Winter 2023 RISC Data Clinic Project: Electronic Monitoring Device Shielding Detection

I. Overview

Electronic Monitoring (EM) can be an effective, safe, and humane means of decarceration if management software can appropriately identify serious infractions, allowing for low touch, passive monitoring of participants, the de-prioritisation of technical violations, and a program where people are not kept under effective house arrest but have free movement to go to work, school, and reintegrate into their communities.

Device shielding or the deliberate obstruction of devices with foil to prevent their location from being tracked may be a significant source of risk. Some participants are able to successfully do so and have been allegedly involved in criminal behavior while their signal was lost. Many other participants simply lose their signal due to environmental factors such as living in a built-up environment, basement, or the like.

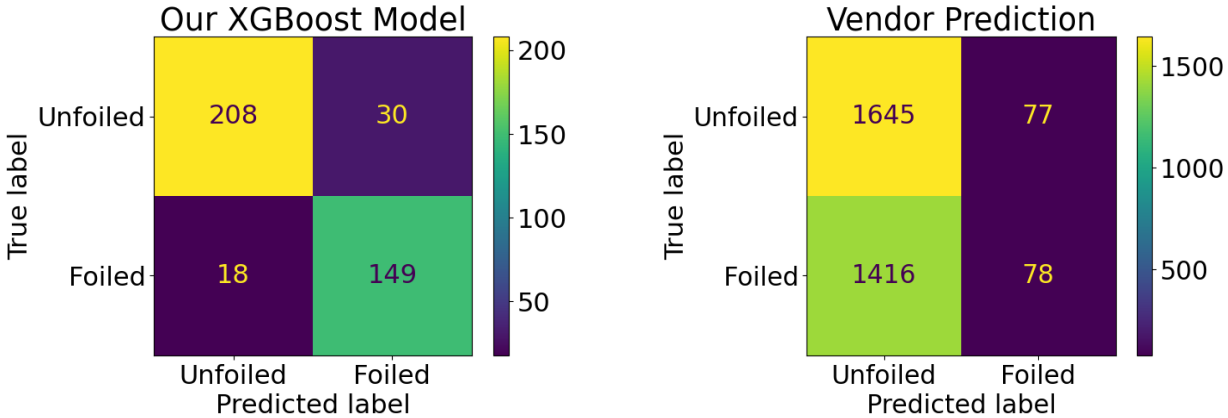
At the moment, Cook County has no way to examine signal characteristics and check in with those that are most suspicious. RISC was looking for a model to detect device shielding that would help prioritize resources where they are needed most while not disturbing those living in areas that naturally impact device signals.

II. Our Contribution

The team designed an experiment to evaluate the impact of device shielding on ankle monitors. Each team member was assigned a different foil type and two monitors, and various locations to test in real-world environments where people would wear an ankle monitor. Locations were chosen based on our research indicating that they could suppress GPS signals. Data was collected for all four possible combinations (device A/B, foiled/unfoiled) for periods of thirty minutes. The data collected revealed empirical evidence that displays the impact of device shielding with foil. Using this data, the team created predictive machine learning models to identify if foiling was taking place.

III. Results and Impact

The model built by the team provides a proof-of-concept that device shielding can be detected and distinguished from environmental signal loss. The model had an accuracy rate of ~80%. This was significantly better than the device vendor's built-in prediction, which only had a foiling detection accuracy rate of 50%, making it no better than random guessing.



The ability to distinguish between device shielding and environmental signal loss can have significant impacts for both EM participants and Cook County. The vast majority of participants who are in compliance will be able to move about undisturbed while law enforcement efforts can be focused on the small proportion of participants who are in serious violation.