

Fermi Summer School 2022

The [Fermi Summer School](#) emphasizes the analysis of data from the Fermi instruments through lectures and hands-on workshops. Students spend time working directly with experts in instrumentation, analysis, theory and modeling to develop and extend their own research projects. Topics cover much of the gamma-ray band ranging from keV-MeV transients seen with Fermi's GBM to the highest energies observed by the LAT and the very high energies observed by ground-based gamma-ray telescopes. This year's school will be held at the [University of Delaware Conference Center](#) in [Lewes, Delaware](#), from May 31 to June 10, 2022.

Material will be aimed at graduate students and post-doctoral researchers. Topics will include particle acceleration and gamma-ray production mechanisms; space-based and ground-based gamma-ray instrumentation; spectral, spatial, and time-based analysis of gamma-ray data; modeling and interpretation of gamma-ray data; and astrophysical source classes such as AGN, GRBs, Galactic pulsars and binary systems, supernova remnants, and pulsar wind nebulae as well as searches for dark matter and new physics.

The software necessary for the tutorials (such as the [Fermitools](#)) are distributed in the [FermiBottle Docker Container](#), a fully-functional, self-contained analysis environment. Please go through the [Summer School Checklist](#) to make sure the container is functioning correctly.

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Schedule

Go directly to [Week 1](#) or [Week 2](#). All times are in Eastern Daylight Time (UTC04:00).

See our [Code of Conduct](#) and our [COVID guidelines](#).

Week 1

	Tues, May 31	Wed, June 1	Thurs, June 2	Fri, June 3	Sat, June 4
8:00	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
9:00	Welcome and Introductions - Liz, Jamie + Intro to Space-based Gamma-ray Astronomy	Intro to Fermi LAT - Liz	Modern Blazar Problems: Multiwavelength & Multimessenger - Tiffany Lewis	Science with Fermi GBM - Cori	Science with Fermi LAT Pulsars - Matthew
10:00	Intro to the Fermi Mission and Sky - Liz Hays	Intro to Fermi GBM - Cori Fletcher	Neutron Stars and Gravitational Waves (GW) - Cecilia Chirenti	Future MeV observations and AMEGO-X - Henrike Fleischhack	BurstCube, a cubesat to detect GW counterparts - Jeremy Perkins
11:00	Break	Break	Break	Break (Photo!)	Break
11:30	Blazar Basics: Background & Time Series - Tiffany Lewis	Intro to Likelihood - Matthew Kerr	Neutron Stars and Gravitational Waves Part II - Cecilia Chirenti	Student Talks / 1 Slide Summaries	Student Talks / 1 Slide Summaries
12:30	Lunch	Lunch	Lunch	Lunch	Lunch

1: 30	Getting started with Fermi: Tools and Resources - Joe Eggen, Joe Asercion, Alex Reustle (remote), Nestor Mirabal (remote), Don Horner (remote) Data Exploration notebook Data Quicklook notebook	Getting Started with Likelihood Analysis - Liz, Joe, Matthew FermiSummerSchool Github link - see read.me for instructions to download files for the analysis Likelihood Notebook	Intro to git and Github - Henrike Fleischhack Next Steps with Likelihood - Liz, Matthew, Jeremy Perkins Special guest Cole Miller (See his course on practical astrostatistics) Optional breakout: FermiTools advanced installation - Joe A. Look here for a few project Ideas	Advanced Likelihood - Liz, Matthew, Jeremy Time to work on Student Projects Optional breakouts: Pulsar timing - Matthew; Multi-Instrument fitting with 3ML - Henrike	Advanced Tutorials (Lightcurves and upper limits) - Liz, Jeremy The Fermi LAT Lightcurve Repository Student Projects
4: 45	End of the Day Tag-up	End of the Day Tag-up	End of the Day Tag-up	End of the Day Tag-up	End of the Day Tag-up
					Crab Feast TBD

