```
install.packages("data.table")
```

```
## Installing package into '/usr/local/lib/R/site-library'
## (as 'lib' is unspecified)
```

```
install.packages("dtplyr")
```

```
## Installing package into '/usr/local/lib/R/site-library'
## (as 'lib' is unspecified)
```

```
install.packages("dplyr")
```

```
## Installing package into '/usr/local/lib/R/site-library'
## (as 'lib' is unspecified)
```

```
install.packages('R.utils')
```

```
## Installing package into '/usr/local/lib/R/site-library'
## (as 'lib' is unspecified)
```

```
library(data.table)
library(dtplyr)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:data.table':
##
##     between, first, last
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
download.file("https://raw.githubusercontent.com/JSC370/JSC370-2025/main/data/met/met_all.gz", destfile
met <- fread("met_all.gz")

stations <- fread("ftp://ftp.ncdc.noaa.gov/pub/data/noaa/isd-history.csv")

stations[, USAF := as.integer(USAF)]
```

```
## Warning in eval(jsub, SDenv, parent.frame()): NAs introduced by coercion
```

```
# Dealing with NAs and 999999
stations[, USAF   := fifelse(USAF == 999999, NA_integer_, USAF)]
stations[, CTRY   := fifelse(CTRY == "", NA_character_, CTRY)]
stations[, STATE  := fifelse(STATE == "", NA_character_, STATE)]

# Selecting the three relevant columns, and keeping unique records
stations <- unique(stations[, list(USAF, CTRY, STATE)])

# Dropping NAs
stations <- stations[!is.na(USAF)]
```

```r
# Removing duplicates
stations[, n := 1:.N, by = .(USAF)]
stations <- stations[n == 1,][, n := NULL]
```

```r
# Rename USAFID in 'met' to USAF
setnames(met, "USAFID", "USAF")

merged_data <- met %>%
  left_join(stations, by = "USAF")
```

```r
head(met)
```

```
##      USAF  WBAN  year month   day  hour   min   lat      lon  elev wind.dir
##     <int> <int> <int> <int> <int> <int> <int> <num>    <num> <int>    <int>
## 1: 690150 93121  2019     8     1     0    56  34.3 -116.166   696      220
## 2: 690150 93121  2019     8     1     1    56  34.3 -116.166   696      230
## 3: 690150 93121  2019     8     1     2    56  34.3 -116.166   696      230
## 4: 690150 93121  2019     8     1     3    56  34.3 -116.166   696      210
## 5: 690150 93121  2019     8     1     4    56  34.3 -116.166   696      120
## 6: 690150 93121  2019     8     1     5    56  34.3 -116.166   696       NA
##    wind.dir.qc wind.type.code wind.sp wind.sp.qc ceiling.ht ceiling.ht.qc
##         <char>         <char>   <num>     <char>      <int>         <int>
## 1:           5              N     5.7          5      22000             5
## 2:           5              N     8.2          5      22000             5
## 3:           5              N     6.7          5      22000             5
## 4:           5              N     5.1          5      22000             5
## 5:           5              N     2.1          5      22000             5
## 6:           9              C     0.0          5      22000             5
##    ceiling.ht.method sky.cond vis.dist vis.dist.qc vis.var vis.var.qc  temp
##                <char>   <char>    <int>      <char>  <char>     <char> <num>
## 1:                 9        N    16093           5       N          5  37.2
## 2:                 9        N    16093           5       N          5  35.6
## 3:                 9        N    16093           5       N          5  34.4
## 4:                 9        N    16093           5       N          5  33.3
## 5:                 9        N    16093           5       N          5  32.8
## 6:                 9        N    16093           5       N          5  31.1
##    temp.qc dew.point dew.point.qc atm.press atm.press.qc       rh
##     <char>     <num>       <char>     <num>        <int>    <num>
## 1:       5      10.6            5    1009.9            5 19.88127
## 2:       5      10.6            5    1010.3            5 21.76098
## 3:       5       7.2            5    1010.6            5 18.48212
## 4:       5       5.0            5    1011.6            5 16.88862
## 5:       5       5.0            5    1012.7            5 17.38410
## 6:       5       5.6            5    1012.7            5 20.01540
```

```r
# Calculate the median of temperature, wind speed, and atmospheric pressure
median_temp <- quantile(merged_data$temp, 0.5, na.rm = TRUE)
median_wind <- quantile(merged_data$wind.sp, 0.5, na.rm = TRUE)
median_pressure <- quantile(merged_data$atm.press, 0.5, na.rm = TRUE)

# Find stations with the median temperature, wind speed, and atmospheric pressure
station_median_temp <- merged_data[abs(merged_data$temp - median_temp) < 0.01, .(USAF, temp)]
