Hi, I'm Bella and this is Henry and we're Symphony solutions.
Our community partner is Larissa.
Larissa has MS which is a disease,
where your immune system eats away at the protective coverings of your nerves.
And this causes a disruption between the communication between your brain and your body.

She's a music lover like Henry and I,
and a DJ and a wife to Shana,
who is in the photo, the person behind Larissa.
Throughout our conversations with Larissa we found out that
Larissa needs to be able to do basic tasks with both hands.

This includes holding a fork down with her left hand while she cuts with her right hand,
or being able to grab something like a cup.

And then she really wants to be able to continue to move her left arm,
in order for it to not atrophy

We started by asking the question: how do we restore the basic function of Larissa's left arm and hand?

But eventually, we realized that this question has a scope that is too large for this class.

So we've kind of narrowed down our statement a little bit after some reconsideration.

Now our current how might we statement becomes:
how should we help Larissa perform actions
such as grabbing and moving object with the remaining motor functions?

So we've kind of delve into this topic by doing a little bit of background research.
We started off by asking a question like : What is MS Exactly?

What are the causes and what are the symptoms?

So it's a disease of the central nervous system, and the nerves are damaged
in a way that cannot conduct electrical impulses to and from the brain.

That means that we probably can't really use EMG as a solution on her muscles.

We moved on to some literature reviews, where we kind of read about some precedent research and studies,
in this particular area of like, arm support.

So we looked at Mechanically Actuated exoskeletons,

so that just means that it uses a series of actuators,
including rotational actuators, and translation actuators, which are basically pistons.
And then there's also pulleys as well as like springs.
So these are just like referring to a group of arm support systems
that utilizes an actuator to assist the movement of the use arm.

And this paper is basically like an overview of many different types of systems.

Next slide, please.

We looked into soft robotics and actuators.

So these are basically silicone capsules with spaces for air on the inside.
So when you inflate these actuators, they expand
and when you release the air out, they kind of shrink.

So the advantage of this technology is that forces applied can be variable,
depending on how much you inflate these capsules.

But by inflating and deflating repeatedly, it could cause material failure, and that will cause the air to leak.
So it's not the most reliable solution.
Hence, we decide to move away from this solution.

And we also looked at Spring Loaded parallel mechanism.
So this basically just uses a series of springs to counteract the weight of the user's arm,
so that the users when supported by this mechanism
can move around a little bit more easily.

But the downside of it is that according to this particular piece of research,
all of the support structures are fixed onto a static surface whether it's like a wheelchair or or wall.
We're not really entirely sure whether a portable variant can actually exist.

So we looked at some existing products that's out there on the market
to see if that could save us any work.

So we looked at these rehabilitation robotic gloves on Amazon,
which utilize some form of soft robotics.
The advantage is that it's really cheap $236, but it's really sketchy.

We also looked at Kinova Jaco Assistive robotic arm,
that costs a car. Like 50 grand.

The advantage is that it's very lightweight, very compact, but it's fixed onto a wheelchair, and are also very expensive.

And we also looked at Neomano soft robotic glove.
It's light and compact, and also very portable, so you can move around with this device on a little bit more easily.
But it's like, pretty ineffective according to many of the Amazon reviews that we've read that it's not actually gripping, or like releasing the grip very well.

And then we looked at Myo Pro,
which seems to be something that would like really help Larissa
but the cons are, that the way you use it is EMG sensing,
so it may not work on people with MS.
And it's so so expensive.
And it's not worth seeing if it's going to work.
And then the Saebo reach,
we're not really sure if this one will work
because of the lack of grip strength that Larissa currently has.

So on the first meeting, we kind of got to know each other
talked about what Larissa kind of expects for the semester,
what are some unmet needs that she has.
And then Henry and I went into research mode,
and we found out everything we could
about everything,
about robotics to like things that are on the market,
and then we came back with it to the second meeting with a lot more information.
And it was much more productive.

And we figured out what our semester project was going to be.
And that is consists of two parts.
The first one is for the forearm to fingertips,
helping restore movement.
There's going be like a bottom part with elastic pulleys.
So that, Larissa can adjust her fingers and wrists to her own like comfortability.
And then we hope to add some kind of attachment on the side,
so that way with her right side, which is very mobile,
she can be able to move it out so that way her elbow can still be used.

The second part of the solution is to provide some form of arm support,
of which can be adjusted by using her right arm,
which still has full functionalities.

And it can be a purely mechanical powered arm support,

where it only uses springs, pulley gears and simple mechanical designs
to eliminate the need for electronics.
So that would reduce the complexity of the project.

And on the right hand side is a sketch,
and on the bottom right corner is like reference
that we saw from the precedent studies of existing research.

And so our timeline consists of four major points, that being
our first low fidelity prototype, then the prototype on proof of concept,
then the form factor prototype and then the final prototype.

In summary, we hope to build something because some kind of assistive device
that will help regain mobility for Larissa,
finish this model and then continue on external research for these cool robots,
and things that we found like clinical studies
to get Larissa and Shana in touch with.

And then Larissa and Shana were really excited about this project being open access
and other people with MS having the option to use this device.
So hopefully at the end of this once it's kind of a good device,
we can find a way for it to be open access.