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# Shallow yet Deep Dive Into LaTeX!

September 2020 Jeffery Russell



ritlug.com

Keep up with RITlug  
outside of meetings:  
[ritlug.com/get-involved](https://ritlug.com/get-involved),  
[rit-lug.slack.com](https://rit-lug.slack.com)



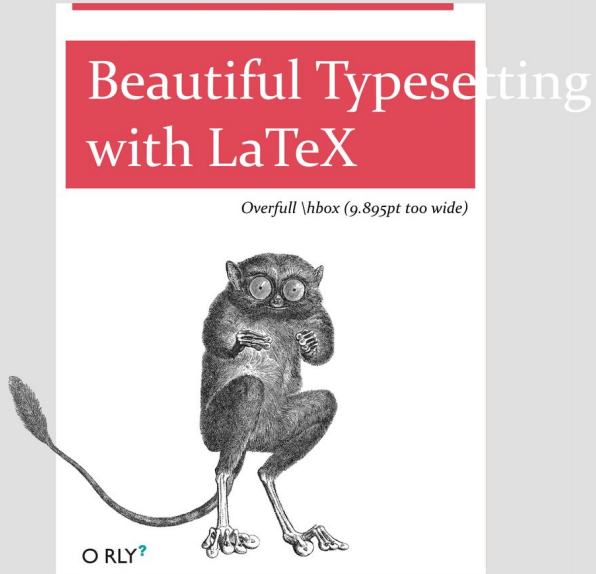
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L<sup>A</sup>T<sub>E</sub>X

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# What is LaTeX?



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# History



- LaTeX is a software preparation software written in 1983 as an extension of Tex.
  - Users write in plane text rather than formatted text like Word and other office processors.
  - LaTeX started as tooling for mathematicians and computer scientists, but have expanded to academia at large.
-

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# Cool Features

- Typesetting for journal articles, technical reports, and books
- Robust cross-references with sections, tables, and figures
- Advanced mathematical typesetting

$$\widehat{L}(u, v) = \begin{cases} 1 & \text{if } u = v \text{ and } d_v \neq 0 \\ -\frac{1}{\sqrt{d_u d_v}} & \text{if } (u, v) \in E \\ 0 & \text{otherwise} \end{cases}$$

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# Use Cases

- Writing research papers
    - Conferences often provide a LaTeX template so everyone conforms to certain standards.
  - Homework
    - Text-based nature of LaTeX makes it easy and fast to work with.
    - Easy to include and manage citations
  - Resume
    - Formatting looks professional and clean
  - Writing a Book
    - I haven't written a book yet, but, I would definitely use LaTeX if I did.
-

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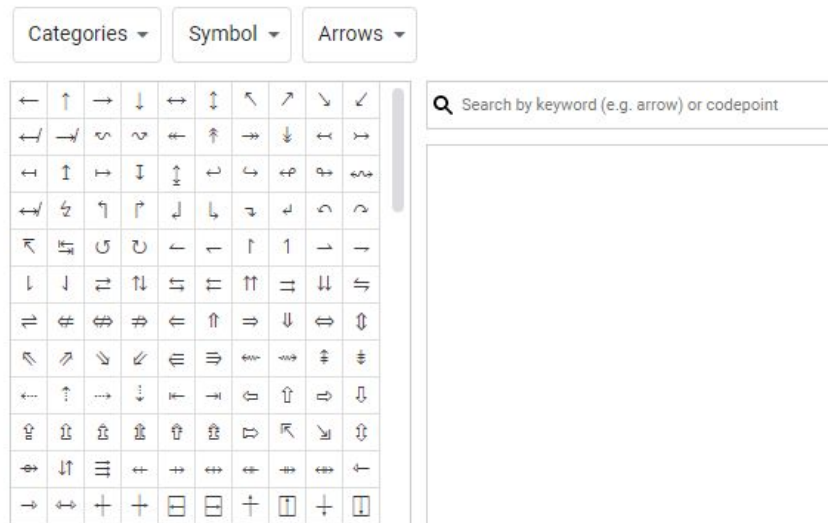
# Why did I switch to LaTeX?

