

Group #10

Designing an Auto-Cartridge Mechanism for a Spectroscopy Device Measuring Insulin Potency

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Abstract

This senior capstone project addresses the lack of accessible testing method for insulin potency and degradation via a novel handheld device through two subprojects designing an auto-cartridge mechanism and web app. The hardware development focuses on creating an automated medical-grade syringe and a 3D printed housing actuated with a cam mechanism to accurately draw and load insulin for light scattering analysis. A corresponding secure web application is being developed to process the spectroscopy data and provide users with a clear clinical dashboard showcasing medical history and current test results indicating if the insulin is potent, marginal, or degraded. Initial validations demonstrate that the hardware can successfully and efficiently automate the insulin fluid draw within seconds, while the software reliably classifies synthetic sample data displaying results with high accuracy. The current scope of the project is a proof of concept and future efforts will focus on integrating mechanical and software analysis, optimizing the system and parts, validating data, and conducting patient testing.