

EXECUTIVE SUMMARY

Spotting plays a crucial role in injury prevention at the gym, but it requires another person with prior experience. Team Bacon's solution is the Auto-Spotter, a device that automates spotting, making weight-lifting safer without interfering with the effectiveness of a workout. This solution is different from existing solutions to bench press injury prevention, such as Smith machines, as the pulley system does not have any tension until the barbell needs to pull. The Auto-Spotter is also unique in that it has machine health monitoring to alert a user of any system nonconformities. Figure 1 shows a high-level overview of the Auto-Spotter.

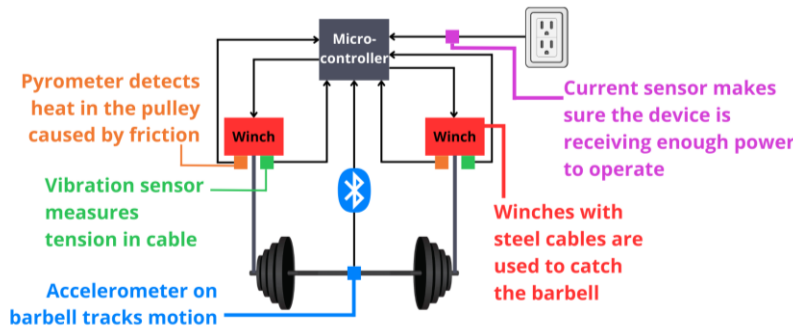


Figure 1: High-Level Overview of the Auto-Spotter

The Auto-Spotter takes precautions to ensure the safety of its users with its capability to lift barbells up to 220 pounds in weight. To further endorse safety, the winches react faster than the time it takes for a bar to fall from the average user's maximum reach. This feature prevents the barbell from falling from its maximum height onto an individual. Lastly, the Auto-Spotter conforms to all the American Society of Testing and Materials safety standards applicable to cable-assisted workout machines, including supporting six times the maximum listed weight.

Using an accelerometer attached to the barbell, the Auto-Spotter is able to communicate the barbell's height, acceleration, and balance. Once one of these values exceeds a given range, the Auto-Spotter halts movement of the weight for the user to rerack the weight safely. To verify that the Auto-Spotter is in good working condition, a machine health system measures possible deterioration or problems with the machine. This system measures heat from the cables' friction, power provided to the winches, and stability of the pulleys to ensure they remain within their thresholds of a temperature less than 167°C , above 20% of the required power, and vibrations less than 8.9 mm/s .

Future work for the Auto-Spotter may entail optimizing the modularity of the device so it can attach to various types of power racks in a gym whilst still maintaining its functionality. Another approach to improving the Auto-Spotter is by upgrading the winch model to enable faster winding and unwinding, allowing it to follow the user's movements better during each rep. These changes are attractive to gymgoers due to the Auto-Spotter's user-friendly nature as well as other advantages over a Smith machine.