Monday 4/8/24

At the RTG seminar,Cody Melcher will be presenting "Career Paths: Navigating Life Post Graduation." in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 4/1/24

At the RTG seminar,Jeff Mei will be presenting "Docker, Containerization, and Open Science." in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 3/25/24

At the RTG seminar, Parneet Gill will be presenting "Mastering Citations: A Guide to Reference Managers." in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 3/18/24

At the RTG seminar, Brian Toner will be presenting "Reproducibility and Open Research." in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 3/11/24

At the RTG seminar, Kevin Lin will be presenting "Why and how to release software." in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 2/26/24

At the RTG seminar, Criston Hyett will be presenting "Leveraging version control to accelerate research." in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 2/19/24

At the RTG seminar, we will host a brainstorming session for the RTG Showcase that will take place later this semester. Everyone is welcome to attend and share their thoughts!

Monday 2/12/24

At the RTG seminar, Joseph and Kevin will be presenting "A Brief Introduction to Lean." in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 2/5/24

At the RTG seminar, Andrew Arnold and Maxwell Thurm will be presenting "Assembling a knowledge network: Note-taking and reference-managing for your dissertation and beyond." in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 1/29/24

At the RTG seminar, Laura Miller will present on "How to Use ChatGPT to Increase Productivity." in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 12/11/23

At the RTG seminar, Alexa Aucoin will present on “Neural Networks” in MATH 402 and via Zoom (Starting at 1:00PM).

Monday 12/04/23

At the RTG seminar, Parneet Gill will present on “ChatGPT and Its Use” in MATH 402 (Starting at 1:00PM).

Monday 11/27/23

At the RTG seminar, John Park will present on “Topological Data Analysis” in MATH 402 (Starting at 1:00PM).

Monday 11/20/23

At the RTG seminar, Rebekah Saucier and Shay Gilpin will present on “Data Assimilation” in MATH 402 (Starting at 1:00PM).

Monday 11/13/23

At the RTG seminar, Jeffrey Mei will present on “Data Structures” in MATH 402 (Starting at 1:00PM).

Monday 11/06/23

At the RTG seminar, Xiaolong Zhang will present on “Natural Language Processing - Topic Modelling” in MATH 402 (Starting at 1:00PM).

Monday 10/30/23

At the RTG seminar, Brian Toner will present on “Generative Models in Machine Learning” in MATH 402 (Starting at 1:00PM).

Monday 10/23/23

At the RTG seminar, Robert Ferrando will present on “Intro to Machine Learning through the Lens of Gaussian Process” in MATH 402 (Starting at 1:00PM).

Monday 10/16/23

At the RTG seminar, Prof. Kevin Lin will discuss about “Git / version control” in MATH 402 (Starting at 1:00PM).

Monday 10/9/23

At the RTG seminar, Addie Harrison will present on “High Performance Computing (HPC)” in MATH 402.

Monday 12/6/21

The RTG students will give informal flash presentations in ENR2 N604. Please come for some much needed in person interactions!

Monday 11/29/21

The RTG group will meet in person for an informal social hour in ENR2 N604. Please come for some much needed in person socializing with students, faculty and postdocs. Refreshments will be served!

Tuesday 3/16/21

Laura Miller will discuss “The importance of developing a daily writing habit.” The is the first of three meetings devoted to scientific writing.

Wednesday 3/10/21

Data Driven Discovery Showcase! More notes to come soon.

Monday 3/1/21

At 11am on Monday 3/1/21, RTG graduate trainees will speak in the **Graduate Recruitment Workshop**:

Title	Speaker	Program
Overview of RTG	Kevin Lin	Mathematics
Adversarial Attacks against Neural Networks	Brian Bell	Applied Math
Carvana Market Launch Sales Predictive Model	Liyun Zeng	Statistics
Neural networks for spatiotemporal spike data	Alexa Aucoin	Applied Math
Reduced Lagrangian models for turbulence	Michael Woodward	Applied Math

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Tuesday 2/26/21
Notes by Kevin Lin

On Wednesday March 10, 2021, the RTG will be hosting a Showcase! Members of the UA community are invited to attend.

