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Objective of Analysis:

The aim of this project is to create a tool that can accurately classify a building as capable of receiving an energy star score rating (energy star score > 75) given a subset of information from the below data dictionary about a specific building in the Seattle Area.

Overview of the data:

The 2016 energy dataset has 3340 observations of 42 features. The variables we are most interested in using include: YearBuilt, NumberOfFloors, PropertyGFATotal, ENERGYSTARScore, SiteEUIWN, Electricity, NaturalGas, TotalGHGEmissions, NeighborhoodProperty and LargestPropertyUseType.

* YearBuilt has a range of 115 years, with a left-skewed distribution. The median year built was 1973.
* NumberofFloors has a very large range from 1-99 with a median of 4 and a mean of 4.682 (right-skewed).
* ENERGYSTARScore has a range from 1-100 with a median of 76 and a mean of 67.89 (left-skewed).
* SiteEUIWN.kBtu.sf has a range from 0-800.60 with a median of 1160236 and a mean of 125330 (the data is very right-skewed).
* GHGEmissionsIntensity.gjCO2e.ft2 has a range from 0 to 31 with a median of 0.46 and a mean of 0.9853 (right-skewed).
* NeighborhoodProperty is a factor with 13 levels. The neighborhoods with the highest proportions include Downtown, QueenAnne, East, and Greater Duwamish areas.
* LargestPropertyUseType is a factor with 57 levels. The property use type with the highest proportion was multifamily housing, which comprises 47.844% of all observations.

Data Dictionary:

Seattle’s Building Energy Benchmarking and Reporting Program (SMC 22.920) requires owners of non-residential and multifamily buildings (20,000 square feet or larger) to track energy performance and annually report to the City of Seattle. Buildings account for 33% of Seattle's core emissions. The benchmarking policy supports Seattle's goals to reduce energy use and greenhouse gas emissions from existing buildings. In 2013, the City of Seattle adopted a Climate Action Plan to achieve zero net greenhouse gas (GHG) emissions by 2050. Annual benchmarking, reporting and disclosing of building performance are foundational elements of creating more market value for energy efficiency. Per Ordinance (125000), starting with 2015 energy use performance reporting, the City of Seattle will make the data for all building 20,000 SF and larger available annually. This update to the benchmarking mandate was passed by Seattle City Council on February 29, 2016.

Source of information: city of Seattle’s open data portal published the logs for 2015 and 2016 to kaggle.com.

