

EEnable

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Objectives:

- Work with the E-nable ND group to create a low-cost, high sensitivity myoelectric prosthetic.
- Prosthetic with four unique hand gestures.
- Accurately use machine learning to output a signal based on muscle movements measured from EMG leads.



ADS:

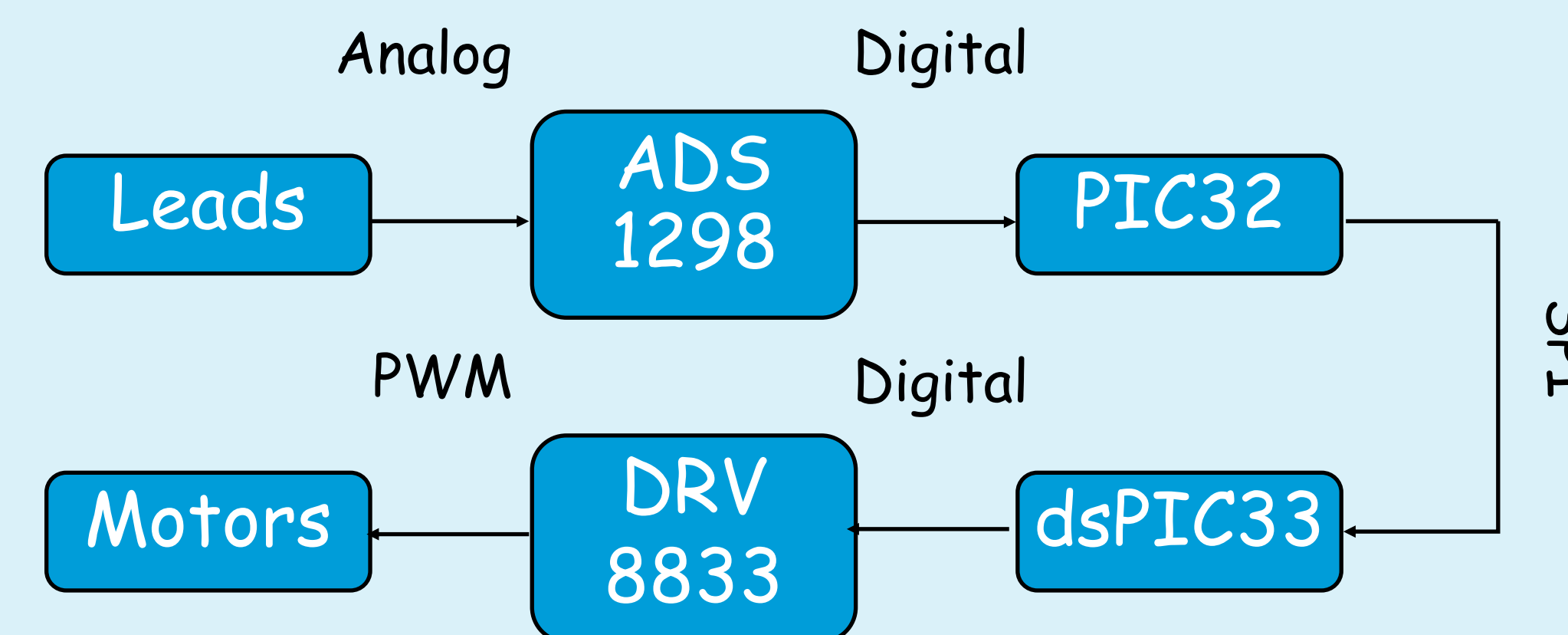
- Converts the analog signal coming from the EMG leads into a digital signal for then PIC32 to run the machine learning algorithm.

Battery:

- Device uses a Turnigy 5000 mAh battery that should allow the prosthetic to run for 4-5 hours depending on use.

