Apr 23rd, 9:00 AM

Utilizing Machine Learning to Predict Workplace Violence in Hospitals

Aiden Touhill
Rowan University

Carter Profico
Rowan University

Avery Bobbitt
Rowan University

JOe DiPietro
Rowan University

Christopher Duym
Rowan University

See next page for additional authors

Student Name
Aiden Touhill, Carter Profico, Avery Bobbitt, JOe DiPietro, Christopher Duym, Anthony Ung, and Jack Myers

Rowan University
Department of Computer Science

Utilizing Machine Learning to Predict Workplace Violence in Hospitals

Aiden Touhill, Carter Profico, Avery Bobbitt, Joe DiPietro, Christopher Duym, and Anthony Ung
Faculty Advisor: Jack Myers

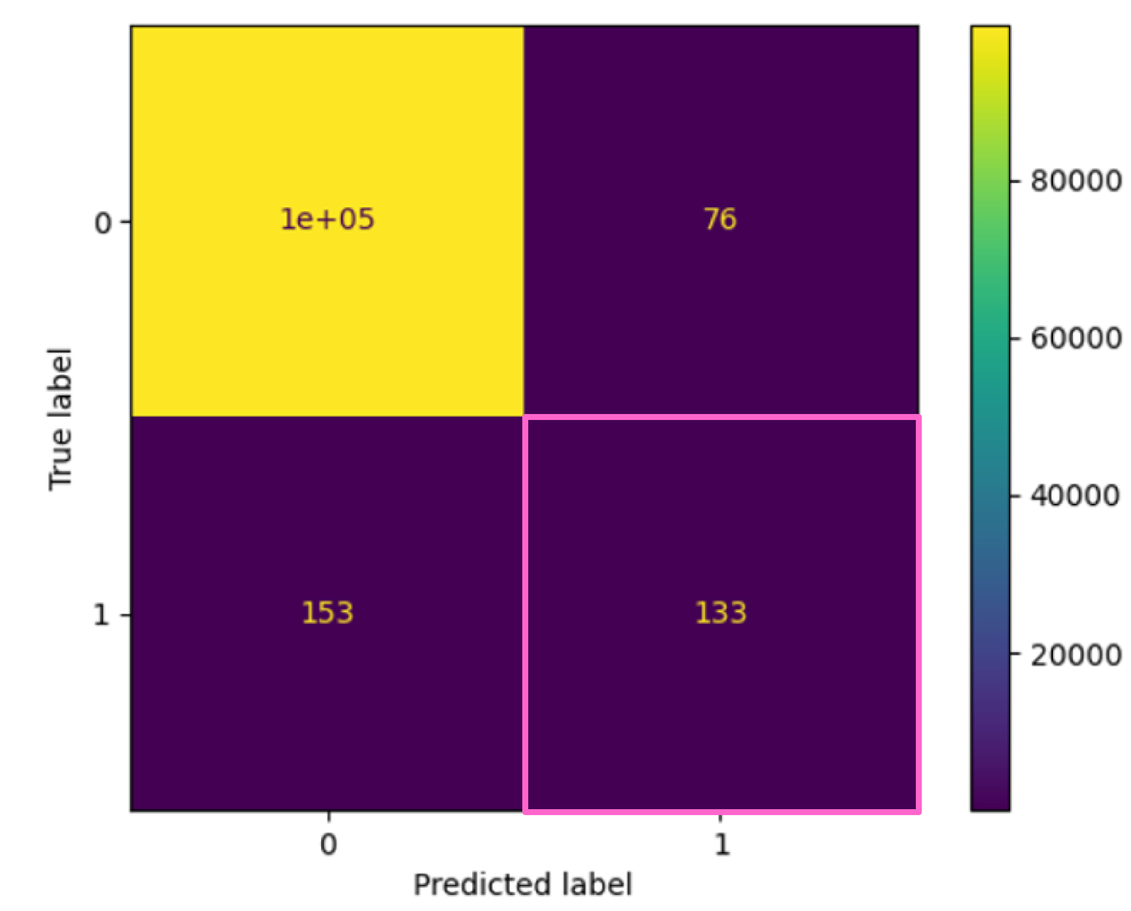
The Problem

Workplace Violence (WPV) is a major concern for hospital staff members. According to the New Jersey Hospital Association, the number of WPV incidents rose about 14.6% from 2019 to 2021 (from 8,691 yearly incidents to 9,962 incidents).

How can hospital staff identify areas of high risk in their facility before a WPV incident occurs?