Tuesday 2/23/21
Notes by Kevin Lin

Christian Parkinson led a live demo of Flux.jl, a scientific machine learning library for Julia. Here is Christian’s notebook.

Tuesday 2/16/21
Notes by Kevin Lin

Michael Woodward led a live demo of Zygote.jl, a framework for differentiable programming in Julia. Michael’s sample code can be found here.

Tuesday 2/9/21
Notes by Kevin Lin
David Sanders continued discussion Julia for scientific computing, this time introducing Julia’s type system and type-dispatch, and using it to implement a simple automatic differentiation system. Here is David’ notebook. You can also check out my implementation here, which differs from David’s in detail but is similar in spirit. The files are also in a GitHub repo.

Tuesday 2/2/21
Notes by Kevin Lin
David Sanders spoke on an introduction to Julia for scientific computing. This is the first in a short series of meetings to introduce people to the Julia programming environment; what distinguishes it from frameworks like Python, R, and Matlab; and its use in scientific computing, machine learning, and related topics.

David used Newton method and root finding as his example. The live-coding session uses Julia with Pluto notebooks. David's Pluto notebook is here. You may also be interested in the following resources, on which David's talk is based:

https://github.com/dpsanders/hands_on_julia

https://github.com/dpsanders/intermediate_julia_2019

A recording is available upon request.

Tuesday 12/15/20

Notes by Kevin Lin

Today, we discussed how model reduction for high-dimensional chaotic systems can be viewed as a linear regression problem, and how it connects to the theory of Wiener filtering. We also discussed some issues that arise:

1. Conditioning (in the context of earlier discussions on linear regression)
2. Stability and generalizability

Notes here.

Tuesday 12/08/20

Notes by Kevin Lin

Today, we discussed (at a high level) stationary processes and Wiener filters, and how the latter can be viewed as an extension of linear regression. Notes here.

Tuesday 12/01/20

Notes by Kevin Lin

Today, I gave a conceptual overview of condition numbers, the singular value decomposition (SVD), and why it's so useful in least squares problems. Here are the notes. Next week, I'll try to tie it all up with model reduction.

Tuesday 11/24/20

Notes by Kevin Lin

I introduced the goals of data driven model reduction, using the Kuramoto-Sivashinsky PDE as an example. (Here are my slides and board notes.)This is meant to motivate a discussion of *linear* regression techniques in data driven modeling and model reduction for *nonlinear* dynamical systems, particularly those that are chaotic and/or stochastic. In the remaining meetings of this term, I'll talk about what these approaches can do, and discuss their limitations and open questions. Next semester, we will discuss other machine learning methods under intense study in the context of data driven modeling of nonlinear dynamical systems, e.g., artificial neural networks.

Tuesday 11/17/20

Notes by Kevin Lin

Today we discussed last Friday's Applied Math Colloquium by Peter Behroozi. Specifically:

- I gave a very high level introduction to Markov chain Monte Carlo on continuous spaces.
- Peter kindly stopped by for a discussion of his Searchlight algorithm.

Introductory references on Monte Carlo:

- A Conceptual Introduction to Hamiltonian Monte Carlo by Michael Betancourt
- Introduction to Monte Carlo method by David MacKay

Tuesday 11/3/20

Notes by Kevin Lin

Brian Bell demonstrated his research work flow. Key points:

- *Test-driven research.* Organizing code around well-defined tasks that process data and produce well-defined results.

- *Human-readable output.* When a piece of code is run, say to analyze a dataset and produce summary statistics, these are printed in human-readable rich-text file (Brian uses Markdown), which is *checked directly back into the git repo itself*.

Brian also keeps associated figure files in the repo, though whether one should keep binary files in git repos is the subject of some debate.