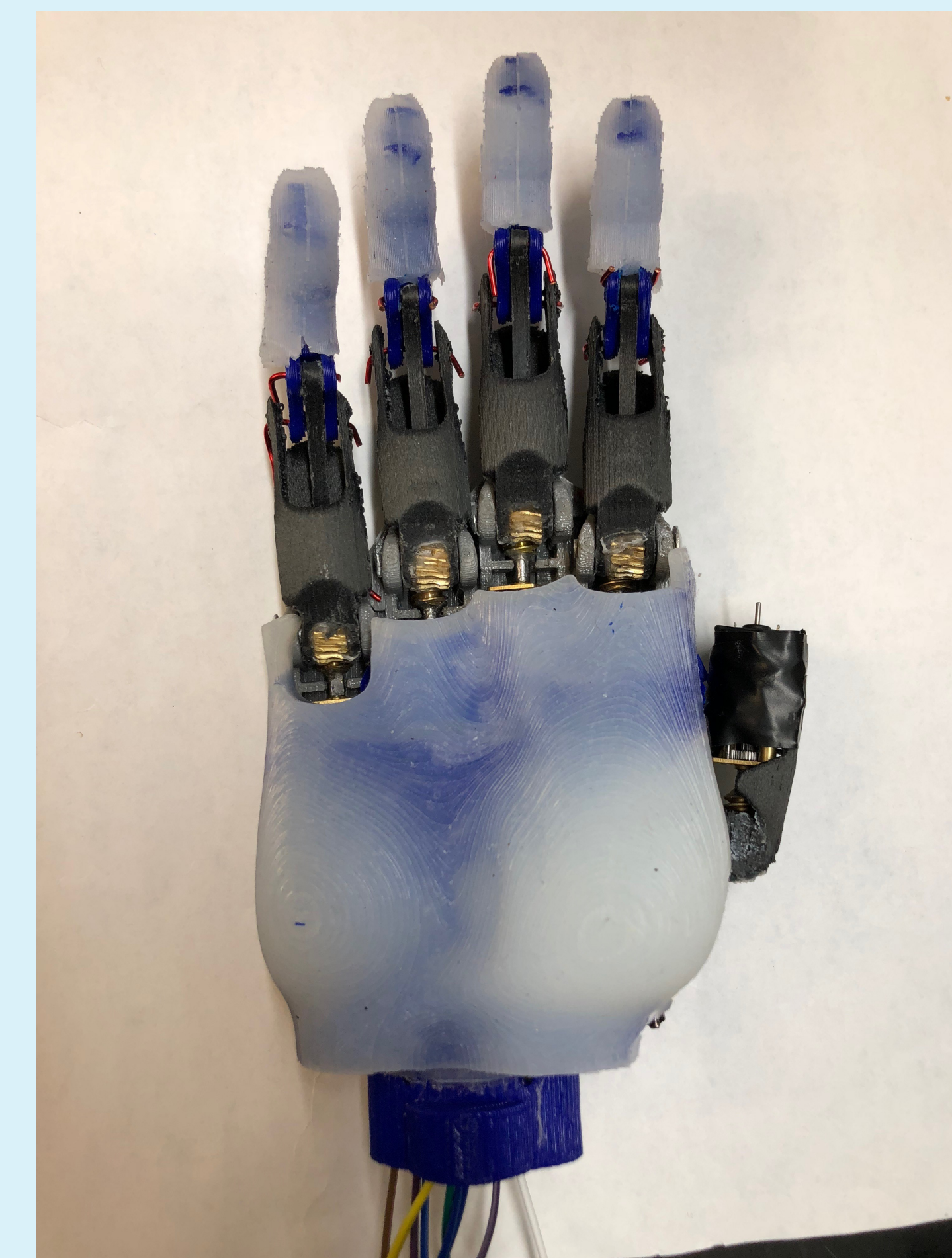
Machine Learning:

- Uses averaging, closest-neighbor training system.
- Once the machine learning algorithm is trained, the algorithm will pick the signal that most closely resembles the input signal.
- Machine learning weights are acquired off-hand and then loaded into the PIC32 for when the hand is in use.