Insert special characters

Categories ▾ Symbol ▾ Arrows ▾

←	↑	→	↓	↔	↕	↖	↗	↘	↙
↵	↶	↷	↸	↹	↺	↻	↼	↽	↾
↿	↻	↼	↽	↿	↻	↼	↽	↿	↻
↵	↶	↷	↸	↹	↺	↻	↼	↽	↾
↿	↻	↼	↽	↿	↻	↼	↽	↿	↻
↵	↶	↷	↸	↹	↺	↻	↼	↽	↾
↿	↻	↼	↽	↿	↻	↼	↽	↿	↻
↵	↶	↷	↸	↹	↺	↻	↼	↽	↾
↿	↻	↼	↽	↿	↻	↼	↽	↿	↻
↵	↶	↷	↸	↹	↺	↻	↼	↽	↾
↿	↻	↼	↽	↿	↻	↼	↽	↿	↻

Search by keyword (e.g. arrow) or codepoint



×

- After writing two research papers in Google drive, I was exhausted with using a word processor to work with citations, figures and mathematical equations.
  - The tipping point was when my Analysis of Algorithms class required homeworks to be typed.
    - Everything in that class was math!
    - Typing math in latex is light years faster than doing math in google docs.
-

# My Old Algo Homework

## 2 Recurrence

(a) **Lemma 1:** For any  $n \in \mathbb{N}$ ,  $\left\lceil \frac{n+1}{2} \right\rceil = \left\lfloor \frac{n}{2} \right\rfloor$

**Proof By Cases:**

**Even Case:**

$n$  can be represented as  $2m$  for some value of  $m$

$$LHS = \left\lceil \frac{n+1}{2} \right\rceil = \left\lceil \frac{2m+1}{2} \right\rceil$$

$$= \left\lceil m + \frac{1}{2} \right\rceil = m + 1$$

$$RHS = \left\lfloor \frac{n}{2} \right\rfloor = \left\lfloor \frac{2m}{2} \right\rfloor = \lfloor m \rfloor = m = LHS$$

**Odd Case:**

$n$  can be represented as  $(2m+1)$  for some value of  $m$

$$LHS = \left\lceil \frac{n+1}{2} \right\rceil = \left\lceil \frac{2m+1+1}{2} \right\rceil$$

$$= \lceil m+1 \rceil = m+1$$

$$RHS = \left\lfloor \frac{n}{2} \right\rfloor = \left\lfloor \frac{2m+1}{2} \right\rfloor = \left\lfloor m + \frac{1}{2} \right\rfloor = m = LHS$$

□

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### Algorithm 1 Strassen's Algorithm