station_median_wind <- merged_data[abs(merged_data$wind.sp - median_wind) < 0.01, .(USAF, wind.sp)]
station_median_pressure <- merged_data[abs(merged_data$atm.press - median_pressure) < 0.01, .(USAF, atm
```

```r
# Print the stations with median values
print(station_median_temp)
```

```
##         USAF  temp
##        <int> <num>
##    1: 720113  23.5
##    2: 720113  23.5
##    3: 720113  23.5
##    4: 720113  23.5
##    5: 720113  23.5
##   ---
## 7357: 726679  23.5
## 7358: 726679  23.5
## 7359: 726679  23.5
## 7360: 726679  23.5
## 7361: 726679  23.5
```

```r
print(station_median_wind)
```

```
##           USAF wind.sp
##          <int>   <num>
##      1: 690150     2.1
##      2: 690150     2.1
##      3: 690150     2.1
##      4: 690150     2.1
##      5: 690150     2.1
##     ---
## 264798: 726813     2.1
## 264799: 726813     2.1
## 264800: 726813     2.1
## 264801: 726813     2.1
## 264802: 726813     2.1
```

```r
print(station_median_pressure)
```

```
##         USAF atm.press
##        <int>     <num>
##    1: 690150    1014.1
##    2: 690150    1014.1
##    3: 690150    1014.1
##    4: 720175    1014.1
##    5: 720175    1014.1
##   ---
## 8783: 726813    1014.1
## 8784: 726813    1014.1
## 8785: 726813    1014.1
## 8786: 726813    1014.1
## 8787: 726813    1014.1
```

```r
# Check if the stations with median values coincide
coincide_stations_temp_wind <- intersect(station_median_temp$USAF, station_median_wind$USAF)
coincide_stations_all <- intersect(coincide_stations_temp_wind, station_median_pressure$USAF)

# Print the stations that coincide across all three
print(coincide_stations_all)
```

```
##  [1] 720965 722090 722093 722175 722210 722238 722246 722250 722269 722270
## [11] 722390 722570 722576 722686 722730 722817 722860 722975 723034 723066
## [21] 723231 723405 723520 723535 723540 723550 723810 724037 724090 724096
## [31] 724338 724457 724467 724505 724550 724680 724695 724837 725144 725335
## [41] 725377 725755 726055 726436 726625
```

Yes, some of them coincide.

```
# Define the function to calculate Euclidean distance for each station
euclidean_distance <- function(station, median_values) {
  sqrt(sum((station - median_values)^2, na.rm = TRUE))
}

# For each state, calculate the median values of temperature, wind speed, and pressure
state_medians <- merged_data[, .(median_temp = median(temp, na.rm = TRUE),
                                 median_wind = median(wind.sp, na.rm = TRUE),
                                 median_pressure = median(atm.press, na.rm = TRUE)),
                             by = STATE]

# Merge the stations with the state median values
met_state <- merge(merged_data, state_medians, by = "STATE")

# Calculate the Euclidean distance for each station from the state median
met_state[, dist := mapply(euclidean_distance,
                           list(c(temp, wind.sp, atm.press)),
                           MoreArgs = list(c(median_temp, median_wind, median_pressure)))]

# For each state, select the station with the minimum Euclidean distance and lowest latitude
representative_station <- met_state[, .SD[which.min(dist)], by = STATE]

# If there are multiple stations with the same minimum distance, choose the one with the lowest latitud
representative_station <- representative_station[, .SD[which.min(lat)], by = STATE]

# Print the representative stations for each state
print(representative_station)
```

```
## Key: <STATE>
##      STATE   USAF  WBAN  year month   day  hour   min    lat      lon  elev
##     <char>  <int> <int> <int> <int> <int> <int> <int>  <num>    <num> <int>
##  1:     AL 720265 63833  2019     8     1     0    15 32.915  -85.963   209
##  2:     AR 720172 53996  2019     8     1     0    15 34.545  -94.203   329
##  3:     AZ 720339   121  2019     8     1     0    45 32.142 -111.175   737
##  4:     CA 690150 93121  2019     8     1     0    56 34.300 -116.166   696
##  5:     CO 720385   419  2019     8     1     0    36 39.800 -105.766  4113
##  6:     CT 720545   169  2019     8     1     0    15 41.384  -72.506   127
##  7:     DE 724088 13707  2019     8     1     0    18 39.133  -75.467     9
##  8:     FL 720373 92824  2019     8     1     0    15 28.000  -82.164    47
##  9:     GA 720257 63835  2019     8     1     0    15 31.397  -84.895    65
## 10:     IA 720293  4989  2019     8     1     0    15 42.453  -91.948   298
## 11:     ID 720322  4129  2019     8     1     0    15 48.299 -116.560   648
## 12:     IL 720137  4867  2019     8     1     0    15 41.425  -88.419   178
## 13:     IN 720266 54809  2019     8     1     0    15 41.275  -85.840   259
## 14:     KS 720422  3037  2019     8     1     0    15 39.428 -101.046   971
## 15:     KY 720353 63875  2019     8     1     0    15 36.611  -83.738   352
## 16:     LA 720346 53991  2019     8     1     0    18 30.750  -92.688    33
```

