

Teaching with Version Control

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"FINAL".doc



FINAL.doc!



FINAL_rev.2.doc



FINAL_rev.6.COMMENTS.doc



FINAL_rev.8.comments5.
CORRECTIONS.doc



FINAL_rev.18.comments7.
corrections9.MORE.30.doc



FINAL_rev.22.comments49.
corrections.10.#@\$%WHYDID
ICOMETOGRADSCHOOL?????.doc

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Students must be taught to use version control.

The sooner the better.

e.g. in first programming course,
and used regularly in later courses

Benefits:

- For their own work
- To ease building on their work
- To contribute to software projects

Useful far beyond programming...

- Writing papers, proposals, etc.
- Collaborating on slides, posters, etc.

Important component to increase “reproducibility” in CSE...

Ability to determine exactly how scientific results were obtained.

- Basis of scientific method.
- Required for confidently building on past results.
- Critical for accountability in engineering analysis / decision making.

Standards and best practices in computational/data science are not yet well codified.

- **Experimental science:** Lab notebooks, methodology section of publications, etc.

Increasing interest in topic from funders, journals, public, ...

National Research Council workshop on

Statistical Challenges in Assessing and Fostering the
Reproducibility of Scientific Results

February 26-27, 2015

http://sites.nationalacademies.org/DEPS/BMSA/DEPS_153236

High Performance Scientific Computing [\[webpage\]](#)

2013: \approx 50 undergrads, 70 grad students (20 online)
+ **Coursera edition**

Topics:

- Git, bitbucket
- Python, IPython notebooks
- bash
- Makefiles
- Fortran 90
- OpenMP
- MPI

Git used to distribute course materials,
and for turning in all homeworks.

2014: “Flipped” the class using 2013 videos.

Two hours of lab sessions each week

Some problems:

- Git was often used only for submission
- Didn't work collaboratively
- Software stack:

2013: Used VirtualBox VM

2014: Used **SageMathCloud**

SageMathCloud™ – collaboratively use
Sage, IPython, LaTeX, and terminals in your
browser.



- **Mathematics:** use the best open source mathematics software (Sage, R, Octave, Python, Cylthon, GAP, Pari, Macaulay2, Singular, and more)
- **Edit:** collaboratively edit Sage worksheets, LaTeX documents and (Python) notebooks
- **Program:** write, compile, and run programs in most programming languages
- **Teach:** organize teaching a course
- **Backup:** all files automatically snapshotted every few minutes
- **Terminal:** full Linux account with color terminal
- **Collaborate:** over 30,000 monthly active users

Create a free account at: cloud.sagemath.com

Presentation by William Stein on March 10, 2015:

<http://uwescience.github.io/reproducible/presentations.html>

GitHub “organization”: <https://github.com/amath574w2015>

with private repositories `am574-student01`, etc.

and public repositories `am574-class`,
and `am574-group01`, etc.

See: GitHub for Education,

<https://education.github.com/>

am574-group03

Updated 15 hours ago

TeX 0 0

am574-group07

Updated 22 hours ago

HTML 0 0

am574-group08

Updated 2 days ago

Python 0 0

am574-group05

Updated 2 days ago

Matlab 0 0

am574-group04

Updated 2 days ago

HTML 0 0



Invite someone

Teams

Jump to a team

Owners

1 member · 33 repositories

group01

3 members · 1 repository

group02

3 members · 1 repository

Create new team

Peer review

For homework:

Used scripts to copy one file (e.g. IPython notebook) from each student's repo to a different one (some mapping)

Push to Github

Students pull, comment in notebook, push

Copy back (invert mapping), push comments

Other tools for peer review?

Aslak Bergersen, Hans Petter Langtangen:

<https://github.com/hplgit/virtual-classroom>

Group projects

Groups of 2 worked on projects for last few weeks.

- Collaborated via GitHub, learned to merge
- Facilitated peer review of code, reports, presentations (some via Issue Tracker)

Repositories contain all materials:

```
http://faculty.washington.edu/rjl/classes/  
am574w2015/project\_presentations.html
```

Course Project Presentations

Students will present [Course Projects](#) in two sessions:

Wednesday, March 11, 4:00 – 5:00pm

In 109 Q2B

4:20 – 4:25: Erinna Månster and Terrence Quill

- **TITLE:** Introduction to WENO Methods
- **ABSTRACT:** Examine the semi-oscillatory or ENO method (and its naturally associated success) at capturing shock discontinuities by devising the successful interpolating polynomial of degree k (depending on a so-called stencil) WENO method using a convex combination of the high-order polynomials at k stencils and their averages with the high-order stencil shocks and high-order accuracy for smooth data. We implement and test these schemes in one-dimensional hyperbolic equations such as the advection and Burgers equations with shocks. We will also include comparisons with CLWENO's results for semi-WENO schemes. We also plan to demonstrate the benefits of using Total Variation Diminishing (TVD) Runge-Kutta schemes versus traditional non-TVD integrators.
- **MATERIALS:** <https://www.youtube.com/watch?v=7MvA1...>

4:25 – 4:30: On the road and being wrong

- **TITLE:** Models of Traffic Flow with C^2 -continuous and non-convex Flow
- **ABSTRACT:** In the project, we investigate the models of traffic flow based on Lighthill-Whitham-Richards model. In the first part, we look into the C^2 -continuous flow via convexity, where the flow function is smoothness and C^2 -continuous. We analyze the behavior of C^2 -continuous in smooth case and discontinuity. We consider the convex flow to solve the Riemann problem, a numerical PDE solver such as HWENO and a C^2 solver of the following model are assigned respectively the regions. In the second part, the C^2 -following model of hyperbolic driving is explored. With or without capturing the derivatives, we could observe the behavior and stability of cells with uniform initial density.
- **MATERIALS:** <https://github.com/erinnam/2023/am574-projects>

4:40 – 5:00: Oliver Seeger and Brad Davis

- **TITLE:** Convergence of Two Second Order Traffic Flow Models
- **ABSTRACT:** While the Lighthill-Whitham-Richards traffic flow model behaves well macroscopically, it does not accurately

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Summary

- Version control can be incorporated into courses
- Teach collaboration too.
- Some class time must be invested
- Lots of other resources available, e.g.
help.github.com
www.clawpack.org/git_resources.html