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```
1: procedure STRASSEN(A,B):
2:    $n \leftarrow$  number of rows in  $A$ 
3:    $C \leftarrow$  new  $n$  by  $n$  matrix
4:   if  $n = 1$  then
5:      $c \leftarrow A[1][1] * B[1][1]$ 
6:   else
7:     Sub partition  $A$  into 4 equal matrix quadrants  $A_{11}, A_{12}, A_{21}, A_{22}$ 
8:     Sub partition  $B$  into 4 equal matrix quadrants  $B_{11}, B_{12}, B_{21}, B_{22}$ 
9:      $s_1 \leftarrow B_{12} - B_{22}$ 
10:     $s_2 \leftarrow A_{11} + A_{12}$ 
11:     $s_3 \leftarrow A_{21} + A_{22}$ 
12:     $s_4 \leftarrow B_{21} - B_{11}$ 
13:     $s_5 \leftarrow A_{11} + A_{22}$ 
14:     $s_6 \leftarrow B_{11} + B_{22}$ 
15:     $s_7 \leftarrow A_{12} - A_{22}$ 
16:     $s_8 \leftarrow B_{21} + B_{22}$ 
17:     $s_9 \leftarrow A_{11} - A_{21}$ 
18:     $s_{10} \leftarrow B_{11} + B_{12}$ 
19:     $p_1 \leftarrow$  Strassen( $A_{11}, s_1$ )
20:     $p_2 \leftarrow$  Strassen( $s_2, B_{22}$ )
21:     $p_3 \leftarrow$  Strassen( $s_3, B_{11}$ )
22:     $p_4 \leftarrow$  Strassen( $A_{22}, s_4$ )
23:     $p_5 \leftarrow$  Strassen( $s_5, s_6$ )
24:     $p_6 \leftarrow$  Strassen( $s_7, s_8$ )
25:     $p_7 \leftarrow$  Strassen( $s_9, s_{10}$ )
26:     $C[1][1] \leftarrow p_5 + p_4 - p_2 + p_6$ 
27:     $C[1][2] \leftarrow p_1 + p_2$ 
28:     $C[2][1] \leftarrow p_3 + p_4$ 
29:     $C[2][2] \leftarrow p_5 + p_1 - p_3 + p_7$ 
30:  return  $C$ 
```

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# Final Paper

## K-means Clustering Over Time CSCI-471-02

Author: Jeffery B. Russell

Reviewer: Daniel Moore

Submitted: April 23, 2020

Computer Science at RIT

### Overview

With the ubiquity of data in today's age, machine learning has become a driving force in research and innovation in both the public and private sectors. Due to the vast quantity of data generated by the internet, unsupervised learning has been at the forefront of data science over the past few decades. Clustering has consistently been an

the topics produced in the paper continues to be an exciting area of investigation because we can compare a relatively older research paper on clustering with a new one. Project Euclid(hosts 1.8 million pages of open-access content) has this paper on its website<sup>1</sup>.

John Paparrizos and Luis Gravano in 2016 wrote a paper that covers how we can cluster time series data using an algorithm they call k-shape– the k-



# Homeworks

## CSCI-420 Homework 2

Jeffery Russell

September 18, 2020

### Abstract

This homework explored threshold classifiers and assessing the performance of classifiers using cost functions and ROC curves.

## 1 Exploratory Data Analysis

Before diving into the project, I started by creating figure 1, which is a scatter plot of both Age and Height, where the color of the data points correlated to the class of snowfolks – Assam, Bhuttan.

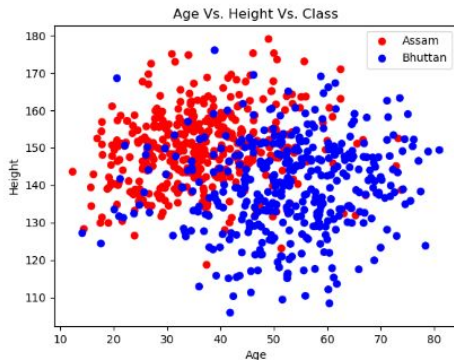


