

# Analyzing Group and Individual Contributions within Group Programming

Maria Quiroz and Michael Wehar

## Introduction

The field of Computer Science has been steadily growing within academic institutions across the country. As a result, the topic of Computer Science Education has grown into a popular subfield. In order for institutions to provide good quality education in Computer Science, there needs to be accessible resources for educators to use. Unfortunately, as of now, there does not seem to be a reliable resource for educators to use to help them evaluate a student group's code for a software engineering project. To tackle this issue, we decided to focus on developing a web-based application that would help educators understand and assess their student projects.

## Problem Statement

The primary problem we investigate is: how can we help educators to understand and assess student code contributions through the evaluation of student code repositories? We suggest that accessible resources taking the form of web-based applications are a necessity.

## Disadvantages of Other Resources

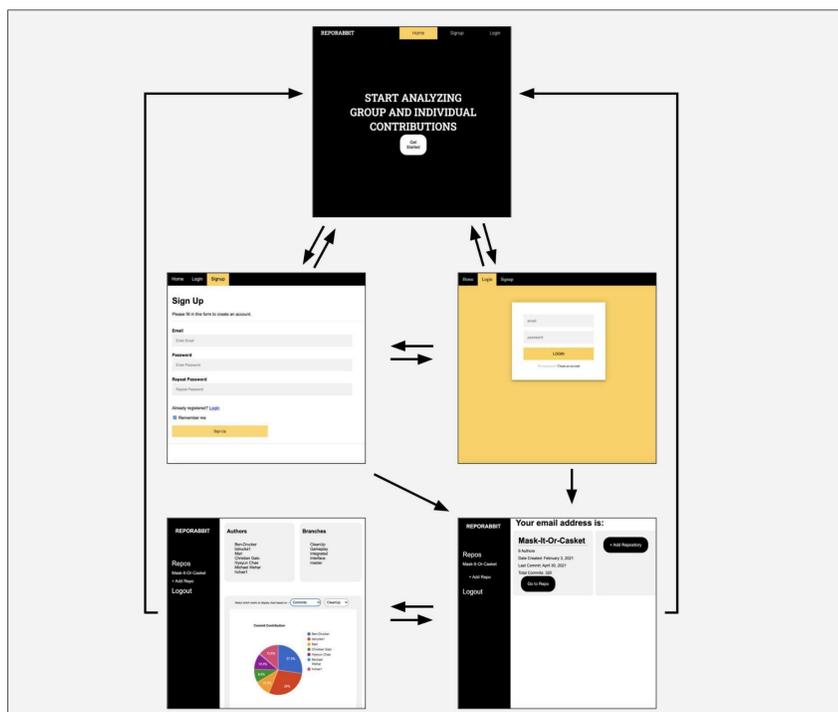
There are some companies and individuals that attempt to help customers review their code repositories; however, their products don't focus on the needs of an educator. Due to this, various drawbacks arise including:

Company Created Application	GitHub Based Applications
<ul style="list-style-type: none"> <li>Designed for companies to track the process of their engineers</li> <li>Many of the functions are excessive for a courses needs</li> <li>Must pay to use it</li> </ul>	<ul style="list-style-type: none"> <li>Usually tend to be terminal-based</li> <li>Don't have a user-friendly interface</li> <li>Requires individuals to read through documentation to understand how to use it</li> <li>Some offer very general information</li> </ul>

## Overview of RepoRabbit

We built our web application while focusing on the needs of educators. The purpose of our web app is to process student code repositories and from this analysis curate graphs to assist educators to answer questions about fairness, timeliness, consistency, and overall contribution from their students.

RepoRabbit's Web Page Flow Diagram:



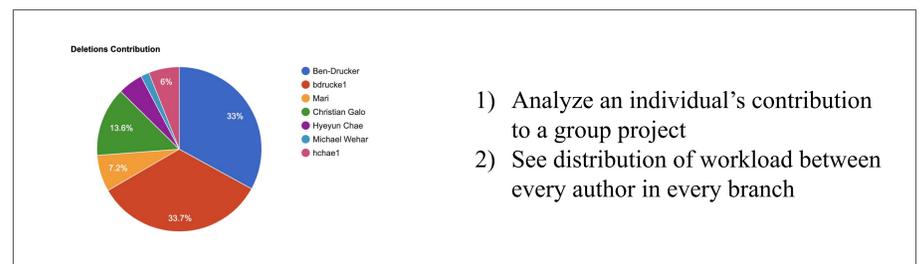
If your interested to delve more into RepoRabbit, feel free to visit: <https://www.reporabbit.com>

