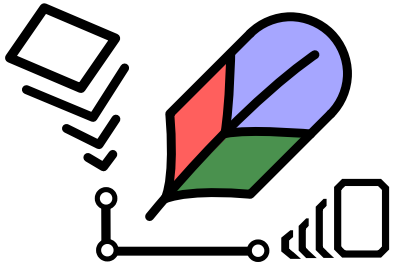

Plom

Paperless Open Marking

Plom is libre online marking

Science Education Open House — 28th April 2022

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Department of Mathematics

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

Plom (PaperLess Open Marking) is a system for large-scale marking by humans. It prepares QR-coded test papers, collates scanned work, and coordinates a team of graders.

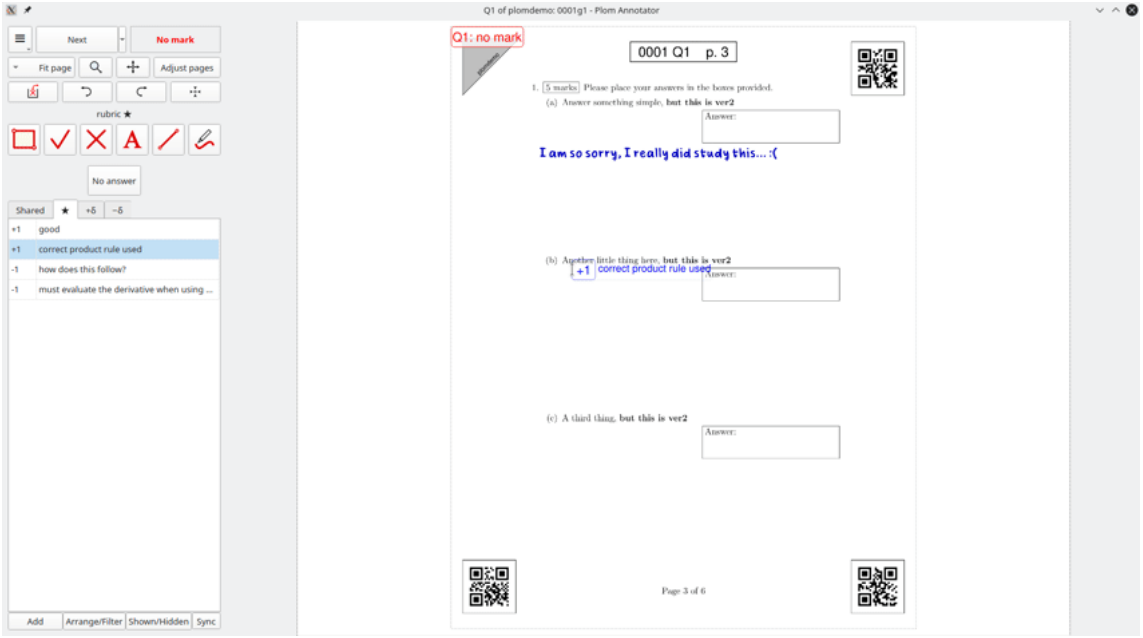
In this poster, we will briefly outline what we can do so far, how we currently support and host the software within the Mathematics Dept, and our plans for how to move forward.

What is Plom

Open-source software to support grading of hand-written work at scale

- Timely and better feedback for students
- Streamlined workflow for TAs — easier to leave feedback
- Test preparation, scanning, and return
- Pedagogical insights into grading practices and student learning
- All data kept locally — student privacy
- Some Canvas integration
- Developed by Mathematics@UBC

A sampling of rubrics



Each rubric is just a few clicks — so use good ones

Poor rubrics

- *"(-3) huh?"*
- *"(-2)"*
- *"(-1) error"*
- *"(+1) right idea"*
- *"(+3) good"*

Good rubrics

- *"(-3) must use int-by-parts"*
- *"(-2) wrong functions for int-by-parts"*
- *"(-1) need chain-rule here not product-rule"*
- *"(-1) right idea but check arithmetic"*
- *"(+3) all solution steps correct"*

Plom workflow

Before the test

-  Instructor builds source-versions of test
-  Instructor edits test-specification file
  - Which pages are which
  - How much each question is worth
  - How many tests to print
-  Plom-TA launches a server
-  Plom-TA builds test PDFs and shares on owncloud
-  Print and staple

Plom workflow

Before marking

-  Plom-TA makes accounts and sends to TAs
-  TAs download and install client
-  (optional) TAs play on demo-server
-  Collect and scan papers
-  Plom-TA uploads to server

Plom workflow

After marking

-  Plom-TA compiles spreadsheet
-  Plom-TA reassembles papers
-  Instructor checks things
-  Instructor creates Canvas Assignment, generates Canvas API key
-  Plom-TA uploads to Canvas
-  Marked midterm & solutions delivered to inbox

Unsolicited feedback from students

Test returned in 36 hours to 680 students during pandemic

- *Moreover, the feedback/exam marking is detailed and fair and they provide personalised solutions.*
- *This course is definitely amazing for returning results back so fast. Huge props to the profs and TAs for putting this much effort into getting results and feedback back to students in a timely manner.*
- *The TA's are cracked WTF. I am seriously impressed. Bruhhhhh my other online class hasn't even given us our Sept quiz back lmaoooo.*

Feedback from experienced user

- *The main advantages... better logistics and bookkeeping in the marking stage at the cost of frontloaded work in setting up.*
- *... the benefit scales with the number of graders and students. I find that even for a single section course of average size (60+) the balance is for online marking.*
- *There [is] a learning curve for graders (very simple) and for setting up the system. The latter is tricky partly since Plom is still being developed, so the workflow changes each semester.*
- *A bonus of active development is that any issues that come up are dealt with quickly...*
- *Most features I ask for end up being implemented.*

Three part plan to ease Plom admin

- Train Plom-admin team
  -  — trained team of 3 maths-grad students
  -  — up and running in 2021W1
  -  — ran 15 courses, 33 assessments, ≅8k students, ≅16k papers
- Get a TLEF grant and hire developers
  -  — Large TLEF starting April
  -  — Developer hiring in progress
  -  — Build web-app alternatives to command-line components
- Consult widely
  -  like right now!

Data and pedagogy

Plom as pedagogical data tool

-  — Plom sits between paper and the TA
-  — collects pedagogical information automatically
-  — all data stays local

Data idea 1: Rubric analysis

- Plom knows all rubrics applied to all tests
- Easy* to compute:
  - histogram of rubrics for each question
  - correlations between rubrics
- Instructor can use that data in post-test discussions with class
- Compile *"good"* and *"bad"* rubric examples** for TA training***
  - *"(+1) log-diff: used logarithmic differentiation, but applied it incorrectly"*
  - *"(-2) function is not continuous on this interval. Incorrect use of IVT"*
  - *"(+1) method good"*
  - *"(-2) major error"*
  - *"(-1) error"*
- What else? — ideas welcome!

- *interface needs work
- **real rubrics
- ***potentially use in 2022W1 training

Data idea 2: Personalised feedback

- Plom already gives individualised solutions — matches (q,v) for each student
- Plom knows which rubrics given to each student
- Instructor assigns* messages to most common rubrics for each question

> *"(-2) function is not continuous on this interval. Incorrect use of IVT"*
> *Please revise Section 1.6 esp the IVT examples.*

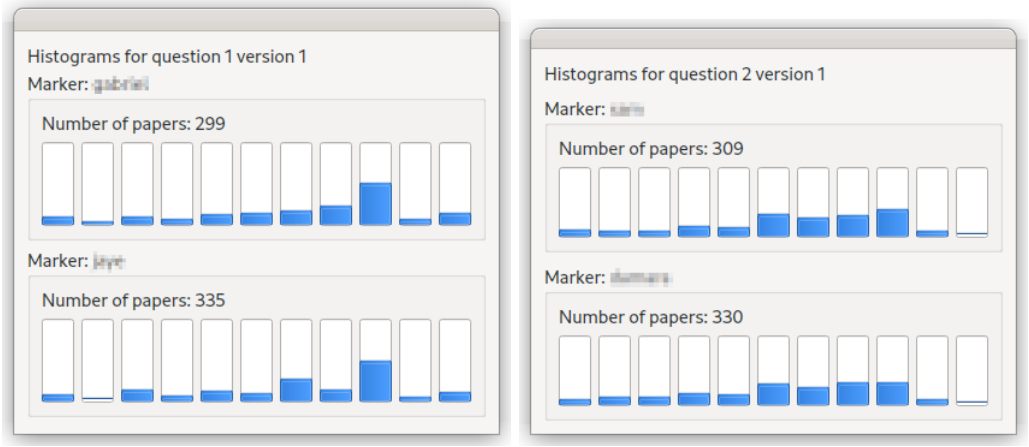
> *"(+1) log-diff: used logarithmic differentiation, but applied it incorrectly"*
> *Please revise Section 2.10.2 and exercises 10-16*

- Plom then sends individualised messages via OnTask**
- What else? — ideas welcome!

- *interface needed
- **or Canvas or ...

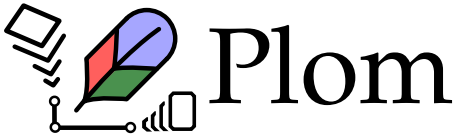
Data idea 3: Marking consistency

- Ensure consistent marking in large courses with many TAs
- Real example — Samir, Sybil, Talia and Trent* marked m253 midterm
  - Samir & Sybil marked Q1 together in same room
  - Talia & Trent marked Q2 remotely, communicated by phone/chat
  - Each groups created their own rubrics
- Mark histograms very similar within each question**



- Very hard to track consistency in tradition marking workflow
- Can mark/rubric data provide early inconsistency*** detection
- What else? — ideas welcome!

- *real data, not real names
- **not between questions
- ***marker or version, before student complaints



It takes a village

```
# git log --format="%aN" | sort -u
```

```
    Andreas Buttenschoen
    Andrew Rechnitzer
    Colin B. Macdonald
(*) Dryden Wiebe
(*) Elizabeth Xiao
(*) Elvis Cai
    Elyse Yeager
(*) Forest Kobayashi
(*) Jalal Khouhak
(*) Jed Yeo
    Jenny Li
(*) Joey Shi
    John Hsu
    Philip Loewen
    Kevin Macdonald
(*) Liam Yih
    Matthew Coles
    Michael Zhang
(*) Morgan Arnold
(*) Nicholas Lai
    Omer Angel
    ovari1
(*) Peter Lee
(*) Vala Vakilian
(*) Victoria Schuster
    Vinayak Vatsal
```

```
9030 commits, 29729 lines of Python

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

Special notice:

  CTLT Small TLEF (and soon Large)
  Noureddine Elouazizi
  Ashley Welsh
  Clarence Ho
  The Ha, et al @ Maths IT
  Sathish Gopalakrishnan
  Eric Cytrynbaum
  Cinda Heeren
```

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