PLOM – PAPERLESS OPEN MARKING

A LIBRE ONLINE MARKING SYSTEM

20TH MARCH 2021

STUDENT PRESENTERS

Dryden Wiebe   **Vala Vakillian**   **Victoria Schuster**

FACULTY SUPERVISORS

Andrew Rechnitzer   **Colin Macdonald**

www.plomgrading.org   gitlab.com/plom/plom

WHO WE ARE

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- Victoria — Engineering Physics Student

CREATORS

PLOM was created by Andrew Rechnitzer and Colin Macdonald, professors of mathematics at UBC
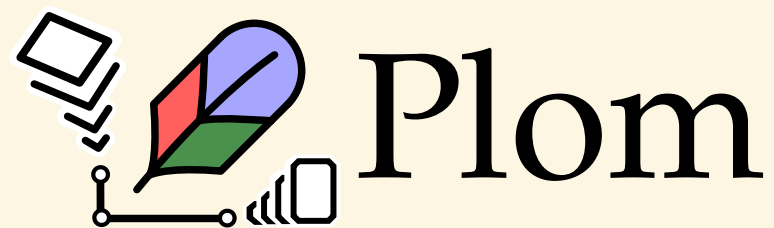
Plom

IT TAKES A VILLAGE

THANKS (BASED ON THE "GIT LOG")

```
# git log --format="%aN" | sort -u          5584 commits, 25537 lines of Python
    Andreas Buttenschoen
    Andrew Rechnitzer
    Colin B. Macdonald                       Many thanks to the students (*)
(*) Dryden Wiebe                             who have contributed!
(*) Elvis Cai
    Elyse Yeager
(*) Forest Kobayashi
    Jenny Li
    John Hsu
    Kevin Macdonald                          Special notice:
    Matthew Coles                              CTLT Small TLEF
    Michael Zhang                              Noureddine Elouazizi
    Omer Angel                                 Clarence Ho
(*) Peter Lee                                  The Ha, et al @ Math IT
(*) Vala Vakilian                              Sathish Gopalakrishnan
(*) Victoria Schuster                          Eric Cytrynbaum
    Vinayak Vatsal
```

AND THE MANY PEOPLE WHO HAVE MARKED USING PLOM

OUTLINE

- History and motivation
- Plom work flow
- The move online
- Student involvement
- PLOM as free software
- Getting students involved with free software
- Demo and question time

HISTORY AND MOTIVATION

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- Andrew — I need lots of versions (without burning out my teaching team)
- Colin — I need to return these tests (without meeting humans, in 2018!)

FOR ANDREW, IT STARTED WITH A MIDTERM...

FEBRUARY 2018, MATHEMATICS-101

- 1250 students in 8 sections, Thurs 09:30 — Fri 16:00
- Classrooms packed — cannot space students
- Multiple seatings required
- Outside regular hours not feasible (many reasons)

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SOLUTION (FAR FROM OPTIMAL)

- 3 versions for Thursday and another 3 versions for Friday
- Less *"leakage"* at the expense of increased logistics
- Drafting and harmonising the tests was a multi-week process
- Far too many hours spent on ad-hoc management by instructor in charge

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- Not sustainable
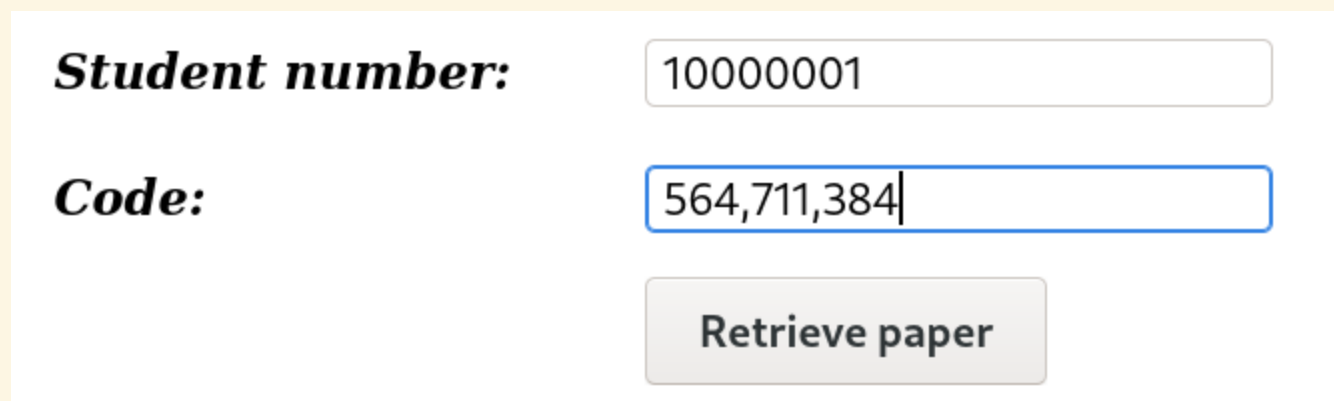
FOR COLIN, IT STARTED WITH A MIDTERM

