Mini Data Analysis: Milestone 1

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Load the required packages for this Milestone:

```
library(datateachr)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.5     v dplyr   1.0.7
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   2.0.2     v forcats 0.5.1
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

Task 1: Choosing my favourite dataset:

1.1

Out of the seven datasets available in the datateachr package, I have chosen four that appeal to me based on their descriptions.

1. **apt_buildings**
2. **building_permits**
3. **steam_games**
4. **vancouver_trees**

1.2

Let's view my dataset on apartment buildings in Toronto to see what sort of data is available to us…

```
head(apt_buildings)
```

```
## # A tibble: 6 x 37
##      id air_conditioning amenities   balconies barrier_free_acc~ bike_parking
##   <dbl> <chr>            <chr>       <chr>     <chr>             <chr>
## 1 10359 NONE             Outdoor re~ YES       YES               0 indoor parki~
## 2 10360 NONE             Outdoor po~ YES       NO                0 indoor parki~
## 3 10361 NONE             <NA>        YES       NO                Not Available
## 4 10362 NONE             <NA>        YES       YES               Not Available
## 5 10363 NONE             <NA>        NO        NO                12 indoor park~
## 6 10364 NONE             <NA>        NO        NO                Not Available
## # ... with 31 more variables: exterior_fire_escape <chr>, fire_alarm <chr>,
## #   garbage_chutes <chr>, heating_type <chr>, intercom <chr>,
## #   laundry_room <chr>, locker_or_storage_room <chr>, no_of_elevators <dbl>,
## #   parking_type <chr>, pets_allowed <chr>, prop_management_company_name <chr>,
## #   property_type <chr>, rsn <dbl>, separate_gas_meters <chr>,
## #   separate_hydro_meters <chr>, separate_water_meters <chr>,
## #   site_address <chr>, sprinkler_system <chr>, visitor_parking <chr>, ...
```

Let's find 3 attributes for each of my datasets…

apt_buildings dataset:

```
dim(apt_buildings)
```

```
## [1] 3455   37
```

```
class(apt_buildings$air_conditioning)
```

```
## [1] "character"
```

building_permits dataset:

```
dim(building_permits)
```

```
## [1] 20680    14
```

```
class(building_permits$project_value)
```

```
## [1] "numeric"
```

steam_games dataset:

```
dim(steam_games)
```

```
## [1] 40833    21
```

```
class(steam_games$publisher)
```

```
## [1] "character"
```

vancouver_trees dataset:

```
dim(vancouver_trees)
```

```
## [1] 146611     20
```

```
class(vancouver_trees$species_name)
```

```
## [1] "character"
```

1.3: Narrowing down my choice of datasets to two:

1. steam_games

This dataset looks like it would be fun to explore - I enjoy playing games and would be interested to see the correlation between genre and all_reviews, publisher and original price, recommend_requirements and release_date, etc.

2. apt_buildings

I selected the apt_buildings dataset as my second choice, as I have recently moved into my first apartment and am curious to learn of any correlations between certain apartment amenities (i.e. heating_type, laundry_room, facilities_available) and size of the building (i.e. no_of_stories) as well as if there is any relation between apartment safety features and year built or no_of_units.

1.4: Final decision:

I have decided to go with the **apt_buildings** dataset, as I was concerned with the tidiness of the steam_games dataset. The steam_games dataset had columns that were quite messy with too much information contained (for example, the all_reviews column contained information on overall rating score, statistics on the amount of user reviews, etc.; the popular_tags and genre columns were also quite broad and I had trouble deciding how I would like to summarize this data).

I would enjoy working with the apt_buildings dataset as it contains a mix of numeric values and character values, and might provide interesting information regarding compliance with apartment safety features and property management companies. I would also like to see whether features that are typically indicative of property age (ie smoking status, emergency power, window type, number of stories) are in fact correlated to building age. I would also be curious to see how many pet-friendly apartments provide air conditioning, as pet safety is important to me.

Task 2: Exploring my dataset

2.0: Introduction to project:

This .Rmd file is the first in a series of deliverables for STAT 545A's Mini Data Analysis Assignment. The goal for the first deliverable in the Mini Data Analysis Assignment is for students to become familiar with data analysis techniques using the R programming language. Students select a dataset of their choosing (for my project, I have selected the apt_buildings dataset available through the datateachr package) and formalize research questions related to their dataset that they wish to explore in future sections of the assignment. Students also gain practice in generating tidy and reproducible code through the use of R Markdown. In the section below, I explore the apt_buildings dataset provided courtesy of The City of Toronto's Open Data Portal using data analysis techniques taught within STAT 545A.

2.0.1: Load libraries:

