

# good title

STAT 385 FA2018 - Team 24

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## Abstract

This is the abstract. It should probably be at most about five sentences. The abstract should briefly explain what you are doing, why you are doing it, and what you hope to gain from it. Reading only the abstract, the reader should have a good idea about what to expect from the rest of the document.

## Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Related Work</b>	<b>2</b>
<b>3</b>	<b>Methods</b>	<b>2</b>
<b>4</b>	<b>Feasibility</b>	<b>3</b>
<b>5</b>	<b>Conclusion</b>	<b>3</b>
<b>6</b>	<b>Appendix</b>	<b>4</b>
6.1	Formatting Notes . . . . .	5
<b>7</b>	<b>References</b>	<b>7</b>

# 1 Introduction

For our Project, we decided to make a program that makes it simple and easy for the user to find a county in the United States that fits their desired needs. When people are choosing where to live, there are some standard factors that most people focus on in order to choose the best county to live in<sup>1</sup>. With our program you will be able to customize the parameters of multiple factors, and immediately see a map of the results that match your selections. This program will use **R** and **shiny** in order to make an easy to use, and highly beneficial tool for people that are looking for counties with certain attributes. The data being used will be from multiple sources that has different information about each county in the United States. These factors will include things such as Average Temperature, Crime Rate, Population Density, etc. The user will be able to select parameters for each one in order to find the best county for them.

## 2 Related Work

The **Related Work** section must provide an overview of pre-existing solutions. In essence, please credit those who enabled you to consider embarking on this project, or as Issac Newton in a letter to Robert Hooke on 15 February 1676 more aptly put it:

If I have seen further it is by standing on the shoulders of Giants.

Address the following questions:

- What other ideas have been attempted?
- Why is your team's idea original compared to prior work?

## 3 Methods

When the program starts, web scraping will begin with **rvest**. The HTML of the page will have to be parsed into data frames. While this is happening, a loading screen will be displayed as this may take a while. Variables of interest will be spliced from the data sets and combined into a master data frame.

On the UI side, the main section will be a map of the counties of the United States, created with **ggplot2**. There will be a sidebar with two tabs. The first tab will be a search panel. The user will be able to select bounds for variables of interest (Avg. temperature, Crime rate, etc.), and search for counties that match these criteria. The counties on the map will change color based on how well they match the parameters. Counties that completely match the desired values will appear green. Those that have properties within some relative error will appear yellow, and the remaining counties will appear gray. From here, the user is able to select a county. This will automatically switch to the second tab, Details.

In the details tab, there will be bar graphs that show every variable of interest for the selected county, colored based on how well they fit the search criteria. These will also be created with **ggplot2**. Because of the interactivity of the project, **shiny** will of course be used.

PROJECT TITLE

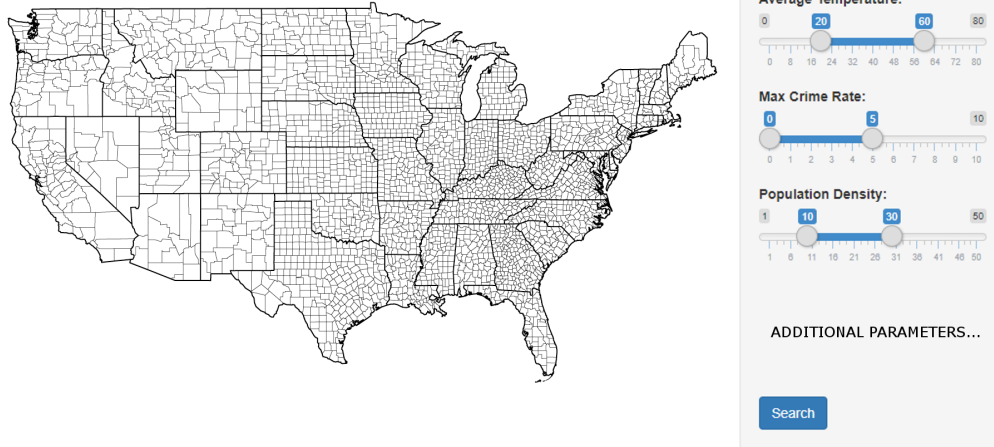


Figure 1: UI Prototype

## 4 Feasibility

The **Feasibility** section is meant to act as a way to reflect upon the proposal. Generally speaking, there will be three weeks of heavy development time afforded to the group. Building a detailed ecosystem or heavily scripting in a different language will likely not lead your team to success. Hence, please provide a project management overview of *who* on your team will be doing *what* and *when* by answering:

