

v2024 QuarkNet Coding Camp 2

Time: Sunday, July 21 - Friday, July 26

We will share our work on the [CC2 group document](#)

Coding Fellows

Megan Alvord (ms.mealvord@gmail.com), Virtual QuarkNet Center (North Carolina)

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Kayla Mitchell (kayla.mitchell@aps.edu), New Mexico QuarkNet Center

Tracie Schroeder (bravesearth@gmail.com), Kansas QuarkNet Center

Participants

1. Peter Apps
2. Shelley Bullard
3. Jim Deane
4. Gerry Gagnon
5. Marla Glover
6. Emily Gwin
7. Jodi Hansen
8. Mark Hermano
9. Monica LopezdeVictoria
10. Tiffany Madison
11. Felix Nieves-Morales
12. Coralís Ortiz
13. Charlie Payne
14. Mike Plucinski
15. Nicole Preiser
16. Vandhana Ramachandran
17. Emily Rosen
18. Jeremy Smith
19. Rob Sullivan
20. Jeremy Wegner
21. Jason Williamson

Welcome!

Thanks for wanting to spend a week of your precious summer with us. In return, we'll do our best to give you a truly valuable experience learning how to enrich your courses with coding and particle physics.

QuarkNet's Coding Camp 2 is a one-week workshop for teachers of high school physics and related topics to gain in-depth experience with fundamental computer programming skills and applications. Particle physics is used as the context for these learning experiences where teachers practice analyzing and visualizing data from high energy experiments with spreadsheets and python notebooks. Coding Camp 2 builds on teachers' prior exposure to programming through QuarkNet's Data Camp and Coding Camp 1 and broader professional development in particle physics, data science, and computational modeling.

Hotel: [Residence Inn Warrentville](#)

Participants List

Vandhana Palliyarikkah Ramachandran - New Mexico QuarkNet Center

Jason Williamson - Rice University QuarkNet Center

Rob Sullivan - Rice University QuarkNet Center

Shelley Bullard - University of Florida QuarkNet Center

Monica Lopez De Victoria- UPRM QuarkNet Center

Felix Nieve - UPRM, QuarkNet Center

Coralis Pagan - UPRM QuarkNet Center

Agenda

Sunday, July 21

- Plan on arriving at the hotel by 6pm. Communicate with Tiffany (info above) if you're having trouble and we'll get it sorted.
- 7pm meet in Residence Inn conference room or outside if the weather is good, short check in meeting
 - Icebreaker activity
 - Determine the local magnitude and direction of the Earth's magnetic field. There are several good, free apps for this. [PhyPhox](#) is great if you don't have one already.
 - Fellows Icebreaker activity
 - Share any coding activities you have used and discuss how you'd continue to use them or change them

- Light Dinner (around 8pm)
 - Pizza, vegetables, snacks

Monday, July 22

9AM meet in Residence Inn lobby to travel to Fermilab

- Get into carpool groups
 - [Driving directions](#) from the hotel to Fermilab Wilson Hall (the tall bldg, locals just call it “the highrise”). You’ll need to enter this direction through the East Gate on Day One to get the business visitor badge from the guard at the gate. **Have your QR code and ID ready!**
- Head to Building 327. [Here’s a map](#). From Wilson Hall heading east, it’s the last building on the left. We held Data Camp there for the past ~5 years, if it looks familiar.

9am-11:45am at Fermilab

- Welcome!
 - Have everyone introduce themselves
 - Structure of the week
 - student-hat: early in the learning cycle, this is for you to learn new things, some will be beyond what you’d have your students do
[QuarkNet Github](#)
Review the [Intro to Colab](#) activity from Coding Camp 1
 - teacher-hat: later in the learning cycle, apply what you’ve learned to design a lesson for your course
[BSCS 5E Learning Cycle](#)
 - Safety, bathrooms, coffee, shoes, lunch
- Begin student-hat activities in groups of 3 or 4
 - Discuss in your groups before beginning
 - *What helps make data visualization effective?*
 - *What tools have you used to make data visualizations in your class(es)?*
 - *What are their pros & cons?*
 - [Data Viz notebook](#): Plot a function with linspace and customize plots with pyplot and mpl’s object-oriented interface.
 - [Users guide — Matplotlib 3.5.2 documentation](#)
 - Reflect on data visualization with these questions for discussion in your groups
 - *What’s useful from [Same graph, different narratives](#) from Betterposters*
 - *How about [Salvaging the Pie](#) from DarkHorse Analytics?*
 - [Anscombe’s quartet](#)
 - [Datasaurus Dozen](#)
 - Finished early or want more? Investigate the code behind [these plots](#) from Son of a Corner.
 - Importing outside data sets [Colab notebook](#)