* OSEBuildingIDA unique identifier assigned to each property covered by the Seattle Benchmarking Ordinance for tracking and identification purposes.
* DataYearCalendar year (January-December) represented by each data record.
* BuildingTypeCity of Seattle building type classification.
* PrimaryPropertyTypeThe primary use of a property (e.g. office, retail store). Primary use is defined as a function that accounts for more than 50% of a property. This is the Property Type - EPA Calculated field from Portfolio Manager.
* PropertyNameOfficial or common property name as entered in EPA’s Portfolio Manager.
* AddressProperty street address
* CityProperty city
* StateProperty state
* ZipCodeProperty zip
* TaxParcelIdentificationNumberProperty King County PIN
* CouncilDistrictCodeProperty City of Seattle council district.
* NeighborhoodProperty neighborhood area defined by the City of Seattle Department of Neighborhoods.
* LatitudeProperty latitude.
* LongitudeProperty longitude.
* YearBuiltYear in which a property was constructed or underwent a complete renovation.
* NumberofBuildings Number of buildings included in the property's report. In cases where a property is reporting as a campus, multiple buildings may be included in one report.
* NumberofFloors Number of floors reported in Portfolio Manager
* PropertyGFATotal Total building and parking gross floor area.
* PropertyGFAParking Total space in square feet of all types of parking (Fully Enclosed, Partially Enclosed, and Open).
* PropertyGFABuilding(s)Total floor space in square feet between the outside surfaces of a building’s enclosing walls. This includes all areas inside the building(s), such as tenant space, common areas, stairwells, basements, storage, etc.
* ListOfAllPropertyUseTypes All property uses reported in Portfolio Manager
* LargestPropertyUseType The largest use of a property (e.g. office, retail store) by GFA.
* LargestPropertyUseTypeGFA The gross floor area (GFA) of the largest use of the property.
* SecondLargestPropertyUseType The second largest use of a property (e.g. office, retail store) by GFA.
* SecondLargestPropertyUseType GFAThe gross floor area (GFA) of the second largest use of the property.
* ThirdLargestPropertyUseType The third largest use of a property (e.g. office, retail store) by GFA.
* ThirdLargestPropertyUseTypeGFA The gross floor area (GFA) of the third largest use of the property.
* YearsENERGYSTARCertified Years the property has received ENERGY STAR certification.
* ENERGYSTARScoreAn EPA calculated 1-100 rating that assesses a property’s overall energy performance, based on national data to control for differences among climate, building uses, and operations. A score of 50 represents the national median.
* SiteEUI(kBtu/sf) Site Energy Use Intensity (EUI) is a property's Site Energy Use divided by its gross floor area. Site Energy Use is the annual amount of all the energy consumed by the property on-site, as reported on utility bills. Site EUI is measured in thousands of British thermal units (kBtu) per square foot.
* SiteEUIWN(kBtu/sf)Weather Normalized (WN) Site Energy Use Intensity (EUI) is a property's WN Site Energy divided by its gross floor area (in square feet). WN Site Energy is the Site Energy Use the property would have consumed during 30-year average weather conditions. WN Site EUI is measured in measured in thousands of British thermal units (kBtu) per square foot.
* SourceEUI(kBtu/sf)Source Energy Use Intensity (EUI) is a property's Source Energy Use divided by its gross floor area. Source Energy Use is the annual energy used to operate the property, including losses from generation, transmission, & distribution. Source EUI is measured in thousands of British thermal units (kBtu) per square foot.
* SourceEUIWN(kBtu/sf) Weather Normalized (WN) Source Energy Use Intensity (EUI) is a property's WN Source Energy divided by its gross floor area. WN Source Energy is the Source Energy Use the property would have consumed during 30-year average weather conditions. WN Source EUI is measured in measured in thousands of British thermal units (kBtu) per square foot.
* SiteEnergyUse(kBtu) The annual amount of energy consumed by the property from all sources of energy.
* SiteEnergyUseWN(kBtu) The annual amount of energy consumed by the property from all sources of energy, adjusted to what the property would have consumed during 30-year average weather conditions.
* SteamUse(kBtu) The annual amount of district steam consumed by the property on-site, measured in thousands of British thermal units (kBtu).
* Electricity(kWh)The annual amount of electricity consumed by the property on-site, including electricity purchased from the grid and generated by onsite renewable systems, measured in kWh.
* Electricity(kBtu) The annual amount of electricity consumed by the property on-site, including electricity purchased from the grid and generated by onsite renewable systems, measured in thousands of British thermal units (kBtu).
* NaturalGas(therms) The annual amount of utility-supplied natural gas consumed by the property, measured in therms.
* NaturalGas(kBtu) The annual amount of utility-supplied natural gas consumed by the property, measured in thousands of British thermal units (kBtu).
* DefaultData The property used default data for at least one property characteristic.
* Comments Comments by a building owner or agent to provide context to the building’s energy use.
* ComplianceStatus Whether a property has met energy benchmarking requirements for the current reporting year.
* OutlierWhether a property is a high or low outlier (Y/N)
* TotalGHGEmissionsThe total amount of greenhouse gas emissions, including carbon dioxide, methane, and nitrous oxide gases released into the atmosphere as a result of energy consumption at the property, measured in metric tons of carbon dioxide equivalent. This calculation uses a GHG emissions factor from Seattle CIty Light's portfolio of generating resources. This uses Seattle City Light's 2015 emissions factor of 52.44 lbs CO2e/MWh until the 2016 factor is available. Enwave steam factor = 170.17 lbs CO2e/MMBtu. Gas factor sourced from EPA Portfolio Manager = 53.11 kg CO2e/MBtu.
* GHGEmissionsIntensityTotal Greenhouse Gas Emissions divided by property's gross floor area, measured in kilograms of carbon dioxide equivalent per square foot. This calculation uses a GHG emissions factor from Seattle City Light's portfolio of generating resources