Figure 1: Plot Shoing Age, Height, and Snowfolk Class

## Analyzing the Effects of Remote Learning on RIT Students\*

Jeffery B. Russell<sup>†</sup>

*Fourth Year Computer Science Student at RIT*

*CUBRC Research Assistant*

(Dated: September 18, 2020)

Conducting qualitative research is essential in implementing public policy because it enables us to understand our complex political and social environments better. This research project aims to gain a deeper understanding of the effects of RIT's decision to conduct remote classes and have students go home. Two methods were employed to collect data. First, we interviewed five participants using grounded theory, and then we did artifact review on images received from participants that describe their mood.

The major takeaways from this research are that the pandemic affects everyone differently; some people were well prepared to deal with this where others struggled with remote class. College in America has been viewed historically as the great equalizer; however, sending people home has re-introduced introduced economic, social, and physiological struggles for people to overcome. This paper weighs some policies that RIT could implement in the future semesters to make remote learning more manageable for students.

**Keywords:** COVID-19, Public Policy, Qualitative Research, Artifact Analysis

### I. BACKGROUND

The recent COVID-19 incident required us to shift our way of living to combat the virus. Schools closed, borders closed, everything came to a halt[4]. As people now reconcile working and learning from home, we are learning about the social impact that it has on people daily.

has blogged a bit about their own experiences<sup>1</sup> as a way of coping with this new normal. With all these struggles, we need to understand how people are affected by the COVID-19 policies so that we can learn how to mitigate unintended negative externalities better.

### II. RESEARCH QUESTION

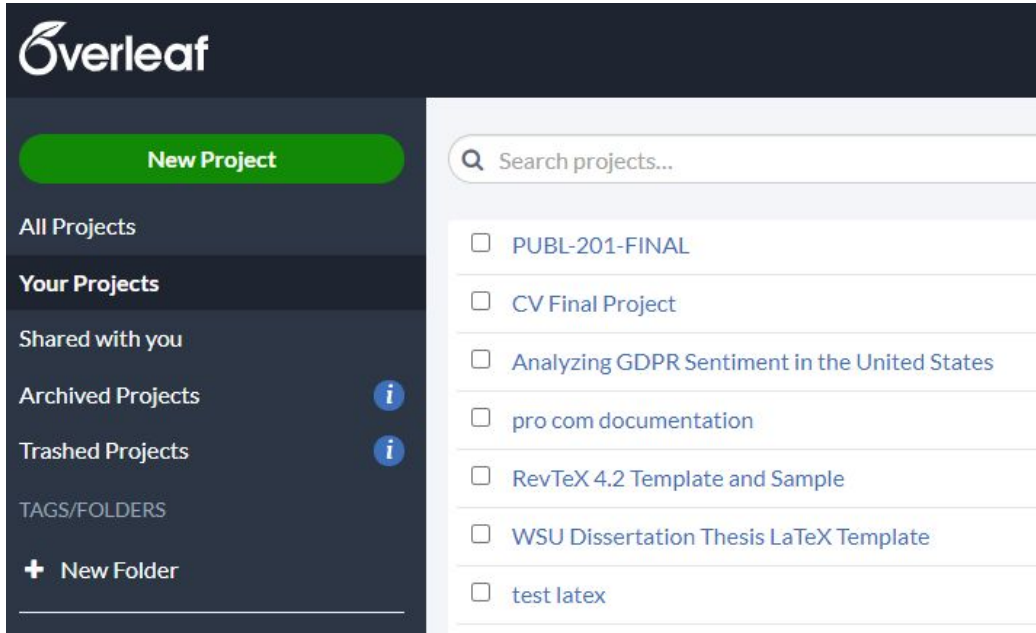
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**How do I LaTeX?**

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# Overleaf



- The “google drive” of LaTeX.
- Ability to create, and collaborate on LaTeX files with other people.
- Has thousands of templates available to brows
- Has option to sync project with Github

## Pro Tip:

You can only share documents with 1 other person in free version, but you can create a share link allowing you to sent it to everyone in a larger group.

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Source Rich Text

Analyzing\_GDPR\_Sentiment\_in\_the\_Unite...  
main.tex

File outline

- Background
  - Research Questions
- Methods
  - Action Research
  - Biographical
- Findings
  - Privacy and Social Media
  - Implementing GDPR
  - Privacy Culture
- Discussion
- Action Research Interview Script
- Biographical Interview Script
- Field Notes