SEPT 2018, COLIN (AND OTHERS) TEACHING MATH 253

- Mark teaching online due to ~~Covid19~~ *insufficient classrooms*
- midterm needs to be returned, without physically meeting students.

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YOU *"JUST"* NEED TO PUT A FEW PDF FILES ON THE WEB, RIGHT?

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- add secret code to each filename, put on web:
  https://amcweb.math.ubc.ca/~cbm/return/midterm1_SID_564711384.pdf
- distribute code as Canvas *"assignment"* mark:
  *"you got **564,711,384/999,999,999** on the Test Return Code assignment!"*
- Student goes to simple auto-generated website:

Student number:	10000001
Code:	564,711,384

Retrieve paper

- We still use similar ideas to return papers and distribute individualized assessment.

SHARED CONCERNS ABOUT EXISTING SOLUTIONS

CONCERNS ABOUT COMMERCIAL AND NON-FREE SOFTWARE...

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- Commercial software solutions get student data
- Long and ambigous agreements that don't protect privacy

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- Surely we can build it to give better feedback to students?
- Surely we can protect student data?
- How hard can it be to build a free software solution?

END OF 2018

PLOM USED IN 5 COURSES FOR $\approx$ 2500 PAPERS.

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BASIC WORKFLOW FUNCTIONAL

- Generating tests with randomized versions, printing
- Scanning, uploading
- Simultaneous grading by large team of TAs (demo next!)
- Baby steps towards Canvas integration

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DEVELOPMENT

- Much code improvement and clean-up (less *"Andrew"*, more standard python)
- Better use of version control and issue tracking via Gitlab
- Three contributors:

```
# git log --format="%aN" | sort -u            321 commits, 7421 lines of Python)
    Andrew Rechnitzer
    Colin B. Macdonald                         (*) student contributors
(*) Elvis Cai
```

PLOM IS FREE SOFTWARE

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FREE SOFTWARE FROM THE THE GROUND UP

- Libre — freely licensed (AGPLv3) and built from FOSS components
- Gratis — no $, €, £ or ฿
- Respects our TAs and our students
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- Pedagogical potential — analysis of rubric data

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  Help Wanted — ideas and collaborators welcome

PLOM WORKFLOW: RUNNING A TEST

TEST SPECIFICATION

- test name, how many pages, questions, and versions
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BUILD AND PRINT PDFS (IN "THE BEFORE TIME")

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FEED TEST TO STUDENTS (AND VICE-VERSA)

- prenamed tests or students fill in ID page

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CAREFULLY SCAN AND UPLOAD THE RESULTING PAPERS

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- use a dependable TA
- system sorts scans (from QR-codes and by reading hand-written student numbers)

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- …but we recommend the marking party approach
- manager-tools to oversee process

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REASSEMBLY AND RETURN

- Scripts reassemble, build spreadsheet, ~~build return webpage~~, push grades to LMS.
- Recent LMS-integration — return-link or PDF directly to student

PLOM ADVANTAGES

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REDUCE VERSIONS BY INTERLEAVING