## Contribution Measurement

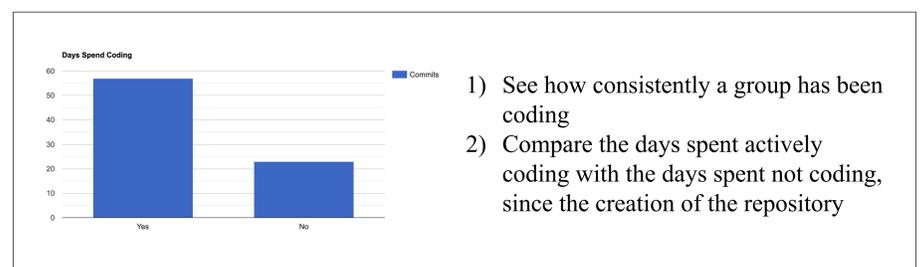
To gain an overview of a group's coding practices we focus on analysing three main types of metrics:

1. Number of commits made
2. Number of insertions made
3. Number of deletions made

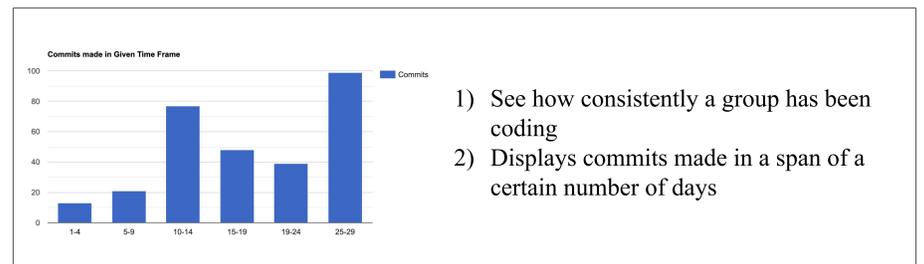
On top of this, we also look at the amount of coding contributions made over the courses timeline (i.e. looking at the code from the creation of the repository to the end of the course.)



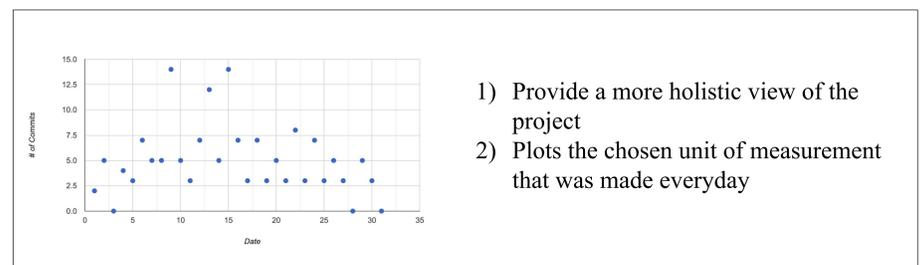
- 1) Analyze an individual's contribution to a group project
- 2) See distribution of workload between every author in every branch



- 1) See how consistently a group has been coding
- 2) Compare the days spent actively coding with the days spent not coding, since the creation of the repository



- 1) See how consistently a group has been coding
- 2) Displays commits made in a span of a certain number of days



- 1) Provide a more holistic view of the project
- 2) Plots the chosen unit of measurement that was made everyday

## Future Work

We built a web application to help educators understand and assess student code contributions. Our next step is to share our application to multiple educators for use in their software engineering courses. As part of this planned collaboration, we hope to gain feedback on our application, make improvements, and resolve current limitations.

**Software Libraries:** Our application utilizes the PyDriller and GitPython modules. We are grateful to their development communities for making their software and documentation available.

### References:

- [1] T. Honglei, S. Wei and Z. Yanan, "The Research on Software Metrics and Software Complexity Metrics," 2009 International Forum on Computer Science-Technology and Applications, 2009, pp. 131-136, doi: 10.1109/IFCSTA.2009.39.
- [2] P. R. de Bassi, G. M. P. Wanderley, P. H. Banali and E. C. Paraiso, "Measuring Developers' Contribution in Source Code using Quality Metrics," 2018 IEEE 22nd International Conference on Computer Supported Cooperative Work in Design ((CSCWD)), 2018, pp. 39-44, doi: 10.1109/CSCWD.2018.8465320.

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