- Is this project able to be completed before the end of the semester?
- What steps must occur to complete the project before the end of the semester?
- What is the work plan to accomplish the necessary tasks before the end of the semester?
  - Specify who is doing what and when.
  - Consider making a Gantt chart to highlight each stage of the project.

## 5 Conclusion

The **Conclusion** section provides a summary of the entire proposal. This acts as the final paragraph that can be used to justify the work being proposed. In general, this means you should make one last push to identify the problem, potential solution, and its novelty.

If a group's project is well written, uses thoughtful and creative approaches, and is sufficiently interesting you may be asked to have your work "published" as an example for future students. **All group members will have to agree to publication.** You may also be asked to make edits before publication, but you should be sure to **proofread** and **spellcheck** your work before your initial submission.

## 6 Appendix

The **Appendix** section contains figures, sample data, and other miscellaneous entries. Generally, this sketch seeks to contain all of your *planning* information.

- Provide the sketches of visualisations and the shiny application.
- Provide an overview on the desired functions.
  - What is a function's input? Output? How are functions related to each other.
  - For example, `read_data("hospital_data.csv")` must be called before `tidy_hospital()`, et cetera.
- Provide a sample of the data set you intend to use (~10 observations).

If you used previous code chunks within the document, this information can be dynamically retrieved and embedded.

```
# Sets default chunk options
knitr::opts_chunk$set(
  # Figures/Images will be centered
  fig.align = "center",
  # Code will not be displayed unless `echo = TRUE` is set for a chunk
  echo = FALSE,
  # Messages are suppressed
  message = FALSE,
  # Warnings are suppressed
  warning = FALSE
)
# All packages needed should be loaded in this chunk
pkg_list = c('knitr', 'kableExtra', 'magrittr')

# Determine what packages are NOT installed already.
to_install_pkgs = pkg_list[!(pkg_list %in% installed.packages()[,"Package"])]

# Install the missing packages
if(length(to_install_pkgs)) {
  install.packages(to_install_pkgs, repos = "https://cloud.r-project.org")
}

# Load all packages
supply(pkg_list, require, character.only = TRUE)
knitr::include_graphics("images/ui-prototype.png")
kable(
  head(mtcars, 20),
  format = "latex",
  caption = "This is an example of a table in the Appendix. Notice that it is way too big, and has way too many columns.",
  booktabs = TRUE
) %>%
  kable_styling(latex_options = c("striped", "scale_down"))
kable(
  head(mtcars, 20),
  format = "latex",
  caption = "This is another example of a ridiculous table. Notice that it is automatically numbered.",
  booktabs = TRUE
) %>%
  kable_styling(latex_options = c("striped", "scale_down"))
```

Table 1: This is an example of a table in the Appendix. Notice that it is way too big, and has way too much information. We use the `kableExtra` package to shrink it down, but even then, no one would actually read this table.

	mpg	cyl	displacement	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2
Valiant	18.1	6	225.0	105	2.76	3.460	20.22	1	0	3	1
Duster 360	14.3	8	360.0	245	3.21	3.570	15.84	0	0	3	4
Merc 240D	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
Merc 230	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
Merc 280	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4
Merc 280C	17.8	6	167.6	123	3.92	3.440	18.90	1	0	4	4
Merc 450SE	16.4	8	275.8	180	3.07	4.070	17.40	0	0	3	3
Merc 450SL	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
Merc 450SLC	15.2	8	275.8	180	3.07	3.780	18.00	0	0	3	3
Cadillac Fleetwood	10.4	8	472.0	205	2.93	5.250	17.98	0	0	3	4
Lincoln Continental	10.4	8	460.0	215	3.00	5.424	17.82	0	0	3	4
Chrysler Imperial	14.7	8	440.0	230	3.23	5.345	17.42	0	0	3	4
Fiat 128	32.4	4	78.7	66	4.08	2.200	19.47	1	1	4	1
Honda Civic	30.4	4	75.7	52	4.93	1.615	18.52	1	1	4	2
Toyota Corolla	33.9	4	71.1	65	4.22	1.835	19.90	1	1	4	1

