**MACHINE LEARNING CLASSIFICATION OF LIGHT-EMITTING DIODES THROUGH SPECTROSCOPY**

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Light-Emitting Diodes (LEDs) are one of the greatest advancements in artificial light technology. They are compact, cheap sources of light which have many uses: from a small flashlight, to a warning icon on a car dashboard, to a power indicator on the outside of a computer. They are also commonly used in the Internet of Things (IoT), the collective group of electronics that power many aspects of our lives. However, many IoT devices are insecure and prone to attacks, due to having simple manufacturer-set passwords, and almost no security updates guarding against new malware and hacking methods. One solution we came up with to guard private data from a rogue IoT device is a new passcode: an LED passcode.

To test if this was possible, we used a PASCO PS-2600 spectrometer to identify ten labeled LEDs’ spectra and ran Principal Component Analysis (PCA) on the results. We then repeated the procedure, but with the labels mixed. Despite not knowing which LED was which, we were able to compare the generated PCA graph with the old graph and determine what number each LED was before the mix-up. This proved that all LEDs have slightly varying spectra, and a computer can identify these differences accurately, even distinguishing one LED from another. Due to the complexity of the wavelengths of light an LED emits, and the general low cost of the required equipment, this is a viable and secure alternative to traditional passwords.

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