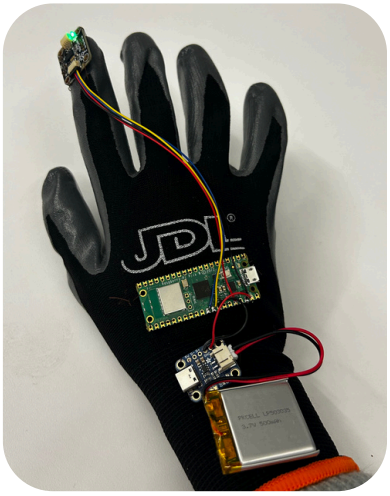
Wearable Gloves for Data Collection — HaptE





What?

- Creating **data collecting gloves** for Physical Therapy
- **Developing MVP** for use in pitch competitions and customer acquisition
- **Simplifying first prototype** (middle) by considering more effective sensors (right)

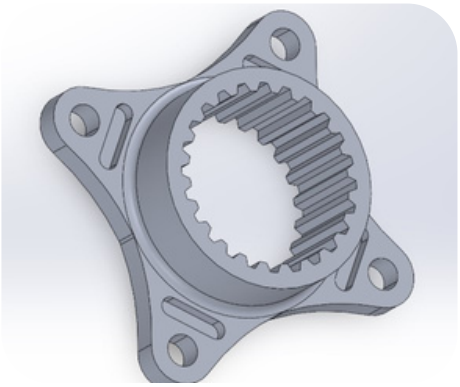
How?

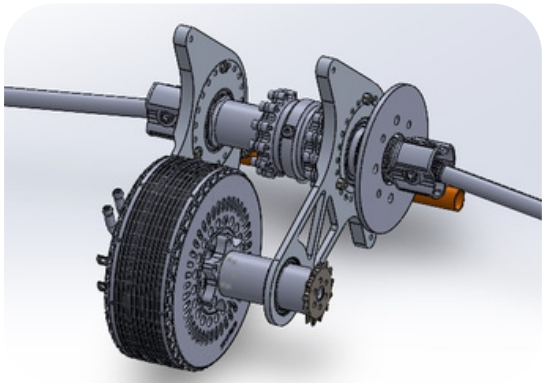
- Using **IMUs** to apply orientation data to musculoskeletal models of human hand, creating visuals for an app
- Developed highly modular **electronic system**, appropriate for a glove
- Using **Raspberry Pi Pico WiFi** to create a wireless product

Results

- **Self-powered** system sewn on glove, **transmitting orientation data wirelessly**
- Discovered issues with IMUs such as **data noise**
- Considering new sensors for future product (**hall effects sensors, actuators**)

Differential Sprocket Adapter — Northwestern Formula SAE Electric





What?

- **Design differential sprocket adapter** from scratch for 2025 car
- Consider **design for manufacturing** due to limited access to stock metal
- Conduct **FEA** and **validation testing** to prevent part failure at competition

How?

- Worked with **drivetrain assembly** (middle) to **optimize design for perfect drivetrain alignment**
- Created initial prototype in **SolidWorks** and presented 'Design Review' with entire chassis team
- Iterated design and used **CAM in Fusion** to manufacture with **CNC Mill**
- Considered various **failure modes**