```
library(dplyr)
library(ggplot2)
```

2.1: Diving deeper into my data:

2.1.1: Plot the distribution of a numeric variable:

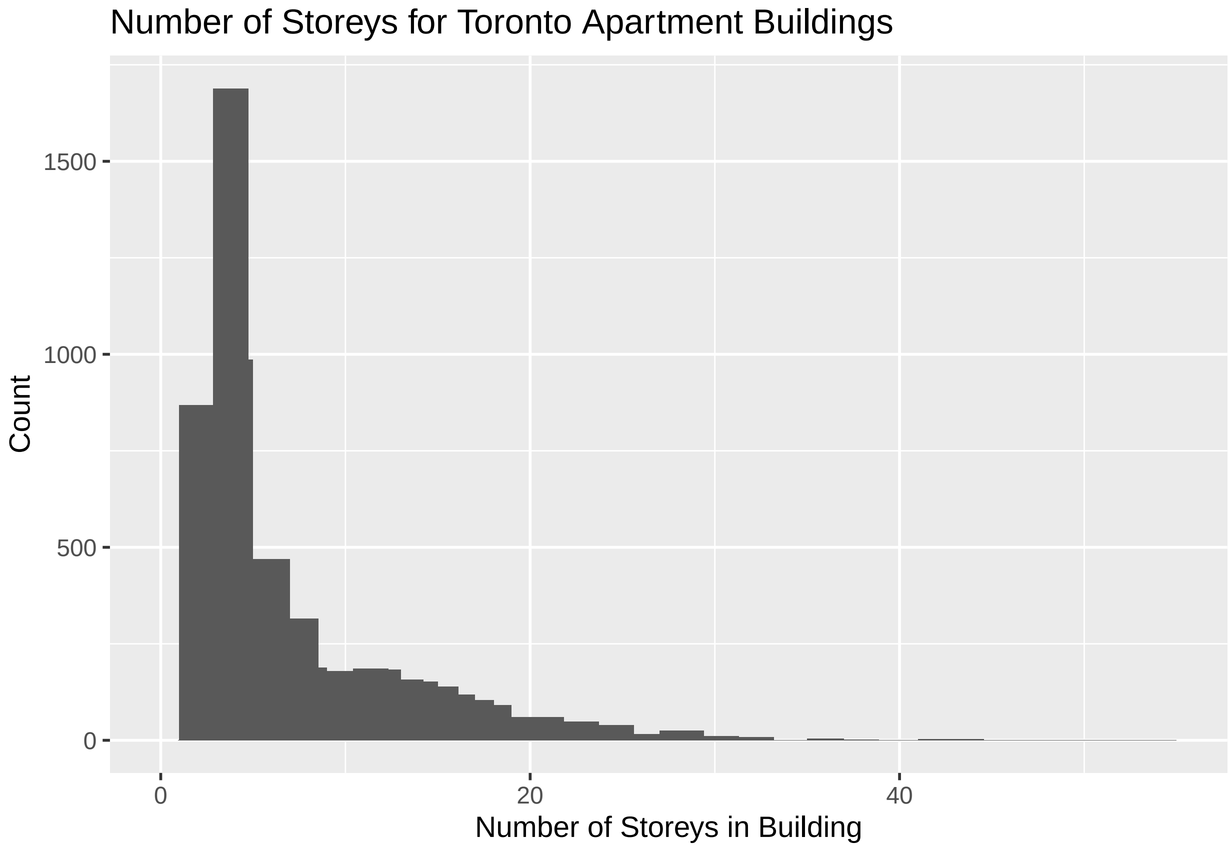
I chose to plot the distribution of number of storeys (no_of_storeys) in apartment buildings within Toronto. I was curious to see what the average height of apartment buildings in Toronto would be. To do this, I used the geom_histogram function from the ggplot2 package.

