

BHSU Quarknet at SURF Coding Workshop

Agenda

Objectives

Participating teachers will:

- Apply physics principles to reduce or explain the observations in data investigations.
 - Examine simulated and experimental data. Identify patterns within the data and consider the causes of those patterns.
 - Create, organize and interpret data plots; make claims based on evidence and provide explanations; identify data limitations.
 - Develop a plan for taking students from their current level of data use to subsequent levels using activities and/or ideas from the workshop.
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Wednesday, July 6th - Morning Session

9:00 Opening & Registration

- Welcome & introductions
- Registration (<https://forms.gle/VeuyjybWkgMvCUji6>) and create/login to Google account
- Update Quarknet Account (<https://quarknet.org/document/update-your-profile-quarknet-site>)

9:30 Working together

- Norms, [APS STEP UP poster](#) & [Fermilab norms poster](#)
- Video: Pair programming how-to ([YouTube](#)) ([Amara w/Sp subtitles](#))
- Video: [What Most Schools Don't Teach](#)
- A look at the [Data Activities Portfolio](#)

10:00 Coding activities ([GitHub](#)) ([Colab Survival Guide](#)) ([MikeP's Sample Code Blocks](#))

- [Introduction to Jupyter](#)
 - Skills: run, edit, & save a notebook
- [Probability](#)
 - Task: Simulate flipping a coin and make a histogram of the number of heads for each trial.
 - Skills: generate random numbers, create and format a histogram
- [Position graphs](#)
 - Task: analyze Position graphs
 - Skills: modify a loop, define a function, format a plot

11:15 All Hands Meeting

- Share observations, challenges
- How do you think your students would handle these tasks?

11:30 Special Topic - collecting data from the [Smartphone](#)

12:00 Break

- Lunch
- Create/update your Quarknet.org account

Wednesday, July 6th - Afternoon Session

13:00 Review challenges from the morning session

13:15 Try another coding activity

- [Velocity graphs](#)
 - Task: Analyze Velocity graphs
 - Skills: modify a loop, define a function, format a plot
- [Projectile in Air](#)
 - Task: Model the motion of a projectile in air
 - Skills: modify a loop, define a function, format a plot
- [Quakes](#)
 - Task: Identify patterns in global seismic activity
 - Skills: read in a large data set from the web, visualize complex data
- [Global Temperature](#)
 - Task: Describe the differences between land and water on temperature
 - Skills: read in a large data set from the web, visualize complex data
- [Tides](#)
 - Task: Identify patterns in tidal height over time
 - Skills: read in a large data set from the web, visualize complex data, manipulate time series data

Chris's [Stars Notebook](#)

[Motion of a pendulum](#)

Charlie's [Gravitational and Electric Fields Program](#)

[Here](#) is the source of a pennies mass lab

Python in [Biology](#)

[Github](#) in Biology

[Getting Data](#) from Google Sheets - the penny lab is near the bottom

[This site](#) from CERN has a great notebook view of analyzing CERN data

[Datasaurus Dozen](#) resource code, etc

14:00 Special Topic: Lab Data Analysis Using Python Notebooks

[Slides](#)

[Notebook: Lab Data Linearization Analysis in Python](#)

[Google Drive Folder: "Dry Lab" Spreadsheet & Python Linearization Activity](#)

[Notebook: Comparison of 2 Mean Values from 2 Measurement Sets](#)

[Google Drive Folder: Cosmic Ray e-Lab to Python Example \(Muon Lifetime\)](#)

14:30 Introduction to Muon Mass Notebook

- Short introduction to Muon Mass notebook
- [Muon mass](#)
 - Task: measure the invariant mass of a muon
 - Skills: calculate invariant mass given its 4-vector (energy and x/y/z-momentum), make a mass plot

15:30 All hands meeting

- Share observations, challenges
 - How do you think your students would handle these tasks?
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Thursday, July 7th - Morning Session

9:00 Welcome back

- Recap from yesterday
- What stood out? Any new thoughts?

9:15 Change from student hat → teacher hat!

- Work Time Outline (Today, this morning and Tomorrow Morning)
- Where might these (or your own) coding activities fit into your course?
- Develop a coding activity and integrate it into your course plan.
 - See [CODINGink12.org](https://codingink12.org) site and the [UCI Machine Learning repository](#) for data sets
 - Coding Fellows [Colab Survival Guide](#)
 - Mike P's [Sample Code Blocks Document](#)
 - embedding an image from your Google Drive ([source](#)):
 - In a text cell, embed an image with: `![alt text label](URL-to-image)`
 - Original URL:
<https://drive.google.com/file/d/0B6wwyazyzml-OGQ3VUo0Z2thdmc/view>
 - Edit the URL to look like this:
<https://drive.google.com/uc?export=view&id=0B6wwyazyzml-OGQ3VUo0Z2thdmc>
 - [Opening a Google Sheet in Colab](#)
 - Superscript example: In a text cell:
 - word `<sup>exponent</sup>` will display as word ^{exponent}
 - This site can be used to create equations in Markdown: <https://latexeditor.lagrida.com/>
 - [Here](#) is a project I wrote a couple of years ago with a statement about project expectations.
- Create an implementation plan.
 - The format should be whatever is useful to you. How do you sketch out your lessons? Do you use a form from your school or district?

11:30 All Hands Check In

12:00 Break

- Lunch

Friday, July 8th - Morning Session

9:00 Continue working on implementation plan

- Get help on coding issues
- Finish your coding activity and drafting an implementation plan

10:30 Share out

- Teachers take turns (5 min each) sharing your ideas for how coding might make it into your classroom. If your Colab notebook is ready for others to try out,
 - Click the Share” button in the top right of the Colab notebook.
 - Copy the link to give others **view-only** access.
 - Send that link to michael.plucinski@gmail.com and we'll post in on the agenda
- Teacher Implementation Notebooks
 - [Alan Grinsteinner - Analysis of Crater Impacts Using a Sense HAT RaspPi Sensor](#)
 - [Dr. Jing Liu - Muon Energy Change with Simulated Data](#)
 - [Ally Bowers - Coding in Chem](#)
 - [Jim Stith - Start of Year Investigation](#)
 - [Rick Hudson - Maximizing Area](#)
 - [LuAnn Lindskov - CRMD Muon Comparison](#)
 - [Kevin Militello - Coding in Biology](#)
 - [Greg Seefeldt - Weather Data](#)

11:30 All hands meeting

- Share observations, challenges
- Closing thoughts? Where to next?
- Complete QuarkNET [Survey Update](#) or [Full Survey](#)

EXTRA: You might (will) need to search for the segment, but here is the CERN 13.6 TeV announcement:
<https://www.youtube.com/watch?v=06kFq1QF5-s&t=3s>

Clips:

The moment CERN started back at 13.6TeV! :
<https://youtube.com/clip/Ugkx02HI31216dbv6vePOQ8GnAScydaQs0vF>

Gimme Some Proton!: <https://www.youtube.com/watch?v=06kFq1QF5-s>

Trinket: <https://trinket.io/>

Phyphox FAQ: <https://phyphox.org/faq/>

Physics Toolbox plus lessons: <https://www.vieyrasoftware.net/>