BeeCast: A Novel Predictive Model Using Neural Networks to Predict Colony Collapse

Brum, Charles (School: Cathedral Catholic High School)

The steady decline in bee population over the past several decades has led to an overall decrease in crop yields and poorer food quality. Today, there are no known tools available on the market that can accurately predict where and when the next colony collapse will occur, thus making it impossible for the agricultural industry to preemptively prepare/prevent such a natural disaster. A predictive forecasting model is needed to help us plan better and be proactive in implementing preemptive measures. Leveraging over 55,000 rows of publicly available datasets from government agencies and leading research institutions, I interpreted and combined the datasets into a list of attributes that directly correlate with the primary causes of bee colony collapse (28 parameters in total). I then designed and built novel predictive neural network frameworks to accurately predict the next location of colony collapse. My model, validated using multiple neural network frameworks, utilizes 28 input parameters from data collected from 2015 to 2025. Despite the strengths and weaknesses of the different frameworks, my model achieved a Mean Absolute Error (MAE) of ˜6.2% across both frameworks. Given its reliability and predictability, my model should be used with location-specific real-time datasets otherwise unavailable in the public domain to help researchers and governmental agencies accurately predict the next colony collapse, and thus, effectively identify, anticipate, and prevent the next colony collapse. With this model, government agencies and the agricultural industry can work together to take measures against bee colony collapse and reverse the decline. I hope that preemptively preventing colony collapses leads to increased crop yields and food production worldwide.

Awards Won: