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

We are undergraduate students at the University of British Columbia had the opportunity to contribute to PLOM during summer 2020 (and beyond)
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- Vala — Computer Engineering Student
- Victoria — Engineering Physics Student
CREATORS

PLOM was created by Andrew Rechnitzer and Colin Macdonald, professors of mathematics at UBC
IT TAKES A VILLAGE

THANKS (BASED ON THE “GIT LOG”)

5584 commits, 25537 lines of Python

Many thanks to the students (*) who have contributed!

Special notice:
CTLT Small TLEF
Noureddine Elouazizi
Clarence Ho
The Ha, et al @ Math IT
Sathish Gopalakrishnan
Eric Cytrynbaum

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

WHAT WERE COLIN AND ANDREW THINKING ...
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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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- 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:

![Image of website interface]

- 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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- Not cheap — you cannot buy the software, you pay per student
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CONCERNS ABOUT COMMERCIAL AND NON-FREE SOFTWARE...

- Not cheap — you cannot buy the software, you pay per student
- Commercial software solutions get student data
- Long and ambiguous agreements that don't protect privacy
SHARED QUESTIONS
Surely we can build it to give better feedback to students?
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- Surely we can build it to give better feedback to students?
- Surely we can protect student data?
SHARED QUESTIONS

- 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.
END OF 2018

PLOM USED IN 5 COURSES FOR ≈ 2500 PAPERS.

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
Andrew Rechnitzer
Colin B. Macdonald
(*) Elvis Cai
```

321 commits, 7421 lines of Python

(*) student contributors
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
- Source code and development is on a public git repository
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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
- how many to name, how many to print
- each question: what pages, max score, how to choose from sources
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BUILD AND PRINT PDFS (IN “THE BEFORE TIME”)
PLOM WORKFLOW: RUNNING A TEST

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

- in “The Before Time”: high-speed scanners, staple guillotine, etc
- use a dependable TA
- system sorts scans (from QR-codes and by reading hand-written student numbers)
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- marking can be done anywhere
- …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

- Plom handles production, distribution and reassembly
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**PLOM ADVANTAGES**

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![Diagram of interleaved versions](image)

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**IMPROVE QUALITY AND CONSISTENCY OF FEEDBACK**
- Marker client encourages rubric use and re-use
- Rubric sharing and filtering
JANUARY 2020

USAGE: 19 COURSES AND 10000 PAPERS.
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1860 commits, 15970 lines of Python

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... BUGS FOUND AND FIXED
SOMETHING HAPPENED
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IF YOU COULD MOVE YOUR CLASS ONLINE BY MONDAY, THAT'D BE GREAT
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ONLINE LECTURES

• Hackery and fun with green-screen and OBS Studio (another talk)
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ONLINE ASSESSMENT

• So many issues — focus on logistics
STUDENT INVOLVEMENT
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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
VICTORIA
VICTORIA

ADDED ADDITIONAL FUNCTIONALITY TO MARKING GUI
FRONT-END DOCUMENTATION & CODE CLEANUP
CURRENTLY: DEVELOPMENT OF POTENTIAL FUTURE WEB INTERFACE
ALL STUDENT INVOLVEMENT
ALL STUDENT INVOLVEMENT

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
EXPOSING STUDENTS TO FREE SOFTWARE

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**

- Understanding 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
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
IN Volving St udents With Free Software
INVolving STUDENTS WITH FREE SOFTWARE

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 institution
THANK YOU FOR YOUR TIME!