```

63 - \begin{document}
64
65 \preprint{APS/123-QED}
66
67 \title{Analyzing GDPR Sentiment in the United States}
68 \thanks{Submitted as a PUBL-201 assignment at RIT}\%
69
70 \author{Jeffery B. Russell}
71 \email{jeffery@jrtechs.net, jxr8142@rit.edu}
72 \affiliation{\%
73 Fourth Year Computer Science Student at RIT\\
74 CUBRC Research Assistant\\
75 RITlug President
76 }%
77
78 \date{\today}\% It is always \today, today,
79 \% but any date may be explicitly specified
80
81 - \begin{abstract}
82 Conducting qualitative research is essential in implementing public policy because it enables
83 us to better understand our complex political and social environments.
84 This research project aims to gain a deeper understanding of American's views on privacy so
85 that we can access what types of GDPR (General Data Protection Regulations) like regulations
86 we should implement in the United States.
87
88 We found that although most people said that they would support regulations like the GDPR in
89 the United States, most people added stipulations as to how it got implemented and enforced.
90 This work calls upon the need to conduct more qualitative research on privacy regulations so
91 that we can find an ideal set of regulations for the United States.
92 Despite the varying opinions on implementations, the consensus that there is currently an
93 issue with privacy regulations illustrates the urgent need for policy change at the federal
94 level.
95
96 \end{abstract}
97
98 \end{description}
99 \item[Keywords]
100 GDPR, Public Policy, Qualitative Research, Data Protections
\end{description}
\end{abstract}
\maketitle
%tableofcontents
\section{\label{sec:level1}Background}

```

Recompile

## Analyzing GDPR Sentiment in the United States\*

Jeffery B. Russell<sup>†</sup>  
Fourth Year Computer Science Student at RIT  
CUBRC Research Assistant  
RITlug President  
(Date: September 17, 2020)

Conducting qualitative research is essential in implementing public policy because it enables us to better understand our complex political and social environments. This research project aims to gain a deeper understanding of American's views on privacy so that we can access what types of GDPR (General Data Protection Regulations) like regulations we should implement in the United States.

We found that although most people said that they would support regulations like the GDPR in the United States, most people added stipulations as to how it got implemented and enforced. This work calls upon the need to conduct more qualitative research on privacy regulations so that we can find an ideal set of regulations for the United States. Despite the varying opinions on implementations, the consensus that there is currently an issue with privacy regulations illustrates the urgent need for policy change at the federal level.

**Keywords:** GDPR, Public Policy, Qualitative Research, Data Protections

### I. BACKGROUND

#### A. Research Questions

This study focused on people's opinions surrounding how their data is being used by websites. With the recent expose of data scandals like Cambridge Analytica and new regulations being introduced in the European Union, it is a perfect time to start exploring people's opinions on data collection in the United States. The goal of this research is to help inform policymakers whether or not we should implement privacy regulations similar to the European Union in the United States.

This research project focuses on the General Data Protection Regulation (GDPR) passed by the European Union (EU) in 2016. The GDPR is a massive consumer protection law that gives people more control over their personal by restricting how companies are allowed to use and collect personal data. Since the passage of the GDPR in 2018, seven other countries passed similar regulations and most large technology companies are working on becoming GDPR compliant so they can do business in the EU!<sup>1</sup>

The GDPR is quite intensive, however, I am going to be focusing my research around the following three points in the GDPR:

- The requirement for active consent to keep storing personal information. (Article 5)<sup>2</sup>
- The right to request for information being stored about you. (Article 15)<sup>3</sup>
- Right to be forgotten. (Article 17)<sup>4</sup>

\* Submitted as a PUBL-201 assignment at RIT  
† jeffery@jrtechs.net, jxr8142@rit.edu

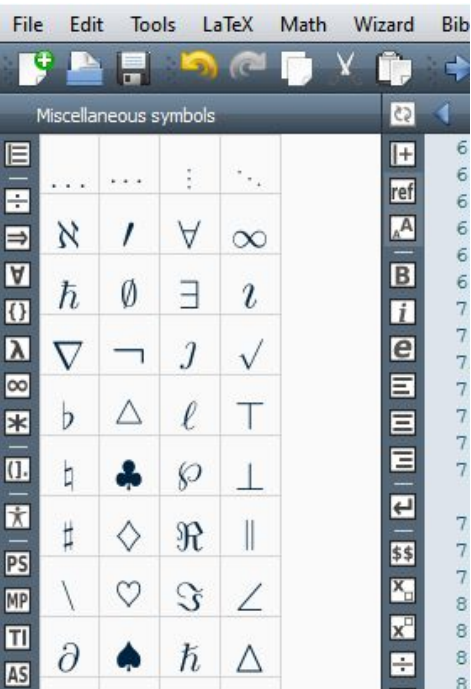
### II. METHODS

#### A. Action Research

This study used two research paradigms to gather data: action research and biographical.

Co-interpretation interviews were used in this study to pull out information from people that have not thought about privacy protection laws before. This method is particularly useful because by using co-interpretation in interviews, we are able to describe what GDPR is to people while learning about their views on privacy regulations. Although most people may have heard about GDPR, relatively few people actually know what is in the law.

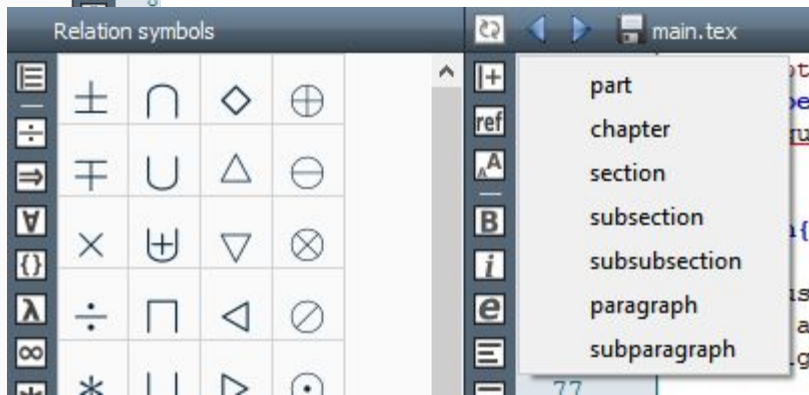
We used Applied Action in conjunction with the Critical Humanism framework to analyze and learn each person's truth. Critical Humanism falls on the radical change and education views spectrum. We chose this



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# TeXmaker

- The “libre office” of LaTeX editing.
- Pros:
  - Personally controlled
  - UI has more options for selecting LaTeX commands
- Cons:
  - Hard to install LaTeX and all of its packages along with TexMaker



Structure

main.tex
LABELS
fig:dataViz
fig:costFunctions
fig:rocCurves
BLOCKS
Exploratory Data Analysis
Meta Programming
Comparison to Otsu's
Cost Functions
Receiver Operator Curve
Conclusion