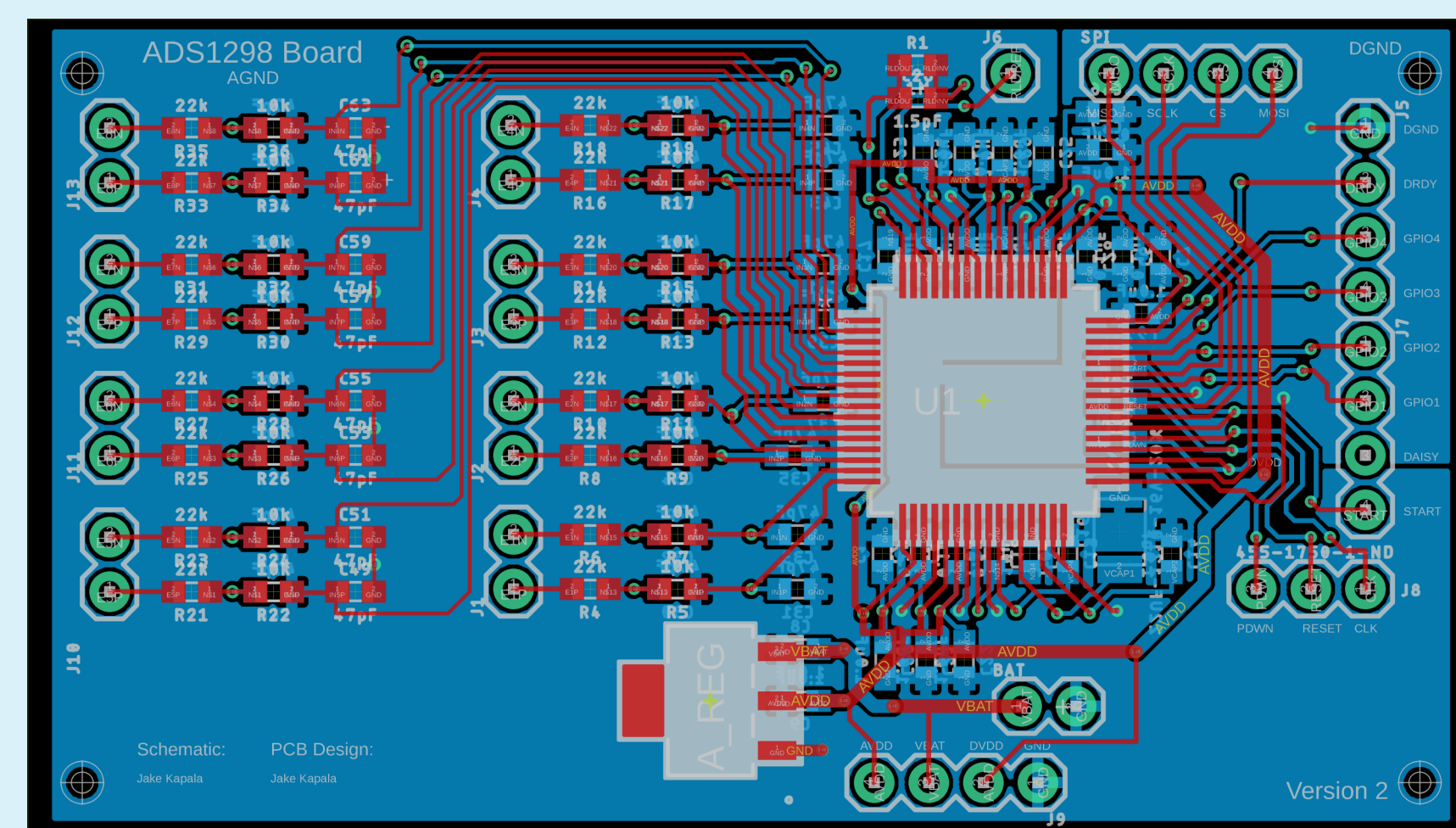
Gestures:

- Uses a PWM signal to activate one to six different motors for each hand gesture.
- There are four hand gestures in total; open fist, closed fist, pointing, and a three finger pinch.
- Hand transitions to the open position in between each hand gesture.