```
## 17:     MA 722256 64774  2019     8     1     0    15 42.098  -70.672     3
## 18:     MD 720334 93764  2019     8     1     0    56 39.168  -77.166   164
## 19:     ME 726060 14764  2019     8     1     0     0 43.650  -70.317    19
## 20:     MI 720113 54829  2019     8     1     0    15 42.543  -83.178   222
## 21:     MN 720258  4997  2019     8     1     0    18 46.619  -93.310   374
## 22:     MO 720169   116  2019     8     1     0    15 38.583  -91.000   149
## 23:     MS 720541 53806  2019     8     1     0    15 34.383  -89.550   138
## 24:     MT 726676 24087  2019     8     1     0    56 47.133 -104.800   749
## 25:     NC 720274 93799  2019     8     1     0    15 34.273  -78.715    30
## 26:     ND 720491   150  2019     8     1     0    15 46.217  -97.633   386
## 27:     NE 720308  4992  2019     8     1     0    15 41.196  -96.112   320
## 28:     NH 726050 14745  2019     8     1     0     0 43.200  -71.500   105
## 29:     NJ 720407   462  2019     8     1     0    56 39.928  -74.292    25
## 30:     NM 720411   137  2019     8     1    16    40 36.422 -105.290  2554
## 31:     NV 720549   171  2019     8     1     0    10 39.183 -119.733  1432
## 32:     NY 722098 64761  2019     8     1     0    15 40.960  -72.252    17
## 33:     OH 720397   131  2019     8     1     0    15 39.217  -82.233   233
## 34:     OK 720342 53947  2019     8     1     0    15 35.864  -98.421   472
## 35:     OR 720202   118  2019     8     1     0    15 45.417 -123.817    11
## 36:     PA 720304 64752  2019     8     1     0    15 40.100  -75.267    92
## 37:     RI 722151 14794  2019     8     1     0    53 41.350  -71.799    25
## 38:     SC 720120 63837  2019     8     1     0    50 32.224  -80.697     6
## 39:     SD 720624   211  2019     8     1     0     0 44.016  -97.086   523
## 40:     TN 720974   344  2019     8     1     0    15 35.178  -86.066   298
## 41:     TX 720110 53983  2019     8     1     0    10 30.784  -98.662   336
## 42:     UT 720567 24180  2019     8     1     0    15 41.552 -112.062  1288
## 43:     VA 720278  3704  2019     8     1     0    15 36.687  -77.483    39
## 44:     VT 720492   151  2019     8     1     0    16 44.567  -72.017   362
## 45:     WA 720254   119  2019     8     1     0    15 46.683 -122.983    54
## 46:     WI 720327  4995  2019     8     1     0    15 44.892  -91.868   273
## 47:     WV 720328 63832  2019     8     1     0    15 39.000  -80.274   498
## 48:     WY 720345 94086  2019     8     1     0    15 42.796 -109.806  2160
##      STATE   USAF  WBAN  year month   day  hour   min    lat      lon  elev
##     wind.dir wind.dir.qc wind.type.code wind.sp wind.sp.qc ceiling.ht
##        <int>      <char>         <char>   <num>     <char>      <int>
##  1:       NA           9              C     0.0          5      22000
##  2:       NA           9              C     0.0          5      22000
##  3:      110           1              N     4.6          1      22000
##  4:      220           5              N     5.7          5      22000
##  5:      170           5              N     8.8          5       1372
##  6:       NA           9              C     0.0          5      22000
##  7:       70           5              N     5.1          5       2134
##  8:       NA           9              N      NA          9       3353
##  9:       NA           9              C     0.0          5      22000
## 10:      100           5              N     2.6          5      22000
## 11:       80           5              N     3.1          5      22000
## 12:       80           5              N     3.6          5      22000
## 13:      360           5              N     3.1          5      22000
## 14:       50           5              N     4.1          5      22000
## 15:       NA           9              C     0.0          5      22000
## 16:       NA           9              C     0.0          5      22000
## 17:       NA           9              C     0.0          5       1524
## 18:       NA           9              C     0.0          1      22000
## 19:      240           1              N     3.6          1         NA
```

```