Tuesday 10/27/20

Notes by Kevin Lin

Marek Rychlik gave a tutorial on GitHub actions, and using this feature to automate tasks like running unit tests. Here is an example project accompanying the tutorial.

Tuesday 10/13/20

Notes by Kevin Lin

Today, after a brief spiel about how nice it is to be able to time travel, Brian Bell and I presented a tutorial on basic git usage, based on the git-novice lesson from Software Carpentry. We covered most of the following:

3. Creating a Repository
4. Tracking Changes
5. Exploring History (about half of this, skipping the part about “detached HEAD”)
7. Remotes in GitHub

We plan to continue next time with a discussion of conflict resolution and branches.

Also, some advice (very much biased by our views):

1. Treat “commit” like “save” in your favorite word processor: commit often!
2. Think carefully before putting binary files (e.g., figures) into a git repository. This is a topic we may discuss another time. You may also want to read #6: Ignoring Things.
3. Do not try to sync a git repository by Dropbox or Google Drive or Box.

Saturday 10/1/20

Notes by Kevin Lin

For next Tuesday’s meeting, Brian Bell and I will present a tutorial on basic git usage, based on git-novice from Software Carpentry. There will be a live demo. You may want to first install git and get a GitHub account.

Tuesday 10/6/20

Notes by Kevin Lin

Today, Christian Parkinson presented his work with on modeling deforestation. This work is documented in

> D. J. Arnold, D. Fernandez, R. Jia, C. Parkinson, D. Tonne, Y. Yaniv, A. L. Bertozzi, and S. J. Osher, Modeling Environmental Crime in Protected Areas Using the Level Set Method, *SIAM Journal on Applied Mathematics* **79** (2019); doi:10.1137/18M1205339; arxiv preprint

This project combines geographical data with numerical PDE methods to develop practical strategies for minimizing the impact of criminal activity on forests. After briefly describing the work, Christian then assesses the software aspects of his project in the context of the ten simple rules.

Tuesday 9/29/20

Notes by Kevin Lin

Today, Laura Miller presented her paper

> Samson, J.E., Miller, L.A. Collective Pulsing in Xeniid Corals: Part II—Using Computational Fluid Dynamics to Determine if There are Benefits to Coordinated Pulsing. *Bull Math Biol* **82,** 67 (2020). https://doi.org/10.1007/s11538-020-00741-y

This is a CFD project involving fluid-structure interaction, using the IBAMR library developed by Boyce Griffith. A complicated project with a fair number of dependencies.

After giving a brief presentation about this work, she went through most of the 10 simple rules from last week and discussed them in this context.

Tuesday 9/22/20
Notes by Kevin Lin
Today we're discussing

> Sandve, Nekrutenko, Taylor, and Hovig, "Ten Simple Rules for Reproducible Computational Research," PLOS Computational Biology **9** (2013) doi:10.1371/journal.pcbi.1003285

Questions to think about:

1. What problems are addressed by these rules? (Think about last week's paper, and about your own work.)
2. What problems are not addressed by these rules?
3. Are they practical? Can you think of situations where the rules are hard to follow?

Tuesday 9/15/20
Notes by Kevin Lin
Today we're discussing

> Mesnard and Barba, "Reproducible and replicable CFD: it's harder than you think," *Computing in Science & Engineering* **19** (2017) doi:10.1109/MCSE.2017.3151254

Questions to think about:

1. What does it mean for numerical results to be reproducible? Why is this a desirable goal? (Is it?)
2. Do you think you can run your code a month from now? a year? 10 years? Can you think of any reasons you might want to be able to do this?
3. What's analogous to "meshing and boundary conditions" in your area? What's analogous to "linear algebra libraries"?
4. Do you depend on other people's research code?
5. Do you know how your code behaves with different optimizations, on different machines, in different floating point precisions?
6. What other problems can you think of?
7. In general, how reproducible is your work?

Note: in hindsight this is too much to try to discuss in one hour, especially on Zoom and without more structure. We'll try a slightly different format next week.