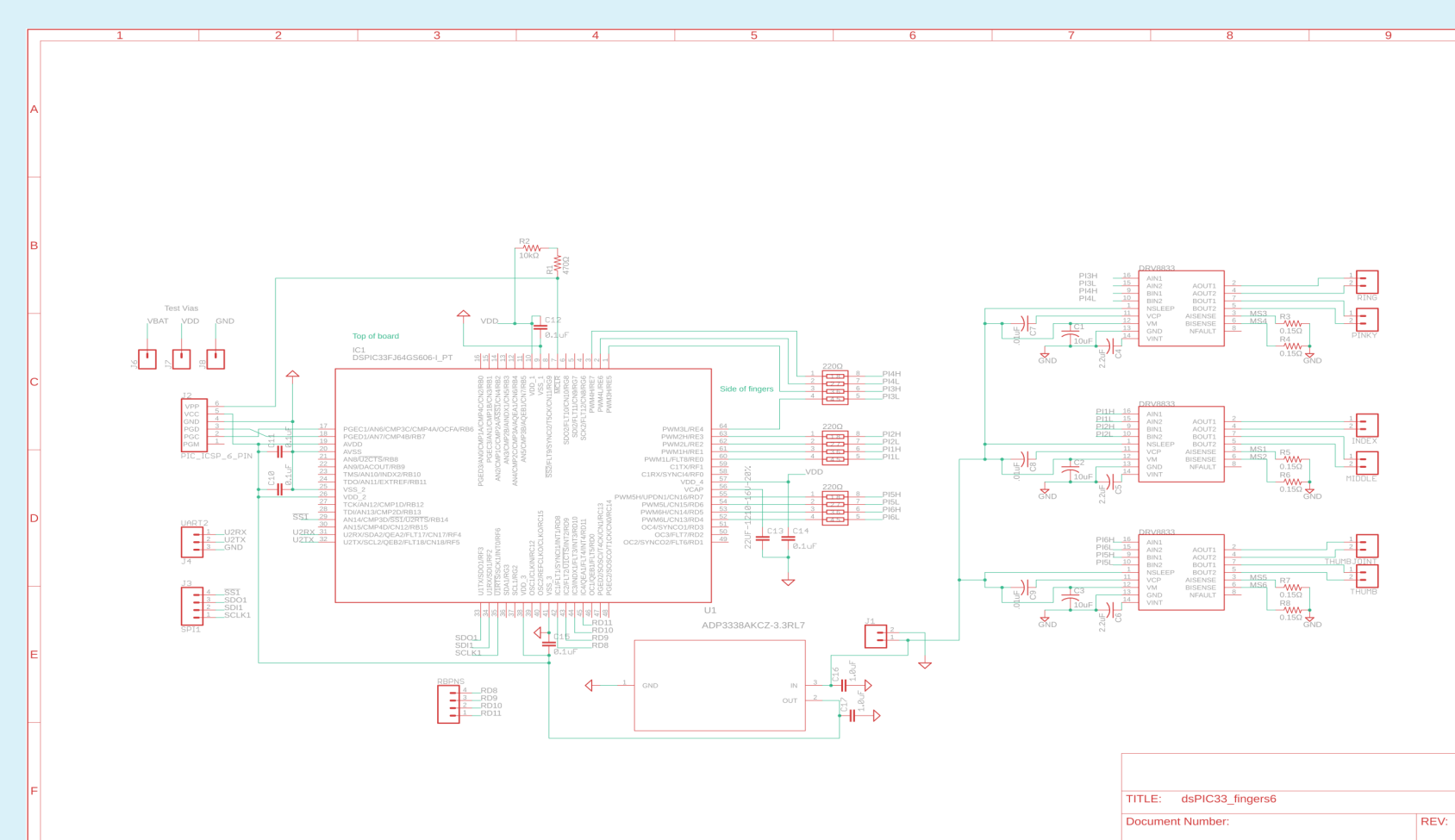
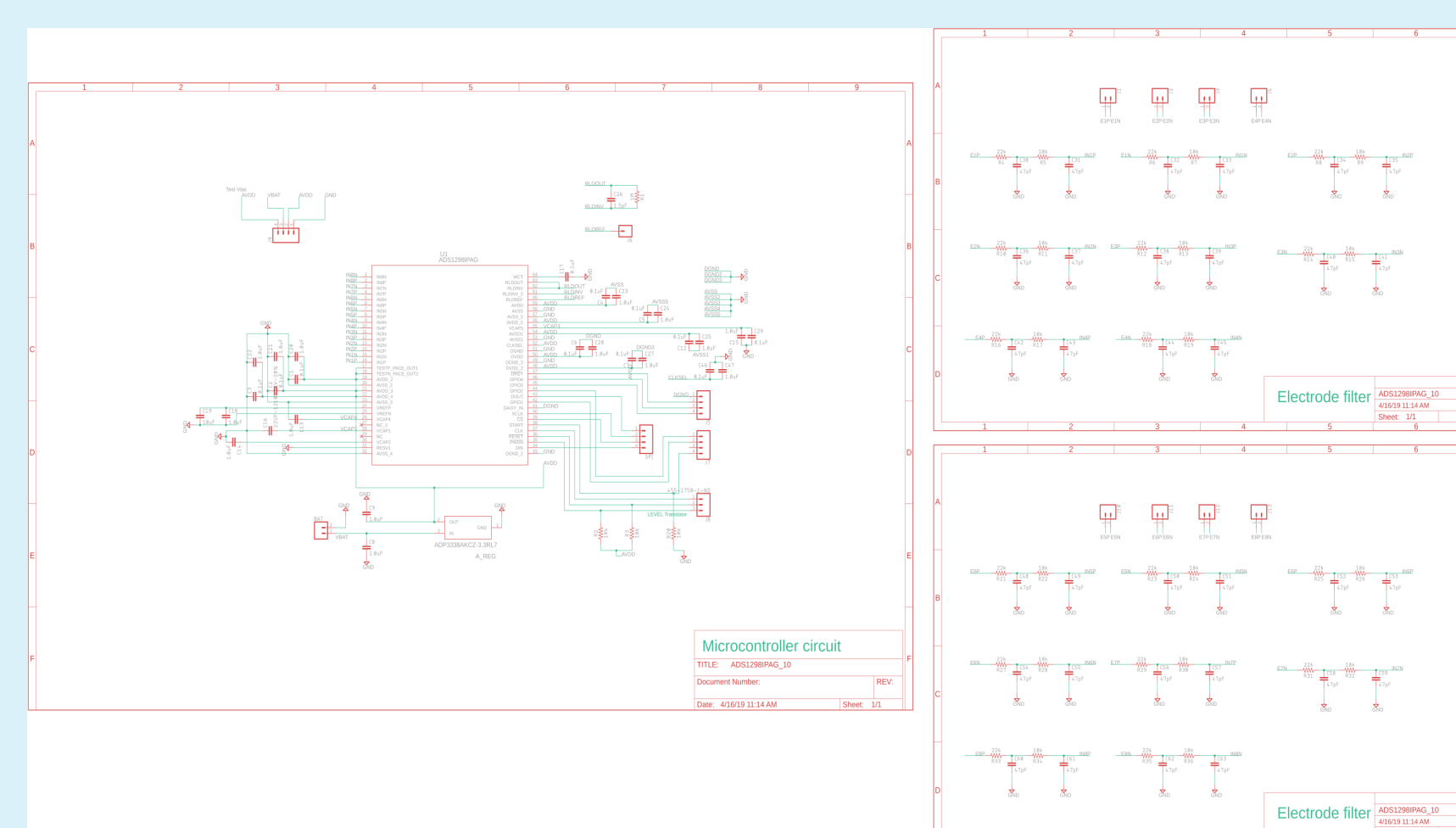
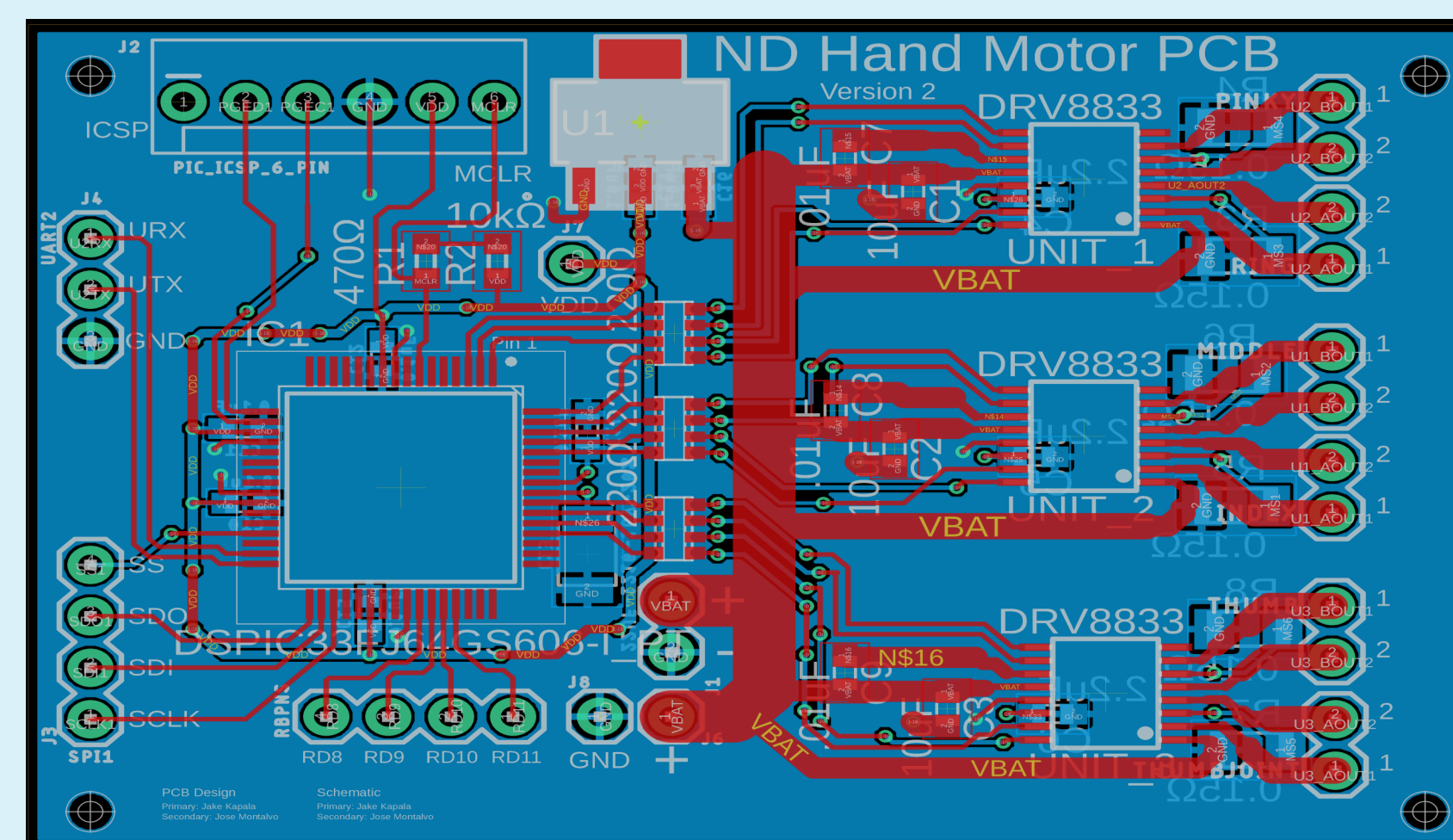


Board Design and Schematic:

ADS1298



dsPIC33



Future Developments:

- Pressure sensors in the fingertips to allow for better grip strength and robustness on objects that the hand is able to pick up.
- Rotation encoder for the PWM to work on motor rotations instead of a time based signal.
- Higher quality electrodes for less noisy signals.
- More hand gestures to better suit everyday life and activities.
- Adaptive transitions between different hand gestures.
- Training the machine learning algorithm in-hand