## 20:       10           5              N     1.5          5      22000
## 21:      180           5              N     1.5          5       3658
## 22:       50           5              N     1.5          5      22000
## 23:       10           5              N     2.1          5      22000
## 24:      340           5              N     2.1          5      22000
## 25:      160           5              N     1.5          5      22000
## 26:      180           5              N     5.1          5      22000
## 27:      110           5              N     4.1          5       2134
## 28:      310           1              N     1.5          1         NA
## 29:       NA           9              C     0.0          5      22000
## 30:      280           5              N     3.1          5         NA
## 31:      240           5              N     5.1          5      22000
## 32:      200           5              N     2.1          5      22000
## 33:       NA           9              C     0.0          5      22000
## 34:      170           5              N     5.7          5      22000
## 35:      250           5              N     4.1          5      22000
## 36:       50           5              N     2.1          5       1250
## 37:      360           5              N     2.1          5      22000
## 38:      190           1              N     3.1          1      22000
## 39:      160           1              N     6.2          1       1341
## 40:      270           5              N     3.6          5       1402
## 41:      100           5              N     3.1          5      22000
## 42:      190           5              N     6.7          5      22000
## 43:      280           5              N     1.5          5       3353
## 44:       NA           9              C     0.0          5      22000
## 45:       NA           9              C     0.0          5       1981
## 46:       NA           9              C     0.0          5      22000
## 47:      100           5              N     1.5          5         NA
## 48:      210           5              V     3.6          5       3353
##     wind.dir wind.dir.qc wind.type.code wind.sp wind.sp.qc ceiling.ht
##     ceiling.ht.qc ceiling.ht.method sky.cond vis.dist vis.dist.qc vis.var
##             <int>            <char>   <char>    <int>      <char>  <char>
##  1:             5                 9        N    16093           5       N
##  2:             5                 9        N    16093           5       N
##  3:             1                 9        N    16093           1       9
##  4:             5                 9        N    16093           5       N
##  5:             5                 M        N       NA           9       N
##  6:             5                 9        N    11265           5       N
##  7:             5                 M        N    16093           5       N
##  8:             5                 M        N    11265           5       N
##  9:             5                 9        N    16093           5       N
## 10:             5                 9        N    16093           5       N
## 11:             5                 9        N    16093           5       N
## 12:             5                 9        N    16093           5       N
## 13:             5                 9        N    16093           5       N
## 14:             5                 9        N    16093           5       N
## 15:             5                 9        N    16093           5       N
## 16:             5                 9        N    16093           5       N
## 17:             5                 M        N    16093           5       N
## 18:             1                 9        N    16093           1       9
## 19:             9                 9        N    16000           1       9
## 20:             5                 9        N    16093           5       N
## 21:             5                 M        N    16093           5       N
## 22:             5                 9        N    16093           5       N
```

```
