

Hands-on Workshop on Fiber-Optic Distributed Acoustic and Temperature Sensing for Interdisciplinary Earth Scientists August 13-17, 2024

<https://ctemps.org>



Summary:

Distributed fiber optic sensing offers two exciting ways to measure the environment: temperature (DTS) and acoustic sensing (DAS). The temperature of fiber optic cables can be read each 0.3 m for up to 30 km every second. The dynamic strain of fiber optic cables can be measured each meter up to 50 km (or more depending on the system) tens of thousands of times per second. While DTS is relatively established for high precision temperature measurements, DAS offers new opportunities for seismic monitoring, geophysical characterization, hydrology, and other applications. The Center for Transformative Environmental Monitoring Programs (CTEMPs) will host a 3.5 day workshop introducing the breadth of issues surrounding the use of these techniques, including fiber/instrument selection, fiber placement, fiber repair, continuous calibration, data acquisition, and data analysis. Participants will take part in design, installation, and data analysis to measure subsurface properties, surface water-groundwater interactions, and micrometeorological processes. The workshop targets early career scientists (graduate students welcome!) who wish to assess and prepare for the use of fiber optic sensing in their research.

Instructors:

Mark Hausner – Desert Research Institute
Eileen Martin – Colorado School of Mines
Adrian Harpold – University of Nevada, Reno
Chris Kratt – University of Nevada, Reno

Sara Sayadi – University of Nevada, Reno
John Selker – Oregon State University
Scott Tyler – University of Nevada, Reno

Sponsors: The National Science Foundation; [Oregon State University](#); [University of Nevada Reno](#); [Colorado School of Mines](#); [Desert Research Institute](#)

Participation: We encourage early career researchers to apply, particularly graduate students, postdocs and faculty that plan to use fiber optic sensing in their research. There are a limited number of participant spots, so register early.

Location: [Sagehen UC Reserve](#) and USFS Research Watershed

Registration: To reserve a space, using a [Google Form](https://forms.gle/x9U9kwHZ9j6eQKdd8) (<https://forms.gle/x9U9kwHZ9j6eQKdd8>). Point of contact for questions about the registration can go to [Ann Gaidos-Morgan](#) . Registration is not binding until payment is received. Please notify of dietary restrictions.

Cost: \$500 per person including all meals, housing, and materials, with an additional \$200 discount for students. (scholarships available – contact [Mark Hausner](#)). Travel will be paid by participants.

What to bring: Boots, field clothing, laptop computers (ideally with MATLAB and/or Python). Sagehen is a high elevation (5,900-8,700 ft) research site with station facilities at 6,390 ft. The station requires [packing personal supplies](#) and contributing cooking and cleaning meals. Plan on field work at elevation in hot weather, so hat, sunscreen, hydration, backpack, gloves, but be prepared for cold nights – overnight lows in August can be around 5 °C.

Program:

August 13, 2024 Flight arrival in Reno and transportation to Sagehen

- 14:30-18:30** Registration and time to explore Sagehen
18:30-20:00 Dinner and get to know each other

August 14, 2024-Instrumentation and installations

- 7:30-8:30** Breakfast, continued registration
8:30-9:00 Participant Introductions
9:00-9:15 Introduction to the Workshop (Harpold)
9:15-10:00 Introduction to fiber-optic sensing - Part 1: The physics (Hausner and Martin)
10:00-11:00 Walking tour of installations to date (Harpold, Hausner, Sayyadi)
11:00-12:00 Introduction to fiber optic sensing – part 2: instrumentation (Kratt, Hasuner, and Martin)
12:00-13:00 Lunch in the field and discussion of new installations
13:00-14:30 Discussion of new installations and work plans
14:30-16:30 Introduction to fiber optic sensing – part 3: fiber selection and calibration. Full team design of calibration experiment (Hausner and Kratt)
16:30-18:00 Begin installations
18:00-19:00 Dinner
19:00-22:00 Presentation of datasets already (Sayyadi and Harpold) collected and open presentations

August 15, 2024-Practicum: installations in stream, soil, and air

- 7:30- 8:30** Breakfast
8:30-9:30 Introduction to fiber optic sensing – part 4: installation and power (Kratt)
9:30-10:00 Coffee break
10:00-11:00 Introduction to fiber optic sensing – part 5: Repairing fiber and care and maintenance (Hausner and Kratt)
11:00-12:30 Finish installations
12:30-13:30 Lunch in the field
13:30-15:00 Introduction to data analysis – part 1: the basics
15:00-18:00 In-field validation or field experiments
18:00-19:30 Dinner
19:30-22:00 Dreaming about other field installations and proposal support (practice fusion welders)

August 16, 2024-Practicum: Data analysis

- 7:30- 8:30** Breakfast
8:30-9:30 Introduction to data analysis – part 2: unique aspects of DTS
10:00-10:30 Coffee break
10:00-10:30 Collect data from the field
10:30-12:00 Introduction to data analysis – part 3: unique aspects of DAS
12:00-13:00 Lunch
14:00-16:00 Data analysis session 1
16:00-16:30 Break and quick presentations
16:30-18:00 Data analysis session 2
18:00-19:00 Dinner
19:00-22:00 Presentations of data and data analyses

August 17, 2024

- 7:30- 8:30** Light breakfast, departures.
7:30- 8:30 Breakfast
8:30-11:30 Pack up, clean up, and departures