

Note: a clean copy has been created for the SI Fellows, included in their shared google folder (here: <https://docs.google.com/document/d/1tKXvbcuh74eIRPrX-L71IBWWbwDMzWSUgP31PbfR-i4/edit?usp=sharing>)

*Please make updates to the new document.*

## CUAHSI Summer Institute at the National Water Center Bootcamp Schedule: June 12 - 23, 2023

### Week 1

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#### SUNDAY, JUNE 11 - Main arrival day

5:30 pm      Evening mixer - *NWC Rotunda*

#### MONDAY, JUNE 12 - Introduction Day

8:00 am      Coffee and donuts (rest of the time, breakfast is on your own) - *NWC Rotunda*

#### ***NWC Auditorium***

8:30 am      Welcome and brief introductions (course coordinators)

8:45 to 9:15 am      Introduction to CUAHSI and Code of Conduct (Deanna)

9:15 to 10:15      Tour of NWC (Sam Contorno)

10:15 to 11:00      Introductions Presentation (course coordinators)

11:00 to 11:30      Introduction to NWC with OWP Director, Tom Graziano

11:30 to 12 pm      Ice Breaker #1 (course coordinators)

12 to 1:30 pm      Lunch on their own

1:30 to 2 pm      Ice Breaker #2 (course coordinators)

2 to 2:15 pm      Introduction to themes and theme leaders (course coordinators)

2:15 to 4:15 pm    Overview of theme-lead background and overall theme goal and motivation  
(30 minutes per theme)

- Hydro-Data science for NextGen: Methods to improve streamflow forecasting accuracy
- Urban Flooding Under Climate Change
- Real-Time Urban Flooding Awareness
- Channel Flow Routing and Flood Inundation Mapping

4:15 to 4:30 pm    Research question poll, overview of tomorrow's schedule (CC)

**Group dinner at The Venue Tuscaloosa**

**Leave at 5:30 for dinner. Vans can pick up fellows from the dorms.**

## TUESDAY, JUNE 13 - Python

8:00 am              Overview of today's schedule (CC) - NWC Auditorium

8:15 to 10 am      Introduction to CUAHSI summer institute computing - Jonathan Frame

- (20 min) Everyone logs into the CUAHSI Virtual Machines
- (20 min) Shell scripting. Goal: Everyone can navigate the VM through Bash.
- (20 min) Github basics. Goal: Everyone is able to clone a repository
- (20 min) Python basics. Goal: Everyone is able to run a python script
- (20 min) Jupyter notebook. Goal: Everyone is able to open a Jupyter Notebook, load in code from a python script, run Python code and Bash code. Make a plot.

10 to 10:15 am    Break

10:15 to 12 noon   Python and general development basics - Jonathan Frame

- Use this time to instill very simple code development practices, so that the code from the SI is reproducible, readable, runnable, etc. for many SIs to follow

- (20 min) Stress the importance of maintaining code in a public facing repository
  - Your work needs to be organized to make life easier for your teammates
  - Your team's work needs to be organized so it is not lost to the Ether
- (20 min) Go over basic Python principals that will make everything easier
  - Object oriented programming
  - Docstrings
- (20 min) README.md files. Let's make sure that every project has a nice clear readme file that the NWC personnel and the next SI fellows can use to make sure all the work done in the SI is reproducible and easily passed on to be built upon.

12 to 1:30 pm      Lunch on your own

1:30 to 3 pm      Python Training (Numpy and Pandas) - Dylan Lee

3 to 3:15 pm      Break

3:15 to 4:30      Python Training (rasterio and geopandas) - Dylan Lee

4:30      Wrap up, research question poll, overview of tomorrow's schedule (course coordinators)

Evening activity optional

## WEDNESDAY, JUNE 14 -

8:00 am      Overview of today's schedule (CC) - Math and Science

8:15 to 12 pm      Session 1. Data Science Principles (Jonathan and Barbara)

1. Data science introduction (Barbara)
2. Dealing with large datasets (Jonathan)
  - a. Data loading and cleaning (getting rid of NaNs, etc)

[Notebook link](#)

- b. Correlations and visualizations

[Notebook link](#)

3. Regression models and avoiding overfitting
  - a. Regression (Jonathan)

Deep learning playground (Barbara)

- b. Training, validation and testing (Jonathan)
- c. Feature and model selection (Barbara)
- d. Shallow ML models (Jonathan)

12 to 1:30 pm	Lunch on your own
1:30 to 3 pm	Structured one-on-one TL Networking rotation
3 to 3:15 pm	Break
3:15 to 4:30	<p>Session 3. Data Science Principles (Jonathan and Barbara)</p> <ul style="list-style-type: none"><li>• (Barbara) Model complexity</li><li>• (Jonathan) Deep learning bucket lab (<a href="https://github.com/NWC-CUAHSI-Summer-Institute/deep_bucket_lab">https://github.com/NWC-CUAHSI-Summer-Institute/deep_bucket_lab</a>)<ul style="list-style-type: none"><li>○ Contest for getting a best model<ul style="list-style-type: none"><li>■ Conflicting metrics</li></ul></li></ul></li></ul>
4:30	Wrap up, research question poll, overview of tomorrow's schedule (course coordinators)
7:00 pm	Evening social event (optional)

## THURSDAY, JUNE 15 - Field Trip

8:00 am	Overview of today's schedule (CC) - <i>Math and Science Building</i>
8:15 to 11 am	Office hours with theme leads
11:00 am	Break to prep for trip Meet for the trip
11:30 am	USGS Field Crew Stream Discharge Measurement Cahaba River in Centreville (Fred) -- <b>pack your own sack lunch</b>
4:55 pm	Research question poll, overview of tomorrow's schedule

7:00 pm                Evening social event

**FRIDAY, JUNE 16 - Training and Project time - Teams finalized **by the end of the day!****

8:00 am                Overview of today's schedule (CC) - NWC Auditorium

8:15 to 10 am        Hydrofabric Presentation - Mike Johnson (Virtual)

10 to 10:15 am      Break

10:15 to 10:45      NYS Emergency Management Executive Deputy Director speaking on importance of Flood Inundation Mapping (Virtual)

10:45 to 12:00      Teamwork/project time

12 to 1:30 pm        WaterWorks lecture with Dr. Ehab Meselhe. Bevill 0009. Lunch will be provided.