## 23:            5                9        N    16093           5       N
## 24:            5                9        N    16093           5       N
## 25:            5                9        N    16093           5       N
## 26:            5                9        N    16093           5       N
## 27:            5                M        N    16093           5       N
## 28:            9                9        N    16000           1       9
## 29:            5                9        N    11265           5       N
## 30:            9                9        N       NA           9       N
## 31:            5                9        N    16093           5       N
## 32:            5                9        N    16093           5       N
## 33:            5                9        N    16093           5       N
## 34:            5                9        N    16093           5       N
## 35:            5                9        N    16093           5       N
## 36:            5                M        N    16093           5       N
## 37:            5                9        N    16093           5       N
## 38:            1                9        N    16093           1       9
## 39:            1                9        N    16093           1       9
## 40:            5                M        N    16093           5       N
## 41:            5                9        N    16093           5       N
## 42:            5                9        N    16093           5       N
## 43:            5                M        N    16093           5       N
## 44:            5                9        N    16093           5       N
## 45:            5                M        N    16093           5       N
## 46:            5                9        N    16093           5       N
## 47:            9                9        N    16093           5       N
## 48:            5                M        N    16093           5       N
##     ceiling.ht.qc ceiling.ht.method sky.cond vis.dist vis.dist.qc vis.var
##     vis.var.qc  temp temp.qc dew.point dew.point.qc atm.press atm.press.qc
##         <char> <num>  <char>     <num>       <char>     <num>        <int>
##  1:          5  29.2       5      22.0            5        NA            9
##  2:          5  31.0       5      23.0            5        NA            9
##  3:          9  28.0       1      20.0            1        NA            9
##  4:          5  37.2       5      10.6            5    1009.9            5
##  5:          5   9.0       5       1.0            5        NA            9
##  6:          5  21.0       5      21.0            5        NA            9
##  7:          5  26.0       5      24.0            5    1016.5            5
##  8:          5    NA       9        NA            9        NA            9
##  9:          5  29.0       5      20.0            5        NA            9
## 10:          5  24.5       5      15.2            5        NA            9
## 11:          5  30.0       5       5.0            5        NA            9
## 12:          5  23.5       5      11.8            5        NA            9
## 13:          5  22.0       5      15.0            5        NA            9
## 14:          5  32.0       5      13.0            5        NA            9
## 15:          5  25.9       5      21.9            5        NA            9
## 16:          5  30.0       5      24.0            5        NA            9
## 17:          5  24.0       5      20.0            5        NA            9
## 18:          9  22.8       1      19.4            1    1018.5            1
## 19:          9  24.4       1      17.8            1    1015.3            1
## 20:          5  25.0       5      13.4            5        NA            9
## 21:          5  23.0       5      13.0            5        NA            9
## 22:          5  25.0       5      20.0            5        NA            9
## 23:          5  28.0       5      21.0            5        NA            9
## 24:          5  32.2       5      12.8            5    1012.1            5
## 25:          5  28.0       5      21.5            5        NA            9
```

```
## 26:          5  27.0       5      19.0            5        NA            9
## 27:          5  23.2       5      19.1            5        NA            9
## 28:          9  22.8       1      21.1            1    1015.8            1
## 29:          5    NA       9        NA            9        NA            9
## 30:          5    NA       9        NA            9        NA            9
## 31:          5  31.0       5       1.0            5        NA            9
## 32:          5  24.1       5      22.8            5        NA            9
## 33:          5  25.5       5      20.7            5        NA            9
## 34:          5  35.4       5      17.8            5        NA            9
## 35:          5  22.0       5      14.0            5        NA            9
## 36:          5  22.0       5      20.9            5        NA            9
## 37:          5  25.0       5      20.6            5    1016.6            5
## 38:          9  28.0       1      24.0            