The Solution

Machine learning can be implemented to analyze trends in the systems of a hospital, with anomalies pointing to potential WPV. Our team decided on a random forest machine learning model for our system. A random forest model is a type of supervised machine learning model that requires a prelabeled data set to be trained on. The model will attempt to classify new data as either WPV or non-WPV based upon the patterns it determines from the original training data set.

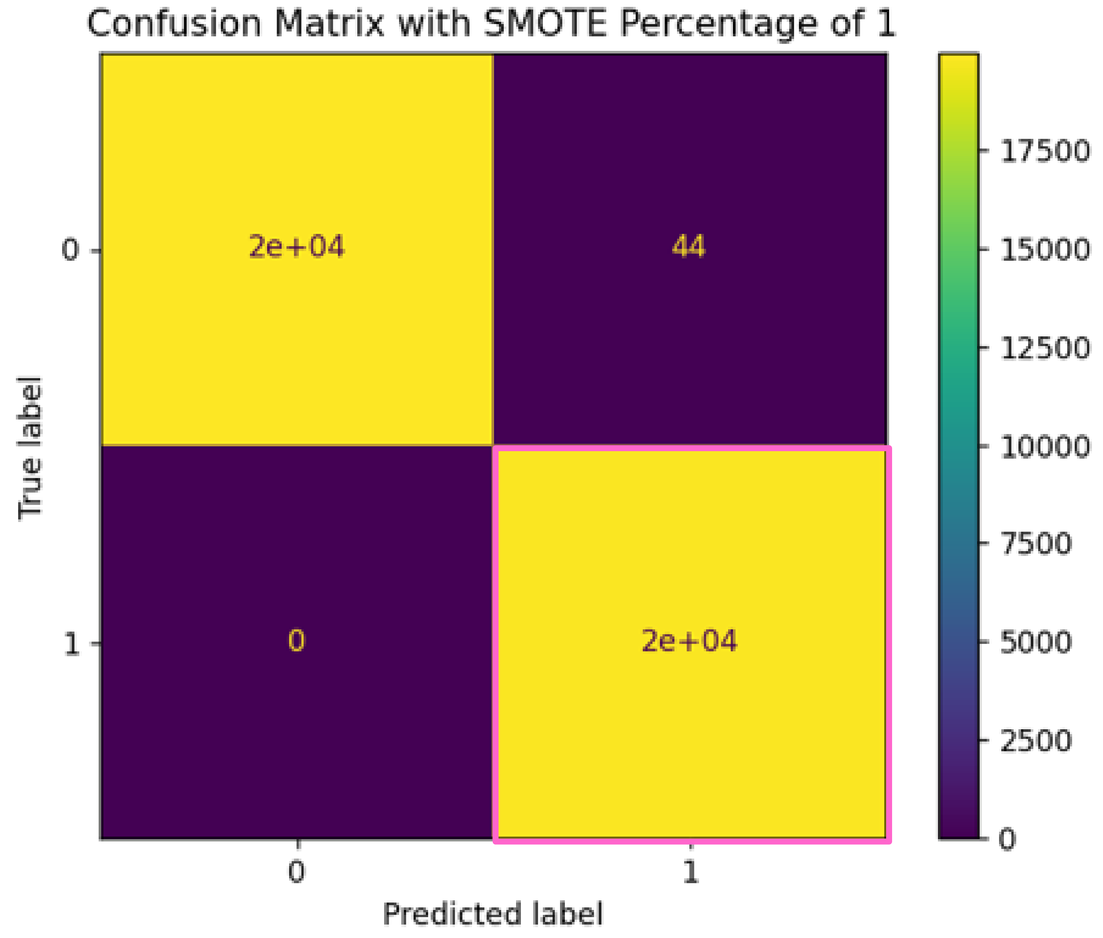


The confusion matrix above shows our original results. The model had initially failed to identify more than half of all true positives.

Barriers to Implementation

When developing the model, the team was unable to receive actual data from a local hospital. As such, the team had to create data that could be fed to the model after doing research on WPV statistics. After finding statistics on violence risk levels, we created a Python script to create randomized data within a normal distribution to train the model.

The team also had to deal with the largely imbalanced dataset. Since the minority class of the data (true WPV incidents) is significantly smaller, we can use SMOTE oversampling to try and offset the issue of imbalanced data. With a SMOTE value of one, both the majority and minority class are about even, and this reduced on the number of false negatives determined by the model.



Future Applications

With access to a large dataset from a currently operating hospital, this machine learning model could stop WPV incidents before they happen. By alerting hospital staff and security to anomalies in their system before they manifest as an incident, the model allows the hospital to act proactively instead of reactively.