1:30 to 3 pm         Teamwork/project time (Math and Science Building)

3 to 3:15 pm        Break

3:15 to 4:30         Preliminary project ideation report-outs

4:30                    Wrap up, research question poll, overview of tomorrow's field trip (CC)

7:00 pm                Evening social event (optional)

**SATURDAY, JUNE 17 - Field trip**

9:00 am - 3:00 pm    Cahaba River Trip -- **pack your own sack lunch**

## Week 2

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### MONDAY, JUNE 19

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| 8:00 am          | Overview of today's schedule (CC) - Math and Science Building |
| 8:15 to 10 am    | Basic Model Interface training - Jonathan Frame               |
| 10 to 10:15 am   | Break   |
| 10:15 to 12 noon | CUAHSI HydroShare. Tony and Irene, CUAHSI                     |
| 12 to 1:30 pm    | Lunch on your own   |
| 1:30 to 3 pm     | Session 3. CUAHSI JupyterHub. Tony and Irene, CUAHSI          |
| 3 to 3:15 pm     | Break   |
| 3:15 to 4:30     | Basic Model Interface training - Jonathan Frame               |
| 4:30             | Wrap up, research question poll, overview of tomorrow (CC)    |

### TUESDAY, JUNE 20

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| 8:00 am | Overview of today's schedule (CC) - NWC Auditorium |
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8:15 to 9:15 am	Next Generation Water Resources Modeling Framework Webinar Recording
9:15 to 10 am	NextGen team (Matt Williamson) Q&A
10 to 10:15 am	Break
10:15 to 11:30	HAND FIM Presentation (Brad Bates) - In-Person
11:30 to 12:30	Lunch on your own
12:30 to 1:30 pm	Project management training with Christy Westcott - In-Person
1:30 to 1:45 pm	Break
1:45 to 4:30	Group work time
4:30	Wrap up, research question poll, overview of tomorrow(CC)

## WEDNESDAY, JUNE 21

8:00 am	Overview of today's schedule (CC) - Math and Science Building
8:15 to 9:00 am	Teamwork/project time (Math and Science Building)
9:00 to 10 am	HEC-RAS Presentation - Brad Bates / Andy Carter at UT-Austin (Virtual) <ul style="list-style-type: none"><li>● Efforts building capabilities based on existing hec-ras models</li><li>● RAS2FIM</li></ul>
10 to 10:15 am	Break
10:15 to 12 pm	Group work time
12 to 1:30 pm	Lunch on your own
1:30 to 3 pm	Session 4 (CUAHSI)

## Preparing Input Data for NextGen Water Resources Modeling Framework

The purpose of this workshop is to provide a practical demonstration of how to gather and prepare input datasets for the execution of a specific configuration known as the Conceptual Functional Equivalent (CFE) Model, within the NextGen Water Resources Modeling Framework. This model configuration requires several input components, including the model domain, model parameters, and model forcing data. To facilitate the preparation process, we will utilize a pre-developed Jupyter Notebook, which will retrieve and subset the Hydrofabric data relevant to the desired region of interest. In addition, we will explore another Jupyter Notebook that incorporates the retrieved information and allows users to specify a particular time period. This notebook will guide participants in collecting, subsetting, and post-processing the Analysis of Record for Calibration (AORC) forcing data, as utilized in the current version of the National Water Model. As part of the post-processing step, participants will learn how to compute basin average forcing values for each Hydrofabric catchment. To expedite these computations, we will leverage Python parallel computing libraries. By the end of the workshop, participants will have gained practical experience in data collection and preparation techniques necessary for running the CFE Model within the NextGen Water Resources Modeling Framework.

3 to 3:15 pm      Break

3:15 to 4:30      Session 5: Team building and cultural intelligence training (Barbara)

4:30              Wrap up, research question poll, overview of tomorrow (CC)

## THURSDAY, JUNE 22

8:00 am              Overview of today's schedule (CC) - Math and Science Building

8:15 to 10:00      Group Work on project timelines

10 to 10:15 am    Break

10:15 to 12 noon   Session 2: Group work time  
Data Science for Nextgen theme: Arpita Patel NextGen for Beginners training

12 to 1:30 pm      Lunch on your own



1:30 to 3 pm	Session 3: Group work time
3 to 3:15 pm	Break
3:15 to 4:30	Session 4: Group work time
4:30	Wrap up, research question poll, overview of tomorrow (CC)

## FRIDAY, JUNE 23

8:00 am	Overview of today's schedule (CC) - Math and Science Building
8:15 to 10 am	Session 1. Group work time
10 to 10:15 am	Break
10:15 to 12 noon	Session 2: Debriefing and conflict resolution training (Barbara)
12 to 1:00 pm	Lunch on your own
1:00 to 2:00 pm	Project presentation preparation
2 to 2:15 pm	Break
2:15 to 4:15	Project presentations
4:30	Wrap up