Using Python to span the gap between education, research, and industry applications in geophysics

Lindsey Heagy, Rowan Cockett, Gudni Rosenkjaer, Seogi Kang, Doug Oldenburg, et al.

Short (400 char):

As researchers, we require tools that facilitate exploration of scientific concepts and methodologies. Additionally, these methodologies and concepts must be disseminated to practitioners and students. We will discuss how we have used the Python environment to "package" our geophysical software framework SimPEG (Simulation and Parameter Estimation in Geophysics) at various levels of abstraction tailored to researchers, students and practitioners.

Long (300 Words):

Developing software to answer academic research questions requires considering and exposing access to the details of the implementation. Tinkering with these pieces is where methodologies can be developed, scientific questions addressed, and new ones found. To capture and disseminate this knowledge, it must be synthesized and packaged in a manner so that it may be applied by other researchers and by those in industry. In addition, as educators in academia, we require tools that enable students, from undergraduate to graduate level, to explore concepts. These applications use the same underlying scientific methodologies, however, each audience requires abstractions that capture the various levels of detail relevant to them: from introducing a concept, developing research tools, to disseminating that knowledge in a reusable form.

We will present how we have used SimPEG (Simulation and Parameter Estimation in Geophysics, http://simpeg.xyz) as our foundation to construct and tailor resources to each of these audiences. Using the tools available in Python, we have re-packaged pieces of SimPEG at varying levels of abstraction for use in education, research, and data interpretation. In particular, we will discuss how we have used SimPEG at the University of British Columbia as a framework to (a) facilitate the development of methodologies and the exploration of research questions, (b) interpret and invert geophysical data, (c) develop IPython notebooks targeted at a range of student audiences, and (d) create web-based physics simulation "toys" to allow for engaged exploration of geophysical concepts.