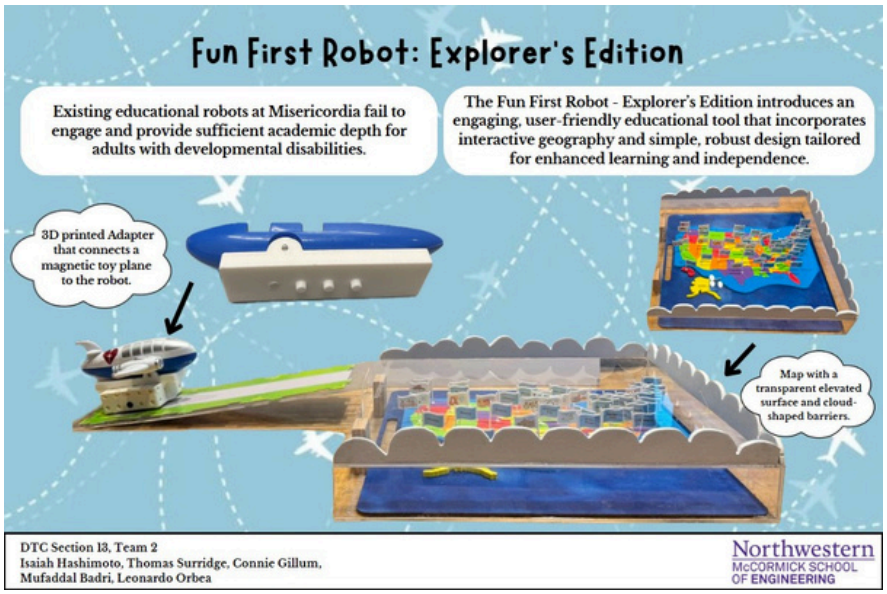
Results

- **Reduced mass by 12%** from 2023/24 design
- Conducted successful **FEA**, **exceeding Factor of Safety regulations by 2x**
- Successfully **manufactured DSA on first attempt**
- First successful DSA project for club **over the past 3 years**

Durable Learning Kits for Adults Northwestern Design Thinking & Communication

What?

- **User-centred design** project with client company Misericordia
- Create **tech-based learning kit** for adults with developmental disabilities
- Document entire design process including **engineering sketches** and **client interactions**



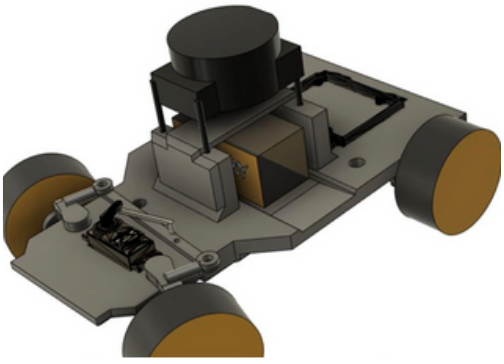
Results

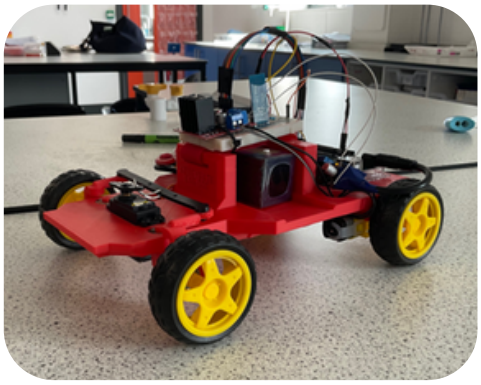
- **Fully-functional prototype**, adhering to user needs
- **Rise in engagement levels** compared to previous learning tools
- Presented at 'DTC Expo' and received feedback of **'best execution & design'**

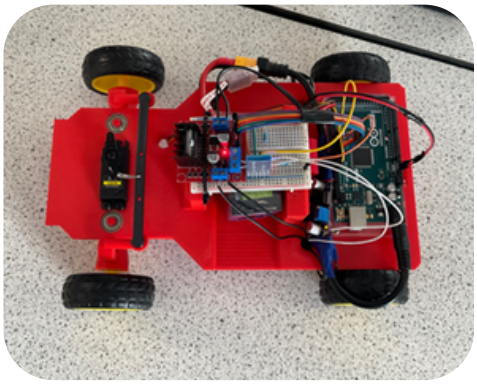
How?

- Worked with a team of 5 from ideation and mock-ups to final prototype through **rapid prototyping**
- Conducted **user research and testing** to fit prototype to user needs, such as safety and engagement
- Designed and **3D-printed** toy parts using **SolidWorks**
- Manufactured **acrylic** and **wooden** play environment using **laser cutter**, **drill press**, and **chemical bonding agents** (epoxy and acrylic adhesives)

Bluetooth-Controlled Car (Project Lead) Abbeygate Engineering Society







What?

- **Design** and **3D Print** a functional remote-controlled car from a $600 budget
- Investigate approaches for how the car can be made **autonomous** using **LiDAR** technology

How?

- Used **solid modelling** features in **Fusion 360** to create a design from scratch
- Created electronics diagrams in **Fritzing** based on **Arduino** Mega microcontroller

