Training

SESYNC is dedicated to fostering socio-environmental (S-E) synthesis skills and abilities by providing short courses and materials on a wide variety of educational and computing tools and techniques. Participants in training activities develop a better understanding of the mechanics, context, and applications for various tools, enabling both their current projects and future research. All training activities are available to synthesis teams and fellows. Select opportunities are open to external researchers.

Summer Institute [1]

The computational summer institute held annually in Annapolis, MD provides a launching point for S-E scholars to learn a broad suite of cybertechnologies in a congenial atmosphere. The 4-5 day short course offers participants hands-on instruction and project-focused coaching on software tools available through open source licenses or widely available at most research institutions.

Teaching Socio-Environmental Synthesis with Case Studies [2]

The Teaching Socio-Environmental Synthesis with Case Studies initiative aims to deepen our collective understanding of the teaching and learning of relevant concepts and competencies, define and adapt the case study approach for use in the socio-environmental context, and create a collection of high quality teaching case studies. The essential components of these case studies include: a clearly defined case problem and story, a set of teaching notes describing activities and pedagogies to use in teaching the case, and any materials needed to implement the case in a classroom.

Data Skills Workshops [3]

Targeting suites of tools that relate to a particular methodology, topic or computing environment,
these workshops introduce novice and intermediate scientific coders to new concepts, skills and approaches for data-driven research. A typical agenda integrates lectures, live-coding and trainee challenge exercises that deepen understanding around a core area (e.g. RStudio, agent-based modeling, or Bayesian hierarchical modelling). The following short courses have been developed and taught regularly at SESYNC.

**Bayesian Modeling for Socio-Environmental Data**

Solutions to pressing environmental problems require understanding connections between human and natural systems. Analysis of these systems requires a model that can deal with complexity, is able to exploit data from multiple sources, and is honest about the uncertainty from multiple sources. Synthesis of results from multiple studies is often required. Bayesian hierarchical models provide a powerful approach to analysis of socio-environmental problems. This nine-day course covers basic principles of using Bayesian models to gain insight from data.

**Spatial Agent Based Modeling**

This 5-day course serves as an introduction to the theory and practice of spatially-explicit agent-based modeling (ABM), including the essential theoretical background and technical expertise needed to conceptualize, build, and analyze an ABM. This course will guide participants through the basic phases of the ABM research process: formulating a research question, specifying a model, creating a simulation and interpreting the output.

**Social Network Analysis**

Where standard statistical analysis assumes that observations on different entities (people, organizations, animals, etc.) are independent, social network analysis (SNA) looks to the relationships among these observations to try to explain why this configuration of relationships might exist, or how this network structure explains other attributes of the network. While network science has a long tradition, this field has recently exploded with new data resources in social media and new computational methods, particularly in the application to socio-environmental systems. This 5-day course serves as an introduction to the theory and practice of SNA.

**Geospatial Data Analysis**

The 3-day course aims to accelerate the adoption of open source computing resources for geospatial and temporal analyses of socio-environmental (SE) issues. Participants can expect to learn about geospatial data processing steps, managing workflows, and spatial and temporal analyses of both raster (i.e. image) and vector (i.e. shape) datasets. Specific topics include plotting spatial data, raster algebra, cropping, and extraction against vector data, and geometric operations for intersecting or otherwise manipulating vector data.

**Phylogenetic and Functional Trait Analysis**

The course was designed to train early career researchers interested in using phylogenetic and/or functional trait data in their research. Topics covered included: quantifying and interpreting phylogenetic and functional alpha and beta diversity, null model concepts and implementation, phylogenetic comparative methods and phylogenetically informed data imputation.

**À la Carte Lessons** [4]

The computational summer institute and data skills workshops offer a full menu of lessons on a logical sequence of topics, but many lessons are also suited for stand-alone training sessions lasting about
two hours. Cyberinfrastructure staff can present these lessons for small groups of SESYNC supported researchers, or the lessons can be used by individuals for self-study.

**External Learning Resources** [5]

The increasing number of on-line resources for self-study in computer programing, quantitative methods and data management can be overwhelming. The cyberinfrastructure staff curates a list of resources that we often recommend to researchers looking for additional learning aids.

If you are a SESYNC fellow or member of a synthesis team and find that the above options do not meet your needs, please contact us at cyberhelp@sesync.org [6]. We can develop lessons in response to specific needs. For individual assistance with your research objectives or software, please view information on our consultation services [7].

Source URL: https://www.sesync.org/for-you/cyberinfrastructure/training

**Links**
[2] https://www.sesync.org/for-you/educator/teaching-resources/resources-case-study-approach
[6] mailto:cyberhelp@sesync.org