```
ggplot(data=apt_buildings, aes(no_of_storeys)) +
         geom_histogram()+
         ggtitle("Number of Storeys for Toronto Apartment Buildings")+
         xlab("Number of Storeys in Building")+
         ylab("Count")+
         xlim(0, 55)+
         stat_bin(binwidth = 2)
```

```
## ‘stat_bin()‘ using ‘bins = 30‘. Pick better value with ‘binwidth‘.

## Warning: Removed 2 rows containing missing values (geom_bar).

## Warning: Removed 1 rows containing missing values (geom_bar).
```



2.1.2: Create a new variable based on other variables in your data:

Buildings 40 years of age or older may be considered for designation of national historic significance (Heritage building) according to the Government of Canada.

I decided to create a new variable named age_significance where apartment buildings in Toronto equal to or greater than 40 years old as of 2021 (i.e. year built equal to or less than 1981) would be classified as Heritage, and all others would be classified as Modern.

```
apt_buildings$age_significance <-
apt_buildings$age_significance[apt_buildings$year_built<= 1981] <- "Heritage"
```

```
## Warning: Unknown or uninitialised column: ‘age_significance‘.
```

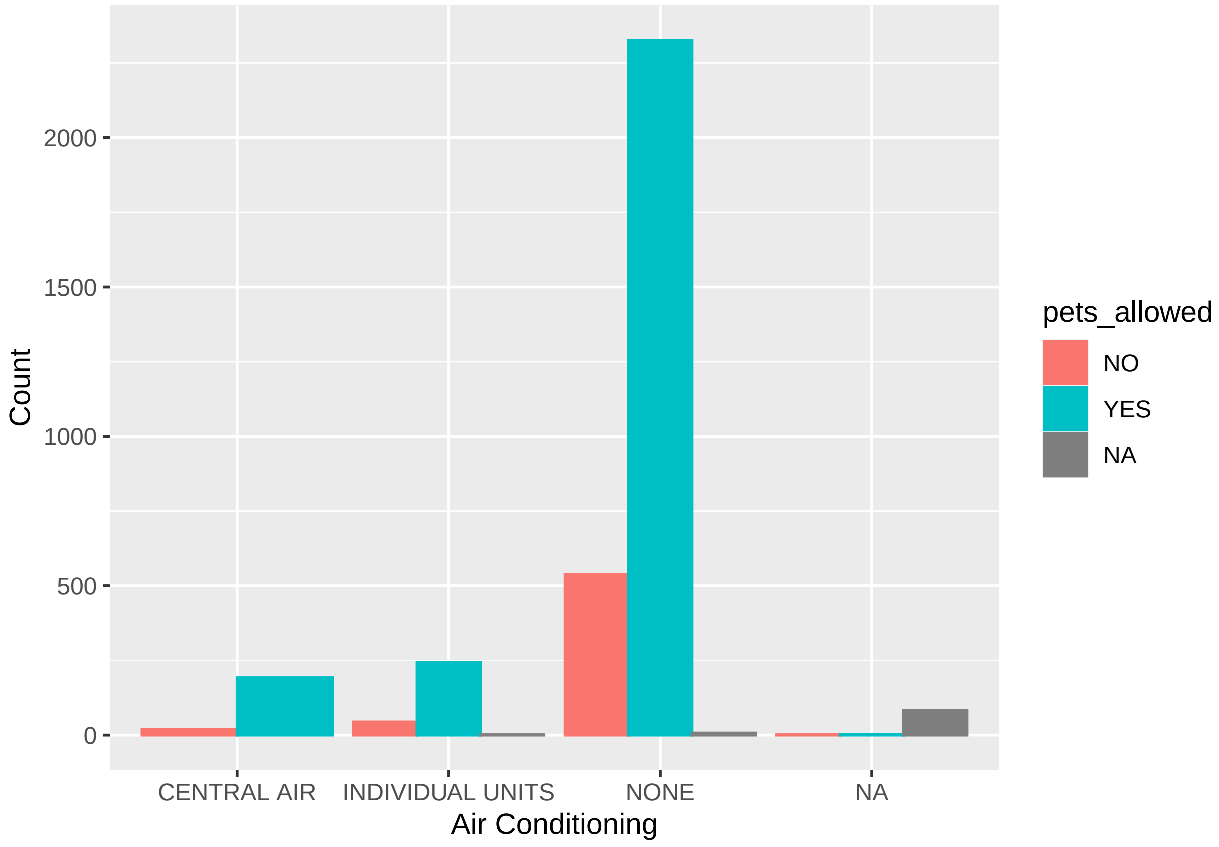
```
apt_buildings$age_significance[apt_buildings$year_built> 1981] <- "Modern"
```

2.1.3: Explore the relationship between 2 variables in a plot:

I decided to explore the relationship between air conditioning and pets being allowed in Toronto apartment buildings. With summer heat waves becoming more common in Toronto and other large cities in Canada, reducing the likelihood of heat exhaustion/heat stroke in pets by providing air conditioning in apartment buildings is a topic of importance to me.

To do this, I used the geom_bar function within ggplot2 to create a bar plot of types of air conditioning in apartment buildings, and broke each category down by whether they allowed pets in the building, or not. Because there was a disproportionately large amount of buildings that did not contain air conditioning (None) compared to buldings that had either central air or individual unit air conditioning, I may tweak this analysis in the future to represent 'pets allowed' (yes, no, n/a) as proportions within each category, rather than counts.