- Make 3 source-versions of a 4-question test
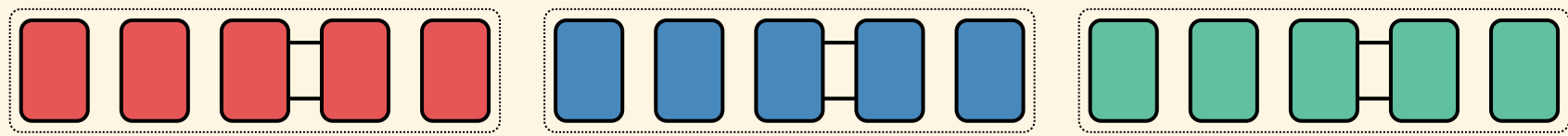
- Plom can interleave different versions to build $3 \times 3 \times 3 \times 3 = 81$ possible tests
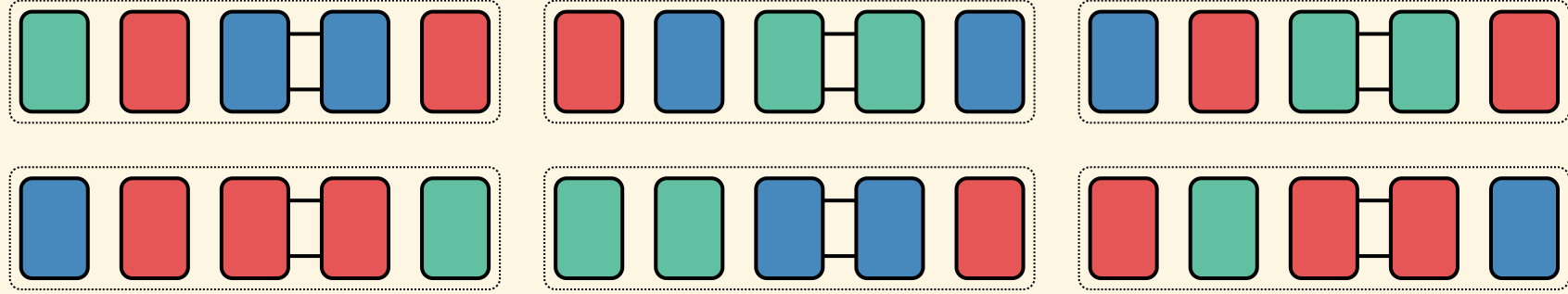
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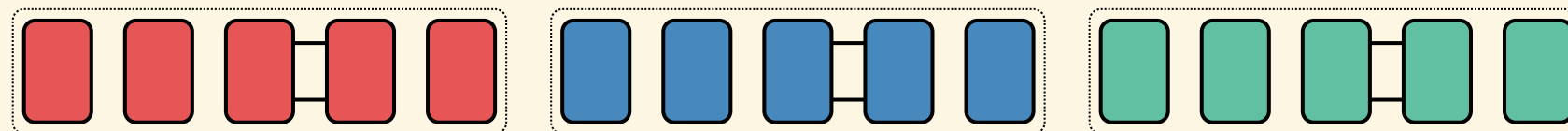
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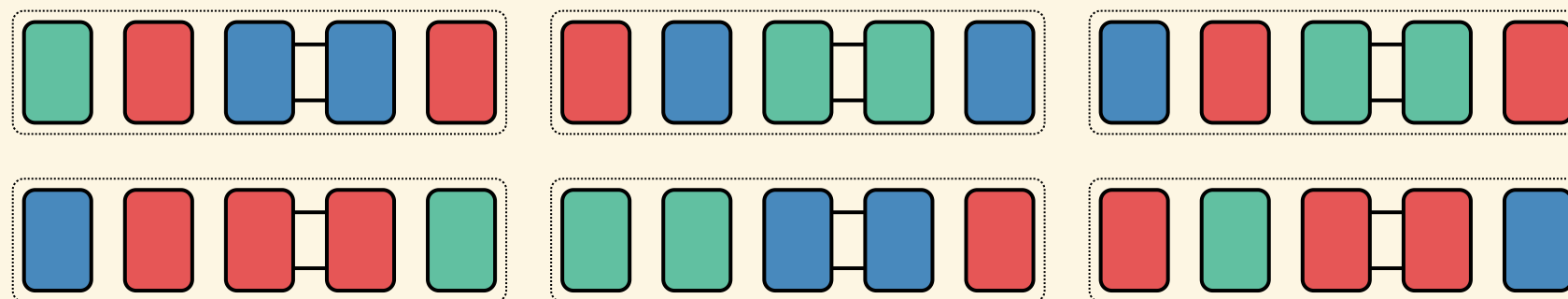
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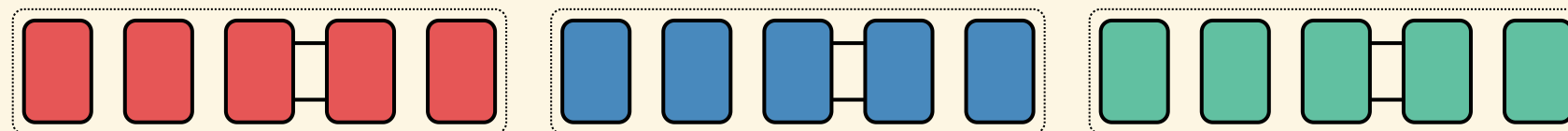
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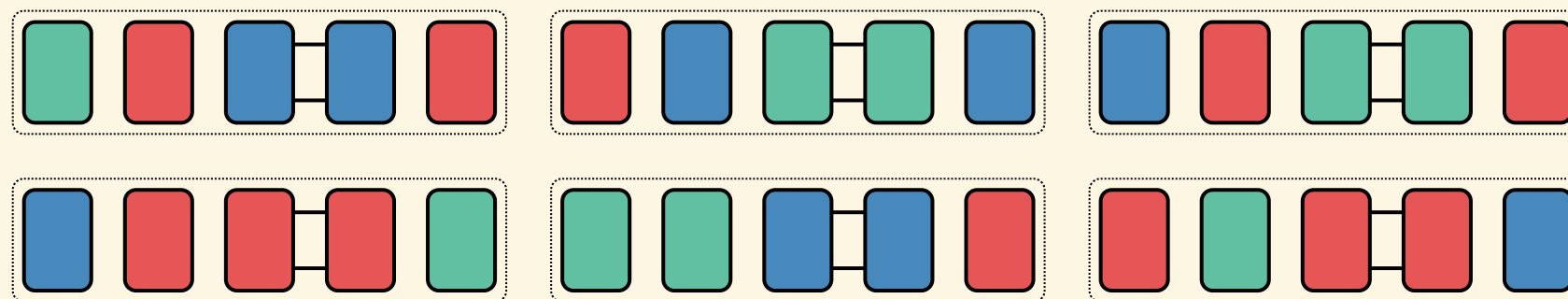
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IMPROVE QUALITY AND CONSISTENCY OF FEEDBACK