```

1 \documentclass[letterpaper,12pt]{article}
2 \usepackage{tabularx} % extra features for tabular environment
3 \usepackage{amsmath} % improve math presentation
4 \usepackage{graphicx} % takes care of graphic including machinery
5 \usepackage{margin=lin,letterpaper}{geometry} % decreases margins
6 \usepackage{cite} % takes care of citations
7 \usepackage{final}[hyperref] % adds hyper links inside the generated pdf file
8 \hypersetup{
9   colorlinks=true, % false: boxed links; true: colored links
10  linkcolor=blue, % color of internal links
11  citecolor=blue, % color of links to bibliography
12  filecolor=magenta, % color of file links
13  uricolor=blue
14 }
15 \usepackage{blindtext}
16 \usepackage{subfig}
17 %+++++
18
19
20 \begin{document}
21
22 \title{CSCI-420 Homework 2}
23 \author{Jeffery Russell}
24 \date{\today}
25 \maketitle
26
27 \begin{abstract}
28 This homework explored threshold classifiers and accessing the performance of classifiers
29 using cost functions and ROC curves.
30 \end{abstract}
31
32 \section{Exploratory Data Analysis}
33
34 Before diving into the project, I started by creating figure \ref{fig:dataViz}, which is a
35 scatter plot of both Age and Height, where the color of the data points correlated to the
36 class of snowfolks -- Assam, Bhutan.
37
38 \begin{figure*}[h!]
39 \centering
40 \includegraphics[width=.8\textwidth]{data_visuzlization.png}
41 \caption{Plot Shoing Age, Height, and Snowfolk Class}
42 \label{fig:dataViz}
43 \end{figure*}
44
45 \section{Meta Programming}
46
47 A program was created that used a linear search of discretized values to determine the

```

File Type Line Message

main.tex Warning line 1 'lh' float specifier changed to 'ht'.

LOG FILE:

This is pdfTeX, Version 3.14159265-2.6-1.40.21 (TeX Live 2020/W32TeX) (preloaded format=pdflatex 2020.9.17) 17 SEP 2020 15:33  
entering extended mode  
restricted \write18 enabled.  
%&line parsing enabled.

## CSCI-420 Homework 2

Jeffery Russell

September 17, 2020

### Abstract

This homework explored threshold classifiers and accessing the performance of classifiers using cost functions and ROC curves.

## 1 Exploratory Data Analysis

Before diving into the project, I started by creating figure 1, which is a scatter plot of both Age and Height, where the color of the data points correlated to the class of snowfolks – Assam, Bhutan.

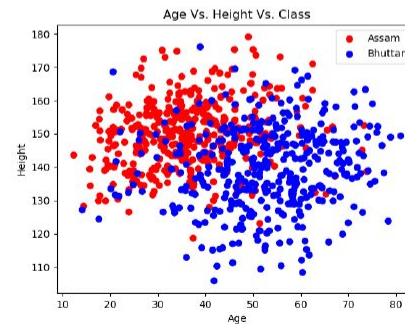


Figure 1: Plot Shoing Age, Height, and Snowfolk Class

# VS Code

Once you get more familiar with LaTeX, I recommend you check out the *LaTeX Workshop* plugin on VScode.

The image shows a screenshot of the Visual Studio Code (VS Code) interface. The main editor window displays a LaTeX source file named `basic_example.tex`. The code includes comments and LaTeX commands for creating a document with a title, author, date, and a section titled "1 Math". It also demonstrates how to create a matrix and how to reference a specific equation.