```
ggplot(apt_buildings, aes(x = air_conditioning, stat="count")) +
geom_bar(aes(color=pets_allowed, fill=pets_allowed), position="dodge")+
xlab("Air Conditioning")+
ylab("Count")
```

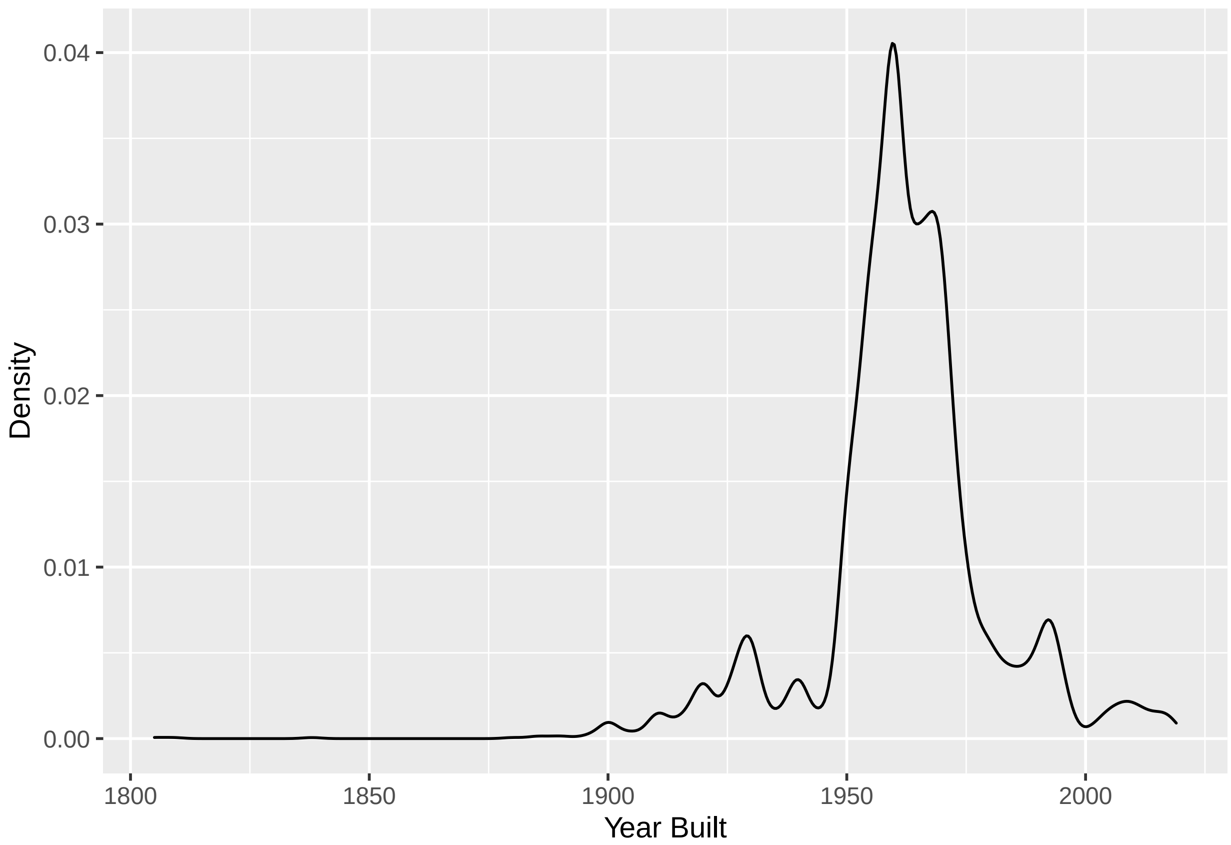


2.1.4: Use a density plot to explore any of your variables:

I decided to create a density plot of year_built to visualize which decades the majority of apartment buildings in Toronto had been built in. In the plot below, we can see that a large number of apartments were constructed between 1950 and 1975.