- Marker client encourages rubric use and re-use
- Rubric sharing and filtering

JANUARY 2020

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... BUGS FOUND AND FIXED

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ONLINE ASSESSMENT

- So many issues — focus on logistics

STUDENT INVOLVMENT

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THIS IS WHERE WE COME IN

WE WERE HIRED TO CONTRIBUTE TO PLOM DURING SUMMER 2020

INDIVIDUAL CONTRIBUTIONS

DRYDEN

DRYDEN

TEST INFRASTRUCTURE
CONFIGS AND PARSING

VALA

VALA

CLEANUP AND DOCUMENTATION FOR THE CODE BASE

IMPLEMENTING SIMPLE ALGORITHMS FOR DIGIT DETECTION

DISTRIBUTED COMMENT PROCESSING DATABASE

VICTORIA

VICTORIA

ADDED ADDITIONAL FUNCTIONALITY TO MARKING GUI

FRONT-END DOCUMENTATION & CODE CLEANUP

CURRENTLY: DEVELOPMENT OF POTENTIAL FUTURE WEB INTERFACE

ALL STUDENT INVOLVMENT

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PLOM HAS SO FAR BEEN ABLE TO HAVE MANY STUDENT CONTRIBUTORS

UNDERGRADUATE

- Elvis Cai — summer 2018
- Vala Vakilian — summer 2020
- Dryden Wiebe — summer 2020
- Victoria Schuster — summer 2020 and current
- Peter Lee — current

POST-GRADUATE

- Forest Kobayashi — current
- Liam Yih — current
- Jalal Khouhak — current

EXPOSING STUDENTS TO FREE SOFTWARE

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STUDENTS ARE THE FUTURE CREATORS AND MAINTANERS OF FREE SOFTWARE

- We all knew very little about Free Software before starting with PLOM
- Mentors (Colin and Andrew) promoted the use of Free Software and its ideals
- We learned about different licences and reasons behind the choices for PLOM

INDIVIDUAL TAKEAWAYS

DRYDEN

DRYDEN

- Understaning about free Software Licences
- The importance of data privacy and the role Free Software plays in that
- The importance of writing software in a way that promotes future collaborators

VALA

VALA

- How to understand and participate on a project with relatively large code bases
- Software maintenance and standards
- A practical experience into distributed software development

VICTORIA

VICTORIA

- Best practices for working on large code bases in a team
- How to quickly grasp a variety of new software tools and platforms
- The underappreciated opportunity that free software offers students to learn and grow

INVOLVING STUDENTS WITH FREE SOFTWARE

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HOW DO YOU GET STUDENTS INVOLVED WITH FREE SOFTWARE PROJECTS?

- Use it in the classroom (ie: tools like PLOM) and let the conversation start there
- Use grants to hire students for projects, for example we were funded
- Use your project as a candidate for a "capstone" course at your instituton

PLOM CLIENT: MARKING DEMO

AS EXPERIENCED BY GRADERS

www.plomgrading.org

Plom

THANK YOU FOR YOUR TIME!