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Microclimates Under the Microscope

The purpose of this project was to develop a set of equations to model the relative effect of six different land surfaces (roads, roofs, cement, vegetation, water, and exposed soil) on temperature, humidity, and dew point. Weather data collected by stations with various microclimates could be accurately compared using the equations. In addition, weather stations with microclimates that changed over time could be adjusted to construct a uniform system of measurement. This project involved collecting weather data from 13,828 personal weather stations. After collecting the data, averages were calculated for each season. Using inverse distance weighting, the weather conditions for each station were calculated. By comparing the estimated weather conditions to the recorded weather conditions a percent deviation was calculated. Determining the land cover of a station's microclimate involved downloading high resolution orthoimagery from the USGS. Next, using a learning artificial intelligence, a Bayesian filter was trained to recognize different land surfaces. Using this Bayesian filter, the orthoimage is then classified one pixel at a time. The predictions of this analysis were, on average, 92% correct. Using the aforementioned datasets, numerous multiple regression analyses were conducted yielding several equations that model the relative effects of land surfaces on dew point, humidity, and temperature. The average r-squared value of the multiple regression analysis was 0.41. Specifically for the temperature equations, the average r-squared value was 0.61. This suggests more variance in temperature can be explained by microclimate composition than the variances in dew point or humidity.