Week 2

	Mon, June 6	Tues, June 7	Wed, June 8	Thurs, June 9	Fri, June 10
8: 00	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
9: 00	Gamma-ray Binaries - Jamie Holder	Neutrinos associated with TXS 0506+056 - Joshua Wood	Impostor Syndrome workshop - Group Impostor Syndrome Resource folder	TeV Ground-based Astronomy with IACTs - Jamie	9:00 -9:30 Pack up. 9:30 - 10:30 Closing Session Feedback Form
10: 00	Ground-based Gamma-ray Astronomy with HAWC (and friends) - Henrike	Gamma-ray burst science from Multimessenger observations - Judy	Student Talks / 1 Slide Summaries	Fermi LAT Catalog Analysis - Jean Ballet (remote)	
11: 00	Break	Break	Break	Break	Break
11: 30	Student Talks / 1 Slide Summaries	Student Talks / 1 Slide Summaries	Photon Adventure - Amy Furniss (Remote)	Student Talks / 1 Slide Summaries	Complete packing up and return bikes.
12: 30	Lunch	Lunch	Lunch	Lunch	Lunch
1: 30	GBM Tutorial - Joshua Wood FindSource notebook : Example of adding a source to the LAT catalog model to test for detection and position of a new source. (practice updating your cloned git repository.) Student Projects	Free Afternoon (may trade with Mon or Wed)	GBM tutorial follow up/ Accounting for Trials - Josh Working with Spectral and spatial shapes - Liz Student Projects	Fermi Science Through Cake - Judy Advanced topics: Systematics and validation checks - Liz, Henrike, Judy Odds and ends and leftover questions - Henrike A PSF-based method for LAT Data Model comparisons	
4: 45	End of the Day Tag-up		End of the Day Tag-up	End of the Day Tag-up	

			Virden BBQ 6-7 PM	Sunset Cruise 7 PM	
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Student Talks and 1 Slide Summary Schedule

Friday, June 3

- Saqqib Hussain
- Nick Kirschner
- Matt Roth
- Audrey Coleman (1 Slide)

Saturday, June 4

- Anton Dmytriiev
- Anne Duerr (1 Slide)
- Domenik Ehlert
- Addy Evans

Monday, June 6

- Shannon Gray (1 Slide)
- Emily Kosmaczewski
- Nik Korzoun
- Douglas Carlos

Tuesday, June 7

- Saeeda Sajjad
- Connor Mooney (1 Slide)
- Oindabi Mukherjee (1 Slide)
- Giorgio Pirola
- Rachel Procter-Murphy (1 Slide)

Wednesday, June 8

- Joshua Baxter
- Lucas Siconato
- Hugh Spackman
- Lucas Smith (1 Slide)

Thursday, June 9

- Oskar Svenborn
- Hongyi Wu
- Justina Yang (1 Slide)
- Jimmy Zaid

Supporting Material

- Primary announcements will be sent out via an e-mail list.
- Secondary announcements, interaction between sessions, instructor-student, and student-student communication will be handled via [Slack](#). Instructions on joining the Summer School Slack will be sent to attendees by e-mail.
- This confluence page will be the home for the schedule as well as the presentation and supporting materials.
- There are a number of [video tutorials](#) for Fermi data analysis already available. You can also find tutorials posted on the SSC web page Data Analysis area.

Interesting repositories for Fermi analysis

- <https://github.com/fermi-lat/FermiBottle/wiki> - a fully-functional, self-contained analysis environment used in the Summer School
- <https://github.com/FermiSummerSchool/fermi-summer-school> - repository for iPython notebooks used during the Summer School
- <https://github.com/fermiPy/> and documentation at <http://fermipy.readthedocs.io/en/latest/>

Stay up-to-date with the gamma-ray sky

- <https://fermi.gsfc.nasa.gov/ssc/data/access/> - Catalogs and lightcurve products in addition to links to data archives
- [Public List of LAT-Detected Gamma-Ray Pulsars](#) - Updated list of confirmed gamma-ray pulsars. Timing models can be found at the FSSC data access website (previous link)

- <https://fermi.gsfc.nasa.gov/ssc/library/pubs/> - Find Fermi publications
- <https://www-glast.stanford.edu/cgi-bin/pubpub> - Fermi-LAT publications page
- https://www-glast.stanford.edu/cgi-bin/pub_rapid - List of rapid communications from the LAT team
- <https://heasarc.gsfc.nasa.gov/W3Browse/fermi/fermigbrst.html> - Table of Fermi GBM gamma-ray bursts
- https://gcn.gsfc.nasa.gov/fermi_grbs.html - Fermi Gamma-ray Coordinates Network (GCN) notices

Additional Resources for gamma-ray astronomy and astrostatistics

Things to Do in Lewes

- Take the ferry to [Cape May](#).
- [Hire kayaks](#) (Don't forget sun screen!).
- If the weather's good, go to the beach! Lewes Beach is fine, or there's a beach on the ocean-side in [Cape Henlopen State Park](#). (Don't forget sun screen!)
- Visit [Prime Hook National Wildlife Refuge](#) (Don't forget bug repellent)
- Visit the [Zwaanendael Museum](#)
- Visit the US Lightship [Overfalls](#) (located just off of Pilottown Rd):
- [Biking and hiking trails](#)