1        NA            9
## 39:          9  22.0       1      20.0            1        NA            9
## 40:          5  24.0       5      19.0            5        NA            9
## 41:          5  37.0       5      16.0            5        NA            9
## 42:          5  25.2       5      11.4            5        NA            9
## 43:          5  25.7       5      20.0            5        NA            9
## 44:          5  19.5       5      18.6            5        NA            9
## 45:          5  27.0       5      13.0            5        NA            9
## 46:          5  22.0       5      11.1            5        NA            9
## 47:          5  22.0       5      18.0            5        NA            9
## 48:          5  22.0       5       4.0            5        NA            9
##     vis.var.qc  temp temp.qc dew.point dew.point.qc atm.press atm.press.qc
##              rh  CTRY median_temp median_wind median_pressure    dist
##           <num> <char>       <num>       <num>           <num>   <num>
##  1:  65.19533     US        25.3         1.5          1014.8 8813.51
##  2:  62.43335     US        25.6         2.1          1014.5 8813.51
##  3:  61.83968     US        29.0         3.1          1010.8 8813.51
##  4:  19.88127     US        21.1         2.6          1012.8 8813.51
##  5:  57.61039     US        18.9         2.6          1013.7 8813.51
##  6: 100.00000     US        22.2         2.1          1015.2 8813.51
##  7:  88.77636     US        24.4         2.6          1015.4 8813.51
##  8:        NA     US        27.0         2.6          1015.1 8813.51
##  9:  58.32577     US        26.0         1.5          1014.9 8813.51
## 10:  56.25873     US        21.0         2.6          1014.9 8813.51
## 11:  20.47012     US        20.0         2.1          1013.1 8813.51
## 12:  47.91272     US        22.2         2.1          1014.6 8813.51
## 13:  64.62394     US        22.0         2.1          1014.8 8813.51
## 14:  31.35863     US        23.3         3.6          1013.5 8813.51
## 15:  78.65806     US        23.0         1.5          1015.3 8813.51
## 16:  70.25783     US        27.8         1.5          1014.6 8813.51
## 17:  78.41305     US        21.7         2.6          1014.9 8813.51
## 18:  81.22631     US        24.4         2.1          1015.3 8813.51
## 19:  66.75185     US        18.9         2.1          1014.1 8813.51
## 20:  48.60006     US        20.6         2.1          1014.4 8813.51
## 21:  53.43049     US        19.0         2.1          1014.7 8813.51
## 22:  73.85499     US        23.3         2.1          1014.8 8813.51
## 23:  65.77411     US        26.0         1.5          1014.9 8813.51
## 24:  30.59406     US        18.3         3.1          1014.3 8813.51
## 25:  67.82219     US        24.0         1.5          1015.7 8813.51
## 26:  61.63770     US        18.0         3.6              NA 8813.51
## 27:  77.82344     US        21.7         3.1          1014.3 8813.51
## 28:  90.18654     US        18.9         1.5          1014.6 8813.51
```

```
## 29:        NA     US        23.3         1.5          1015.1 8813.51
## 30:        NA     US        24.4         3.1          1012.0 8813.51
## 31:  14.50240     US        27.0         2.6          1011.8 8813.51
## 32:  92.48048     US        20.6         2.1          1014.9 8813.51
## 33:  74.84629     US        21.7         2.6          1015.0 8813.51
## 34:  35.20512     US        26.7         3.1          1012.8 8813.51
## 35:  60.59571     US        17.2         2.1          1015.4 8813.51
## 36:  93.51503     US        21.1         1.5          1015.6 8813.51
## 37:  76.63728     US        22.2         2.6          1014.0 8813.51
## 38:  78.92251     US        25.0         1.5          1015.3 8813.51
## 39:  88.48594     US        20.0         3.6          1014.3 8813.51
## 40:  73.70146     US        24.0         1.5          1014.9 8813.51
## 41:  28.68429     US        29.0         3.1          1012.6 8813.51
## 42:  42.11247     US        26.1         4.1          1012.1 8813.51
## 43:  70.83785     US        23.4         1.5          1015.2 8813.51
## 44:  94.57557     US        18.9         1.5          1014.5 8813.51
## 45:  42.01891     US        18.0         0.0              NA 8813.51
## 46:  50.12878     US        18.6         2.1          1014.6 8813.51
## 47:  78.14902     US        21.1         1.5          1015.7 8813.51
## 48:  30.88978     US        18.3         3.6          1014.0 8813.51
##            rh   CTRY median_temp median_wind median_pressure    dist
```