Results

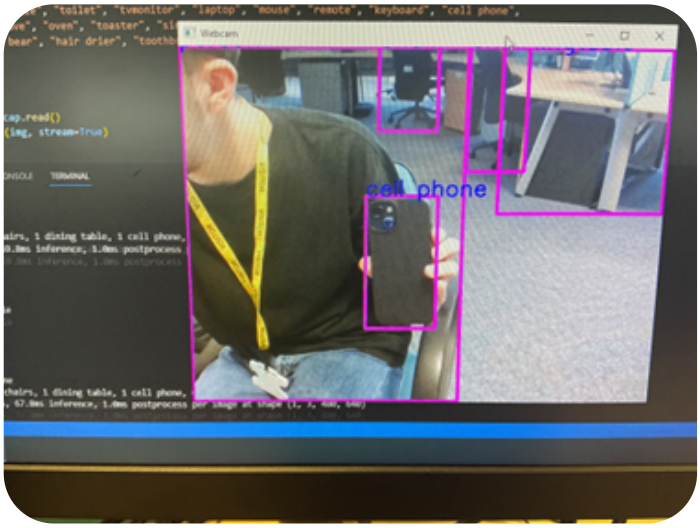
- Achieved a fully-functional RC Car with **dynamic steering mechanism**
- Entered project for **UK National Science Fair** as the leader of 5-person team

Object Recognition Application for Network Equipment

BT Group

What?

- Implement a trained **object detection** model into a **Unity** application
- Enhance the scope of **Augmented Reality** tools used at BT Group
- Provide a tool for BT field engineers to **improve their efficiency**



Results

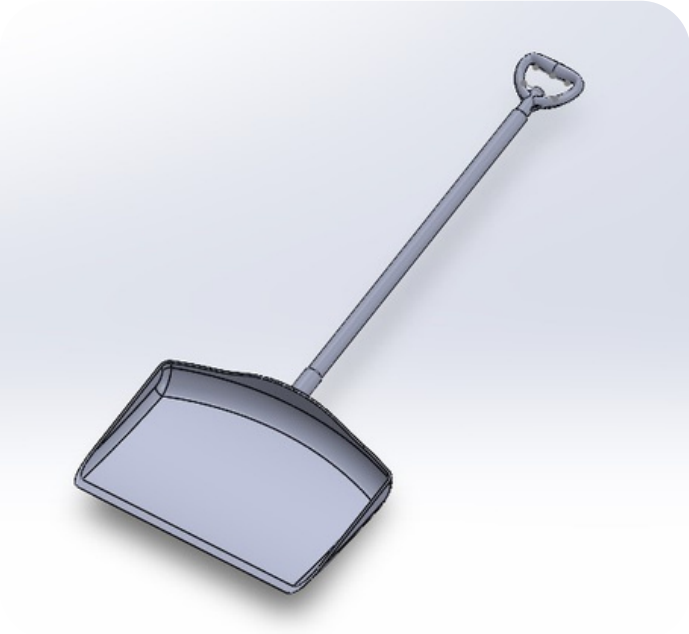
- Trained **model recognised desired equipment**
- Wrote a **research report** on my project and computer vision
- Presented at **Nuffield Research fair**
- Received **UK Gold CREST Award**

How?

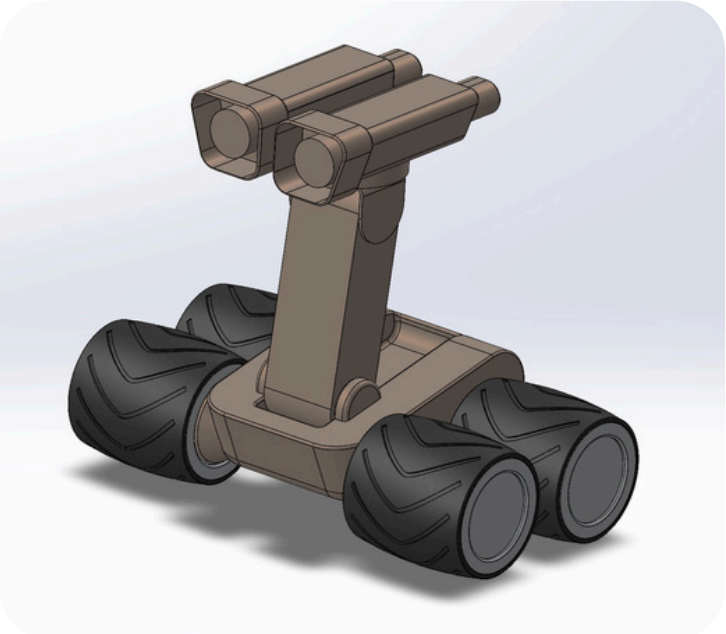
- Designed a webcam-enabled application on **Unity** with **interactive UI**
- Established a **dataset of BT network equipment** and utilised it to train a **YOLOv8 detection model**
- Implemented trained model into **Unity** application

Additional CAD Designs

DSGN 240: Intro to Solid Modelling



3-part Shovel Assembly



5-part Wall-E Assembly