11:45am walk to lunch at Wilson Hall Cafeteria

Tip: Check out the menu and order online on your way to the cafeteria to skip the line!
<https://www.clover.com/online-ordering/fermilab-caf---taher-batavia>

The Clover app is also available if you want to order via phone. Look for the FERMILAB CAFE - TAHER

12:45pm walk back to Building 327

- Complete Data Viz

2:30pm Guest speaker Dr. Sudhir Malik, UPRM, CERN

3:30pm Share out

- Add your colab links to our [CC2 group document](#)
- Share a short gem or two from the conversations you had relating to data visualization today

4:30pm Wrap up

- Do the [daily feedback form](#) before you leave
- Dinner suggestions, optional

Around 5pm Leave Fermilab for Residence Inn

Tuesday, July 23

9:00am meet in hotel lobby to drive to Fermilab

9:30am Building 327 at Fermilab

- Drop a read-only link to your data visualization Colab in this document if you didn't yesterday: [Share Out](#)
 - Some folks have tips, advice, or activities to share that would benefit everyone, if you want to add your ideas to the same document, different tab, we'll set aside time on Thursday specifically for intergroup sharing
- More student-hat time: focus on [B Field Variation notebook](#) (make a copy in your own Gdrive)
 - For first timers - Does the magnetic field around your workspace have the same magnitude as outside? (follow the notebook and use [Holmes Statistics Summary](#) when you get to that part. Numpy has a handy `np.std()` function)
 - Finished early or want more? Gather more data from areas that you think should have different B field results and compare. Compare your results with others and see if they change when you aggregate data.

- For returners - find your notebook from last time and review the [Holmes Statistics Summary](#). Then explore how you could repeat the process with a different phyphox or physics toolbox sensor. Then do it! Partner work is encouraged
- Looking for a greater challenge? Try Fitting by the Method of Weighted Least-Squares from [Holmes Statistics Summary](#) starting on page 4.
- Other helpful resources
 - [Getting your data from PhyPhox to Colab](#) or [General Reading in from a file](#)

12 pm Lunch at Wilson cafeteria

<https://www.clover.com/online-ordering/fermilab-caf---taher-batavia>

[FermiLab Tour](#)

Return to Building 327 at Fermilab

- More student-hat time
 - Finish up the t' test activity comparing magnetic fields in 2 locations
 - Further discussion on stats: [Holmes Statistics Summary](#)
 - How much stats should we include in physics labs or classes overall?
 - Upload your completed activity as view only in the [Share Out](#) document

2:30pm Guest speaker [Dr. Sergei Gleyzer, University of Alabama](#)

Dr. Sergei Gleyzer, Associate Professor, Department of Physics & Astronomy, Director of the UA Data Science Laboratory and Alabama Center for Advancement of Artificial Intelligence. Dr. Sergei Gleyzer has been an integral part of the team that discovered the Higgs boson in 2012. His research interests include novel approaches to physics analysis, particle and event identification, detector reconstruction, simulation and particle physics triggering systems. Dr. Gleyzer works on the development of artificial intelligence techniques for new physics, including searches for rare decays of the Higgs boson and dark matter using the data collected by the Compact Muon Solenoid (CMS) experiment. He is the founder of the Inter-experimental LHC Machine Learning (IML) Working Group, the CMS Experiment's Machine Learning Forum and the Machine Learning for Science (ML4SCI) organization.

3:30pm Wrap up B Field

- Cosmic Ray Detector with Jim Deane
 - [Resources for Cosmic Ray Analysis](#)
 - Do you want a cosmic ray detector for your classroom? Contact Mark Adams

QuarkNet Cosmic Ray Coordinator
Email adams@fnal.gov

- Review and sum up [B Field Variation notebook](#) in groups
 - Learn how one person interpreted each line of pseudocode
 - If you would like to compare your data analysis to the official readings from NOAA: <https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml?#igrfwmm>
 - Extra time? Start the final notebook on [Model Fitting with Muon Tracks](#)
 - Do the [daily feedback form](#) before you leave
 - [Glowscript tutorials](#) from Jim Deane
 - Leave Fermilab around 5pm
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Wednesday, July 24

8:30am meet in hotel lobby to drive to Fermilab

9am Building 327 at Fermilab

9:15-9:30 [Brief overview of particle physics](#) with a focus on muons and muon tracks

9:30-10am Working in building 327 at Fermilab

- More student-hat time, try out another activity even if you haven't finished previous activities
- Start notebook on [Model Fitting with Muon Tracks](#) (under the Coding Camp 2 tab)
- This is meant to be a partner or group activity, feel free to discuss both the coding and the physics