## 6.1 Formatting Notes

### 6.1.1 R Code and `rmarkdown`

An important part of the report is communicating results in a well-formatted manner. This template document should help a lot with that task. Some thoughts on using R and `rmarkdown`:

- Chunks are set to not echo by default in this document.
- Consider naming your chunks. This will be necessary for referencing chunks that create tables or figures.
- One chunk per table or figure!
- Tables should be created using `knitr::kable()`.
- Consider using `kableExtra()` for better presentation of tables. (Examples in this document.)
- Caption all figures and tables. (Examples in this document.)
- Use the `img/` sub-directory for any external images.
- Use the `data/` sub-directory for any external data.

### 6.1.2 LaTeX

While you will not directly work with LaTeX, you may wish to have some details on working with TeX can be found in this guide by UIUC Mathematics Professor A.J. Hildebrand.

With `rmarkdown`, LaTeX can be used inline, like this,  $a^2 + b^2 = c^2$ , or using display mode,

Table 2: This is another example of a ridiculous table. Notice that it is automatically numbered.

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
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Merc 240D	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
Merc 230	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
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Merc 450SL	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
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Toyota Corolla	33.9	4	71.1	65	4.22	1.835	19.90	1	1	4	1

$$\mathbb{E}_{X,Y} [(Y - f(X))^2] = \mathbb{E}_X \mathbb{E}_{Y|X} [(Y - f(X))^2 \mid X = x]$$

You **are** required to use BibTeX for references. With BibTeX, we could reference the `rmarkdown` paper (Allaire et al. 2015) or the tidy data paper. (Wickham and others 2014) Some details can be found in the `bookdown` book. Also, hint, Google Scholar makes obtaining BibTeX reference extremely easy. For more details, see the next section...

## 7 References

### 1. Best Counties to Live in America

The **References** section acts as a bibliography for all papers referenced in the **Introduction**, **Related Works**, and **Method** sections. The references should be formatted in Chicago author-date format, which is the default for RMarkdown.

- Provide a list (5+) of papers or items you have read to write this proposal.
- Please list all *R* packages or software referenced.

To acquire software citation information, *R* has a built-in command that creates a BibTex and in-line text citation. To generate the citation of an installed *R* package, type:

```
# In R  
citation(package="pkg_name")
```

For example, to cite `dplyr`, one would generate the BibTex entry from:

```
citation(package="dplyr")  
  
@Manual{dplyr:2018,  
  title = {dplyr: A Grammar of Data Manipulation},  
  author = {Hadley Wickham and Romain François and Lionel Henry and Kirill Müller},  
  year = {2018},  
  note = {R package version 0.7.7},  
  url = {https://CRAN.R-project.org/package=dplyr},  
}
```

Note, we added a “name” to the autogenerated citation of `dplyr:2018`. Using this name, we can reference the work within the paper via (Wickham et al. 2018) or Wickham et al. (2018).

Allaire, JJ, Joe Cheng, Yihui Xie, Jonathan McPherson, Winston Chang, Jeff Allen, Hadley Wickham, Aron Atkins, and Rob Hyndman. 2015. “Rmarkdown: Dynamic Documents for R.” *R Package Version 0.5*.

Wickham, Hadley, Romain François, Lionel Henry, and Kirill Müller. 2018. *Dplyr: A Grammar of Data Manipulation*. <https://CRAN.R-project.org/package=dplyr>.

Wickham, Hadley, and others. 2014. “Tidy Data.” *Journal of Statistical Software* 59 (10). Foundation for Open Access Statistics: 1–23.