COMPUTATIONAL TURBULENCE AND VISUALIZATION LAB

THE SHODOR EDUCATION FOUNDATION, INC.

UTSA
Mechanical Engineering
Klesse College of Engineering and Integrated Design

https://ceid.utsa.edu/garaya/   **www.shodor.org**

High-school Workshop: Modeling Your World

Workshop Objective:
The main educational objective of this workshop is related to the enhancement of computational thinking, multiscale modeling, and scientific visualization in K-12 students. This initiative is part of the education strategy proposed by Dr. Araya in his NSF-CAREER project (#1847241 "High fidelity numerical simulations of turbulent flow separation at high Reynolds numbers with passive scalar transport"), and in collaboration with Dr. Panoff from the Shodor Education Foundation.

Workshop Schedule:
This workshop will meet online, Friday March 17th, 2023, 9:00AM -12:00PM (lunch break) 1:00PM-5:00PM central time.

Workshop Fee:
This workshop is completely free and open to the high school community. It is sponsored by the National Science Foundation (NSF).

Teaching Language:
English

Maximum number of participants: 20-25 students.

Prerequisites:
Participants should be rising 9th - 12th graders interested in science, technology, engineering, and/or mathematics. No prior programming experience is needed. Experience with typing and Microsoft Excel is preferred.

Workshop Description:
Every day, most of us interact with technology that runs a computer program in some aspect. Computational tools can model real-world phenomena and help you better understand what it means to "model your world" from atoms all the way to galaxies and everything in between! In this hands-on, interactive workshop, students will be introduced to the world of computer modeling and simulation as they explore scientific problems. Students will first learn how to think computationally and then learn to build working models. Students will also learn a wide variety of computer programming concepts such as variables, conditional statements, loops, and functions. Students will run existing Web models and use Microsoft Excel to run and build new models. Students will also learn how to program in a textual

programming environment to create dynamic, visual, and interactive models that can run on the Web. In the process, students will learn how to create computational solutions to problems such as population dynamics, predator-prey relationships, and the spread of diseases.

Structure of Activities:
Participants will learn by doing; they will be given demonstrations of modeling and coding practices and then work to complete the activities on their own computer with help from the remote instructors. Every workshop session and all communication will be held through Zoom.

Educational Objectives:
Students often do not have the opportunity to experience the tools and techniques that drive cutting-edge scientific research. In fact, most school science curriculum hardly mentions the revolutionary new approaches modern science uses daily to research such areas as galaxy formation, volcanic eruptions, cardiovascular activity, the spread of disease, and a host of other interests. This workshop is designed to expose the participants to the high technology environment in which most scientists now work and the specialized critical thinking and communication skills they must have to be successful in the 21st Century Workforce. In addition, while there are countless opportunities these days to learn coding, too many of those opportunities do not answer the question, "Coding what?" For this workshop, the "what" are dynamic, visual, and interactive science applications that allow students to learn not just how to code but how to code something that would be useful to a scientist. Students will be introduced to programming techniques and tools for solving real-world problems. Students will work from existing examples to see how they actually work, rather than merely starting with a blank page and writing "Hello World" programs.

Facilities and Equipment:
All activities will take place online. Participants will need access to a laptop or desktop computer with Internet access. Participants should please also do the following before the workshop:
- Please make sure you have a copy of Zoom (https://zoom.us/) and can run it on your computer.
- Please create an account on Replit.com.

If you have a copy of Microsoft Excel available, we encourage you to use it during the workshop -- preferably the desktop (not web) version if possible. If you do not have Excel available, some activities can also be done on Google Sheets, Apple Numbers, LibreOffice Calc, and/or other spreadsheet programs.

Registration Instructions
Please fill out the following electronic form HERE.
IMPORTANT: it is required to initialize a Google session in order to upload **a non-official high school transcript and a headshot image.**
The selected students will be contacted and supplied with the Zoom link and instructions via email.

Workshop organizer:
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