DATA SCIENCE (DATA_SCI)

DATA_SCI 401-1 Data-Driven Research in Physics, Geophysics, and Astronomy (0 Unit)
Major projects in earth sciences, physics, and astronomy have revolutionized research in these fields and have created major data challenges. In this course we will review the science motivation and goals and the relevant data challenges of the Earthscope, aLIGO, and LSST projects that represent large-scale investments in these research communities. Although the goals for the three projects may appear to overlap only partially, there are strong intellectual bridges and shared challenges because of the data-intensive science involved.

DATA_SCI 401-2 Data-Driven Research in Physics, Geophysics, and Astronomy (1 Unit)
Major projects in earth sciences, physics, and astronomy have revolutionized research in these fields and have created major data challenges. In this course we will review the science motivation and goals and the relevant data challenges of the Earthscope, aLIGO, and LSST projects that represent large-scale investments in these research communities. Although the goals for the three projects may appear to overlap only partially, there are strong intellectual bridges and shared challenges because of the data-intensive science involved.

DATA_SCI 421-0 Integrated Data Analytics I (1 Unit)
Data analysis in the modern age requires familiarity of many concepts and methods from statistics. This course provides an introduction to the basics as well as exposure to some of the most advanced techniques. The emphasis will be on practical problems from physics and astronomy, rather than on theory or on statistical methods from other fields. Prior knowledge of statistics is not required.

DATA_SCI 422-0 Mathematical Inverse Methods in Earth and Environmental Sciences (1 Unit)
Theory and application of inverse methods to gravity, magnetotelluric, seismic waveform, multilateration, and students' data. Nonlinear, linearized; underdetermined, and mixed-determined problems and solution methods, such as regularized least-squares and neighborhood algorithms.

DATA_SCI 423-0 Machine Learning: Foundations, Applications, and Algorithms (1 Unit)
From robotics, speech recognition, and analytics to finance and social network analysis, machine learning has become one of the most useful set of scientific tools of our age. With this course we want to bring interested students and researchers from a wide array of disciplines up to speed on the power and wide applicability of machine learning. The ultimate aim of the course is to equip you with all the modeling and optimization tools you'll need in order to formulate and solve problems of interest in a machine learning framework. We hope to help build these skills through lectures and reading materials which introduce machine learning in the context of its many applications, as well as by describing in a detailed but user-friendly manner the modern techniques from nonlinear optimization used to solve them.