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# Load packages -----

library(tidyverse)
library(readxl)
library(writexl)

# Load data -----

# Stations

stations <-
  read_csv('assignment5/alt_fuel_stations.csv')

# EV registration

LDV_2021 <-
  read_excel('assignment5/2021_LDV_registration.xlsx')

LDV_2020 <-
  read_excel('assignment5/2020_LDV_registration.xlsx')

LDV_2019 <-
  read_excel('assignment5/2019_LDV_registration.xlsx')

LDV_2018 <-
  read_excel('assignment5/2018_LDV_registration.xlsx')

# State name and code

state <-
  read_csv('assignment5/state.csv') %>%
  select(-'abbrev') %>%
  rename('State' = 'state')

# Data for 2021 -----

# Electric vehicle supply equipment (EVSE, charging points) in 2021 by state

charger_2021 <-
  stations %>%

  # the open date is ealier than 2022, so this is the existence of chargers in
  # 2021

  filter(year(`Open Date`) < 2022) %>%

  # 'ON' is in Canada

  filter(State != 'ON') %>%
  select(`Station Name`, `EV Level1 EVSE Num`, `EV Level2 EVSE Num`,
        `EV DC Fast Count`, State) %>%

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# 'NA' indicates that there is no this type of EVSE in the station, so there
# is 0 this type of EVSE in the station

replace(is.na(.), 0) %>%

# the total number of charging points in a charging station is the sum of
# 3 types of EVSEs

mutate(EVSE = `EV Level1 EVSE Num` + `EV Level2 EVSE Num` +
        `EV DC Fast Count`) %>%

# calculate the total number of EVSE in each state in 2021

group_by(State) %>%
summarise(EVSE_state = sum(EVSE))

# the Plug-in Electric Vehicles in 2021 by state

PEV_2021 <-
  LDV_2021 %>%

# exclude the total amount

filter(State != 'United States') %>%

# only calculate the types of EV that needed chargers

mutate(PEV = `Electric (EV)` + `Plug-In Hybrid Electric (PHEV)`) %>%
select(State, PEV)

# Merge the needed data for 2021

merge_2021 <-
  full_join(state, PEV_2021) %>%
  select(code, PEV) %>%
  rename(State = code) %>%
  full_join(charger_2021) %>%
  mutate(EV_per_charger = PEV / EVSE_state) %>%
  select(State, EV_per_charger) %>%
  mutate(year = 2021)

# Data for 2020 -----

# Electric vehicle supply equipment (EVSE, charging points) in 2020 by state

charger_2020 <-
  stations %>%
  filter(year(`Open Date`) < 2021) %>%
  filter(State != 'ON') %>%
  select(`Station Name`, `EV Level1 EVSE Num`, `EV Level2 EVSE Num`,
        `EV DC Fast Count`, State) %>%
  replace(is.na(.), 0) %>%

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mutate(EVSE = `EV Level1 EVSE Num` + `EV Level2 EVSE Num` +
        `EV DC Fast Count`) %>%
group_by(State) %>%
summarise(EVSE_state = sum(EVSE))

# the Plug-in Electric Vehicles in 2020 by state

PEV_2020 <-
  LDV_2020 %>%
  filter(State != 'United States') %>%
  mutate(PEV = `Electric (EV)` + `Plug-In Hybrid Electric (PHEV)`) %>%
  select(State, PEV)

# Merge the needed data for 2020

merge_2020 <-
  full_join(state, PEV_2020) %>%
  select(code, PEV) %>%
  rename(State = code) %>%
  full_join(charger_2020) %>%
  mutate(EV_per_charger = PEV / EVSE_state) %>%
  select(State, EV_per_charger) %>%
  mutate(year = 2020)

# Data for 2019 -----

# Electric vehicle supply equipment (EVSE, charging points) in 2019 by state

charger_2019 <-
  stations %>%
  filter(year(`Open Date`) < 2020) %>%
  filter(State != 'ON') %>%
  select(`Station Name`, `EV Level1 EVSE Num`, `EV Level2 EVSE Num`,
        `EV DC Fast Count`, State) %>%
  replace(is.na(.), 0) %>%
  mutate(EVSE = `EV Level1 EVSE Num` + `EV Level2 EVSE Num` +
        `EV DC Fast Count`) %>%
  group_by(State) %>%
  summarise(EVSE_state = sum(EVSE))

# the Plug-in Electric Vehicles in 2019 by state

PEV_2019 <-
  LDV_2019 %>%
  filter(State != 'United States') %>%
  mutate(PEV = `Electric (EV)` + `Plug-In Hybrid Electric (PHEV)`) %>%
  select(State, PEV)

# Merge the needed data for 2019

merge_2019 <-
  full_join(state, PEV_2019) %>%

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EV_per_charger <= 30 ~ '20 - 30',  
EV_per_charger <= 40 ~ '30 - 40',  
.default = '40 - 50'))
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# Export an excel file for Tableau
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write_xlsx(All_years, 'assignment5/merge_all.xlsx')
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