

IRIS-HEP & QuarkNet Coding Camp 2

Pre-ML workshop for high school teachers



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Sept 19, 2022 @ IRIS-HEP EB Meeting

QuarkNet

High School Teacher Outreach since ~1999 funded by NSF, US-CMS, & US-ATLAS (& now IRIS-HEP)

Activities at 50 U.S. universities plus *intensive week-long summer workshops* for teachers:

- Data Camp (at Fermilab): 24 teachers learn standard model & intro Python/Pandas
- Coding Camp 1 (virtual): 36 teachers learn Pandas/Numpy/Matplotlib with HEP data



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With IRIS-HEP Support: Coding Camp 2

- At Fermilab in July 2022
- 24 teachers dig deeper into SciPy stack and 'pre-ML' skills
- Most had 1-4 years Python exp. from Data Camp and/or Coding Camp 1.

Topics included:

- Jupyter/numpy/pandas/matplotlib in Google Colab
- Analysis & viz of data from CMS, K12 probeware, public repositories
- See the [QuarkNet GitHub](#) for teacher activities.



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Coding Camp 2: Modules

Data Viz: Plot a function with linspace and customize plots with pyplot and mpl's object-oriented interface and define a function

B-field Variation: Analyze data from mobile app using Natasha Holmes' t' analysis

Muon Tracks: Analyze tracker data from muons in CMS manually, with SciPy curvefit, & SKLearn linear_model

Muon Tracks with Machine Learning: Repeat the muon tracks analysis with several machine learning techniques



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Coding Camp 2: Outcomes

- Achieved gender parity with attendees; facilitators were all women
- Black & Latinx representation was moderate, but above norms
- Range of school incomes and racial demographics represented
- Teacher developed lessons and implementations plans for incorporating into their classes
- Full report from external evaluator & photos have been shared with IRIS-HEP leadership



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Coding Camp 2: Budget

	Budget	Actual
Development & evaluation	\$36k	\$26k
Stipends & travel	\$77k	\$54k
Total	\$111k (+ indirect)	\$80k (+ indirect)



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Coding Camp 2: Next Steps

- More model-fitting
- More HEP data relevant to HS Physics content
- Reinforcement through hack-a-thons, half-day Zooms
- Scale to additional sites & areas



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