10am DEI Discussion with Adam LaMee adamlamee@gmail.com , Lead on [PhysTEC at APS](#) ([zoom link](#))

- Why should kids take physics in high school? See some resources [here](#).
- [Future Physicists of Florida](#) has materials for students and parents/guardians
- [STEP-UP program](#) and their [great classroom norms poster](#)
- Videos
 - [Byte-sized DEI](#) short videos from the [Alliance for Identity-Inclusive Computing Education \(AIICE\)](#)
 - [Coded Bias](#) documentary on ethical concerns in AI
- Books
 - [The Disordered Cosmos](#) by [Dr. Chanda Prescod-Weinstein](#)

- [Algorithms of Oppression](#) by [Dr. Safiya Noble](#)
- [Invisible Women](#) by [Caroline Criado Perez](#)
- [Viral Justice](#) by [Dr. Ruha Benjamin](#)
- [Unapologetically Dope: Lessons for Black Women and Girls on Surviving and Thriving in the Tech Field](#) by [Dr. Nicki Washington](#)
- On the web
 - Dr. Chanda Prescod-Weinstein: [site](#) [mastodon](#) [twitter](#)
 - Dr. Timnit Gebru: [site](#) [mastodon](#) [twitter](#)
 - Dr. Margaret Mitchell: [site](#) [mastodon](#) [twitter](#)
 - Dr. Alex Hanna: [site](#) [mastodon](#) [twitter](#)
 - Dr. Nicki Washington: [site](#) [mastodon](#) [twitter](#)
 - Caroline Criado Perez [site](#) [twitter](#)
 - Dr. Safiya Noble: [site](#) [mastodon](#) [twitter](#)
 - Dr. Ruha Benjamin: [site](#) [mastodon](#) [twitter](#)
 - DAIR, Distributed AI Research: [site](#) [mastodon](#) [twitter](#)
- Looking to create a Mastodon account? Here's how:
 - It's sort of like email where you have an account with some host (like gmail or outlook) and can communicate with others on different hosts. There are even ways to move to a different host and keep your account, if you ever need to.
 - The host (or 'instance') you choose will have its own rules for discourse and what gets through from other instances. I'm on [Hachyderm.io](#). It's an instance run by a wonderful group of mostly LGBTQ+ programmers and they filter lots of harmful instances with hate speech so my feed is way more pleasant than on other instances or platforms (like Twitter or facebook).
 - Many use a web browser to view it, even on mobile. There are some mobile apps, too.
 - Cool things about Mastodon:
 - it's free
 - your feed is only based on who you're following, what they post (toot), and what they 'boost' (share another's post). 'Liking' a toot only notifies the author and doesn't affect the post's visibility or priority.
 - There's no ads or algorithm that feeds you content it thinks you should see.
 - DMs and replies appear in your feed with everything else, but aren't visible to the public.
 - you can follow hashtags, like #iteachphysics

10:30am Continue [Model Fitting with Muon Tracks](#)

11:30am Lunch: [Fermilab Cafeteria](#)

Group Picture! [Folder with pictures](#)

1pm Reconvene in 327

Continue working on [Model Fitting with Muon Tracks](#)

For an extra challenge, try the [Model Fitting with Muon Tracks Machine Learning](#)

Additional Colab example files:

[Energy Lab](#) (student)

[Energy Lab](#) (teacher)

[Pendulum](#) draft(!)

2:30pm Guest Speaker [Dr Aleksandra M. Ciprijanovic](#), Wilson Fellow Associate Scientist at the Data Science, Simulation, and Learning Division at Fermi National Accelerator Laboratory, also leading the Cosmic AI group

Aleksandra is a Wilson Fellow Associate Scientist at the Data Science, Simulation, and Learning Division at Fermi National Accelerator Laboratory and is also leading the Cosmic AI group. Before moving to Fermilab, she was an Assistant Research Professor at the University of Belgrade, Serbia, and the Mathematical Institute, Serbian Academy of Sciences and Arts. She is interested in the formation and evolution of structures in the Universe - from galaxies and galaxy clusters to large-scale structures. Her work focuses on advancing and building trustworthy and robust AI algorithms that will allow us to fully utilize all available data in the era of large astronomical surveys.

Resources and presentation share by Dra.Aleksandra:

- <https://drive.google.com/file/d/1sIMJiopqaIE3bSOIkCgISd6eINdVUt6F/view?usp=sharing>
- https://github.com/BNL-Fermilab-RENEW/tutorials_2024

[Deep Skies](#)

[Hello Universe](#)

[Galaxy zoo](#)

3:30pm

Wherever you are in the [Model Fitting with Muon Tracks](#) activity, stop and share something you learned with someone near you. Share a question you still have.

