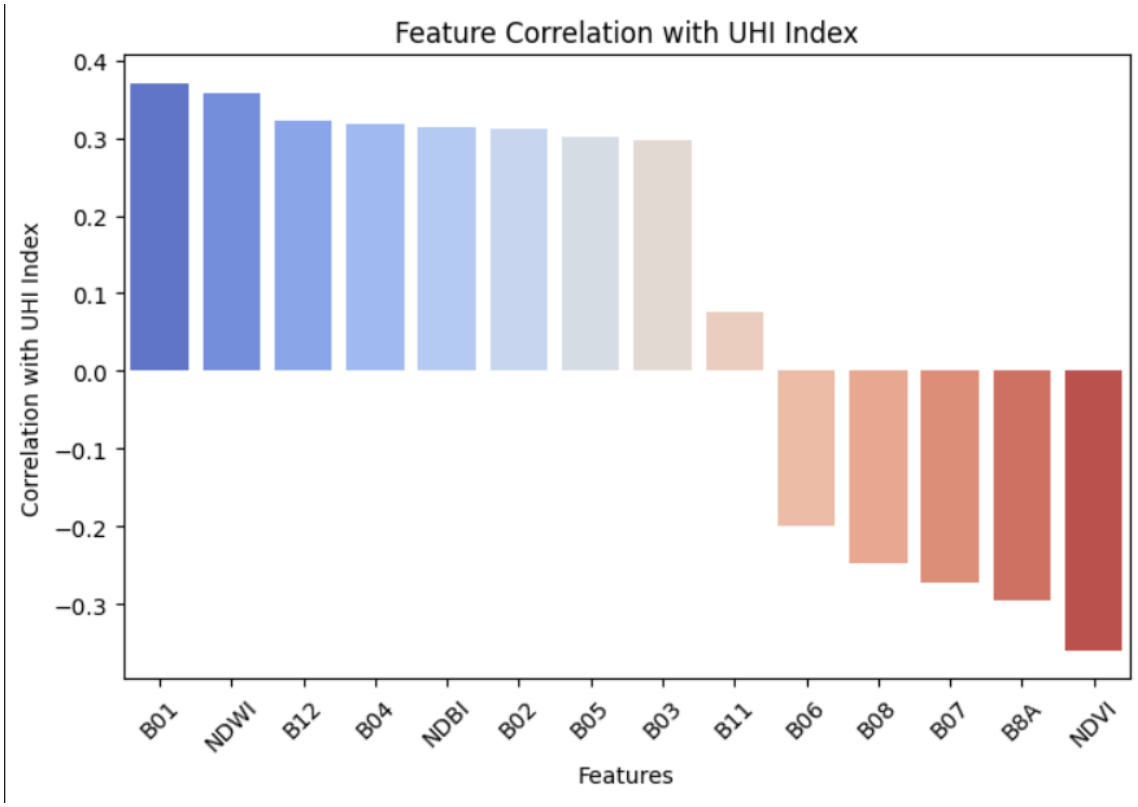
1. For the satellite data, I output every band (B01, B02,..) into the tiff file
2. Do the features selection on tree models (random forest, XGBoost) , finding out that for the Random Forest model(the best four features are B01, B05, B8A, B12), and for the XGBoost(the best four features is B01, B8A, B12, B11)
3. The R-square score on training is (Random Forest: 0.92, XGBoost: 0.99), the R-square score on testing data (random forest: 0.52, XGBoost: 0.5587),



Positive correlation: water, density, building

Negative correlation: vegetation

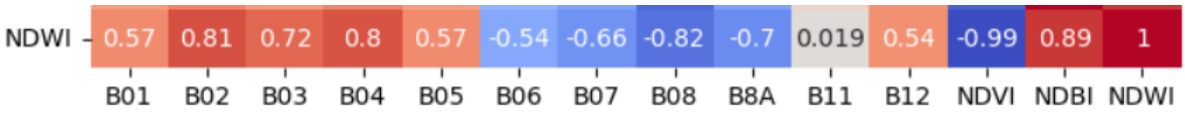
Water:

1. Water surfaces generally have a **lower albedo (reflectivity)** than light-colored urban surfaces, meaning they **absorb more solar radiation** and contribute to warming nearby

areas.

2. **Cities often develop near water** sources for historical and economic reasons.

Proof:



Correlation coefficient between NDWI and NDBI is pretty high (0.89)

3. While water can provide evaporative cooling, its effectiveness depends on environmental conditions. In humid climates or areas with low wind, evaporation is less efficient, and water may not significantly cool the surrounding area.

Population Density (building as well):

1. Urban areas with **high population** density have more buildings, roads, and pavements, which **absorb and store heat** during the day and release it slowly at night.

2. These materials have **low albedo (reflect less sunlight)** and high heat capacity, making urban areas warmer than surrounding rural areas.

3. More people mean more energy consumption from **air conditioning, vehicles, industrial activities, and household appliances.** This **releases additional heat** into the environment, further increasing urban temperatures.

4. High-density areas have **tightly packed buildings**, **limiting natural airflow** and trapping heat. This "urban canyon" effect slows down cooling at night.

5. High-density urban areas tend to have **less exposed soil** or **water** surfaces, reducing evaporative cooling.

Vegetation:

1. Plants **release moisture** into the air through transpiration, which helps cool the surrounding environment.

2. Trees and vegetation **block direct sunlight**, reducing the heating of roads, pavements, and buildings.

3. Vegetation, especially green plants, **reflects more sunlight** compared to asphalt and concrete.

4. Vegetation can help break up urban heat islands by allowing better airflow and reducing heat trapping.