Project Proposal - Utilizing Sound Analysis for Immediate Crime Alerting

**What is the problem?**

Our team is deeply concerned about the safety of the Winnipeg community. Since the outbreak of the pandemic in 2020, the number of crimes in Winnipeg has been consistently rising. It increased from 53,955 cases in 2021 to 60,846 cases in 2022 and has reached 68,277 cases this year. These crimes include property losses, violent incidents, and other criminal activities. Promptly addressing these incidents is crucial to ensuring the well-being of the residents.

However, the current approach taken by the police to solve non-emergency cases typically involves “receiving reports“ – ”retrieving surveillance footage“ – ”conducting investigations“. This process often takes several hours, causing a delay in the initiation of police action. Moreover, many incidents such as break-ins, vehicle thefts, and even homicides frequently occur during the early hours of the morning when people are asleep. Even if the surveillance captures the crime, there is a lack of immediate alert mechanisms in place. Reporting usually occurs after people discover the losses the following day, resulting in a significant time gap since the incident. In many cases, suspects have already fled by that time, substantially increasing the difficulty of apprehending them.

Suppose we could gather a variety of specific sounds, such as "glass breaking, car alarm sounds, gunshots, cries for help," and then select appropriate sound recognition models for training on these sounds. By connecting these models to sensors on surveillance cameras, we could achieve real-time alerts, promptly notifying local law enforcement, property owners, or administrators. This proactive approach would enable individuals to take immediate action upon the occurrence of criminal activities, making it highly beneficial.

**Why is it important to me?**

We have all been victims of these criminal activities. In November 2022, there were multiple incidents of vehicle vandalism and thefts in Winnipeg, including my own car being damaged. In the subsequent month, several stores were broken into and robbed during the early hours, resulting in significant property theft and store damage. These incidents posed a challenge for law enforcement to investigate, not due to their lack of action, but because these crimes often occurred at night with no immediate witnesses to report them. Even if surveillance footage captured the suspects, they were often disguised with masks and hats, making it difficult for the authorities to identify them based on these visual clues. Therefore, having surveillance that can detect criminal activities and issue timely alerts becomes crucial. This not only provides prompt warnings to the police but will also significantly reducing local crime rates, creating a safer and more secure environment for the community.

**Why Machine Learning Can Help?**

Through advanced algorithms and predictive modeling, Machine learning can identify patterns and anomalies in large datasets that human monitoring might overlook. By training an AI model to recognize distinct sound events, such as breaking glass, car alarms, gunshots, and distress calls, we can create a system capable of real-time detection and immediate alerts.

**What Data to Use?**

The success of our proposed solution relies on a high-quality and diverse dataset. To this end, I have found 8,732 labeled sound recordings. Each recording is annotated with the start and end times of sound events belonging to 10 classes: air conditioner, car horn, children playing, dog bark, drilling, engine idling, gunshot, jackhammer, siren, and street music. (<https://www.kaggle.com/datasets/rupakroy/urban-sound-8k>) We believe that these datasets can serve as a starting point, enabling us to select appropriate sound recognition models and develop a machine learning model.