Share your draft or complete version in view only format in the [Share Out](#) document

4pm Do items 1 & 2 on the [QuarkNet must-do page](#)

- We'll omit items 3 & 5 and save item 4 (surveys) for Friday AM
- Do the [daily feedback form](#) before you leave

Leave Fermilab around 4:30pm

Thursday, July 25

8:30am meet in hotel lobby to drive to Fermilab

9am Building 327 at Fermilab

- Review [Share Out](#) document and add any links you still have
- Questions and thoughts from yesterday? Any questions on the muon tracks activity or the machine learning extension?

Switch from *student-hat* to *teacher-hat*.

- Reevaluate the 3 activities you've worked on with your teacher hat on
 - How would you see this working in your class?
 - How would you change it?
- Teacher-hat time
 - How do you envision incorporating something you learned this week into your classes?
 - Discuss ideas with other teachers and share
 - Start developing your implementation plan
- Some ideas from the [Coding GitHub repository](#)
 - [Earthquakes](#)
 - [Sun Position](#)
 - [Elements](#)
 - [Word Analysis](#)

10:30am Megan Alvord: Using GitHub

- Discussion on data storage: [Github](#), [A tutorial](#) (1 hour)
- Walkthrough activities <https://hylandtechoutreach.github.io/teaching-with-git/>
- Fantastic resource - <https://www.markdowntutorial.com/>
- How do you use Github or how would you like to use it?

How we currently store resources - [QuarkNet Github](#)

Some other things

- [Svaha teacher discount](#)
- [Muon Collider Shop](#)
- [Physicists for Inclusion in Science](#)
- [Fermilab Natural Areas](#) - Bison shirts!
- Forget something from the Fermilab store? They have an [online store](#) too
- [Megan Lee](#) on Etsy has science stickers and shirts (ex. [women in science sticker pack](#))

Thank you notes!

Lunch: 11:30-12:30

<https://www.clover.com/online-ordering/fermilab-caf---taher-batavia>

- [Art Gallery Tour](#)

12:45pm Building 327

- Share your draft implementation plan with your group ([Share Out](#))
 - Spend about 5 min sharing/explaining/letting them try it out

2:30pm [Guillermo Fidalgo](#), doctoral student at Alabama University, High Energy Physics, specializes in Machine Learning and Shera Sharma UPRM PostDoc

[Presentation](#)

3:30pm Building 327

- Plan for sharing something you've worked on, something you've done, a coding tip or a good idea you have in the [Share Out](#) document for Friday morning
- Add a link to your implementation plan in the [Share Out](#) document
- Do the [daily feedback form](#) before you leave
- Leave Fermilab around 4:30pm

Friday, July 26

8:30am meet in hotel lobby to drive to Fermilab

9am Building 327 at Fermilab

- Complete implementation plans and share links on the [Share Out](#) document, last tab!
- Work with each other to review, help edit, help with roadblocks, etc.

11:15am Lunch at [Cafeteria](#)

12:30 leave for Building 327

1:00pm Final Sharing

- [Share Out](#) !
- Show your activity to the group and walk through w/ discussion, between 3-5 minutes - timer will go off at 5 minutes!

3pm Final Logistics and Wrap Up

- [Workshop Evaluation](#) When you submit it, you will get a link to a form you can download and fill out to turn in to your district for credit.
- [Survey](#) from Spencer's office
- Complete item 1 and item 3 on the [QuarkNet must-do page](#)
 - 1) Registration - follow the link on the above page

- 3) Annual QuarkNet Survey - some need the full, some need the express, there's also a Spanish language version, use whatever link you need
- Send gas, rental car, travel expenses to [Anne Zakas](#).

Colab tip from Google Support: [Notice template for schools when gathering parent or guardian consent](#)

[Colab parent/guardian permission request sample](#), generated by ChatGPT

Graduate credit is available through St Francis University

<https://myusf.stfrancis.edu/portal/real/browse/202330?c=24>

- You should register for REAL-696-I (QuarkNet Coding II)
- Once you register, you should receive confirmation from St Francis

Travel Information

Chatgpt introduction for Megan:

Introducing Megan: A Physics Educator Extraordinaire

With over a decade of experience teaching all levels of physics, including computational physics, Megan has become a cornerstone of the North Carolina education community. Currently shaping young minds at the North Carolina School of Science and Mathematics, she also dedicates her time to coaching the swim team and organizing teaching assistants. Megan's coding journey began in college with Java and HTML, and she has since expanded her expertise to include teaching the MIT App Inventor at summer camps. Her favorite programming language is Python, and she particularly enjoys using Colab for its seamless integration with GitHub.