```
18 In \LaTeX, there are tons of options for writing math.
19 Over time you will memorize a lot of them, however, TeXMaker has a side panel with all the mat
20
21 % The following shows some math examples
22 \begin{align}
23   \label{math1}
24   E_0 &= mc^2 \\
25   E &= \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}
26 \end{align}
27
28 Look at equation \ref{math1}. Isn't that a cool function! Math blocks can also be constructed u
29
30
31 $$
32 \begin{bmatrix}
33   1 & 3 \\
34   7 & 5
35 \end{bmatrix} \odot
36 \begin{bmatrix}
37   6 & 8 \\
38   4 & 2
39 \end{bmatrix} \\
40 $$
41
42
43
44 Cool right?
45
46
47
48
49
50
51
52
```

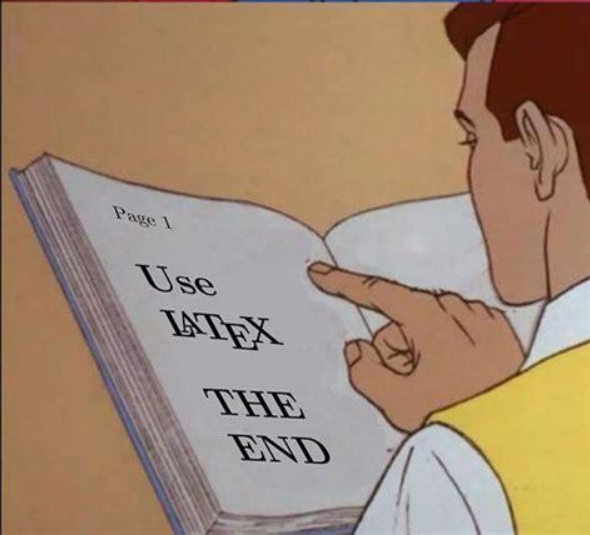
The right-hand side of the image shows the rendered PDF output of the LaTeX code. The document has a title "Introduction" by Jeffery Russell, dated September 18, 2020. It includes a section "1 Math" and a paragraph explaining LaTeX options. The rendered output shows the matrix and equation from the source code, with the equation  $E_0 = mc^2$  and  $E = \frac{mc^2}{\sqrt{1 - \frac{v^2}{c^2}}}$  displayed. The matrix operation is also rendered as  $\begin{bmatrix} 1 & 3 \\ 7 & 5 \end{bmatrix} \odot \begin{bmatrix} 6 & 8 \\ 4 & 2 \end{bmatrix}$ .



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# Down to Basics

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# Live demo? What can go wrong?

<https://github.com/jrtechs/latex-quick-reference>

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# Questions



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# Resources

- [Youtube LaTeX Tutorial](#)
- [LaTeX Kickstart](#)