```
ggplot(apt_buildings, aes(year_built))+
  geom_density()+
  xlab("Year Built")+
  ylab("Density")
```

```
## Warning: Removed 13 rows containing non-finite values (stat_density).
```



Task 3: Write my research question:

In greater depth, I would like to explore the following research questions throughout this assignment:

1. Which property management companies in Toronto provide the greatest level of living quality to their tenants? Living quality could be defined by the presence or absence of certain amenities such as availability of bike parking, car parking, visitor parking, air conditioning, no smoking policy, etc. Categorical values such as parking type could be reclassified as numerical values on a scale (less desirable categories being assigned lower values, while more desirable categories being assigned higher values) and scores for each variable could be added together to create a final score for each property management company.
2. Is building safety related to building age? This could be explored by plotting the relation between year_built and other variables such as exterior_fire_escape, fire_alarm, sprinkler_system, emergency_power, non_smoking_building, etc.
3. Are certain desirable apartment amenities to me (such as indoor recreation room, indoor exercise room, presence of laundry room, outdoor rec facilities, units with balconies, underground or ground level garage, yes to pets being allowed) more commonly found in apartment buildings of larger sizes (i.e. no_of_storeys)? Are certain amenities found less in apartments with a lower amount of storeys?
4. Which neighborhoods/areas in Toronto contain the greatest amount of apartment buildings based on the information contained in this dataset? This could be assessed using the ward column and quantifying the number of apartments in each ward. It would also be interesting to assess whether certain wards have a greater percentage of buildings considered to be Modern (based on my age_significance variable), contain more safety features, or contain more desirable amenities.

This concludes the first portion of my Mini Data Analysis Assignment for STAT 545A. Thank you very much for reading through this deliverable! Any feedback is greatly appreciated. :)