Our knowledge about geological systems and processes comes from data. Data analysis leads to increasingly complex models of the Earth. This course discusses the tools needed for taking the first steps in the data analysis journey. Hands-on computational exercises with real-world data supplement theoretical studies.

Key Topics:

Data Attributes
mean and variance, median and quantile, sorting and searching algorithms, semblance and similarity

Signal Analysis
convolution and correlation, Gaussian smoothing, bandpass filtering, minimum-phase filters, spectral factorization

Numerical Analysis
spatial interpolation, sampling theory, splines

Basis Functions
Fourier and wavelet transforms

Least Squares Estimation
adjoint operators, conjugate directions and conjugate gradients, regularization and preconditioning

Class objectives:

1. To familiarize students with key concepts in data analysis.
2. To provide experience in applying data-analysis methods to real data.

Lectures: Mondays and Wednesdays, 11:00 am – 12:00 pm.

Lab sessions: Fridays, 11:00 am – 1:00 pm

Classroom: JGB 2.312

Computational environment: The Julia Programming Language
Instructor:

Sergey Fomel
E-mail: sergey.fomel@beg.utexas.edu
Office hours: Mondays, 1:00 – 3:00pm, JGB 4.216F

Teaching Assistant:

Hector Corzo-Pola
E-mail: hcorzopola@utexas.edu
Office hours: Tuesdays, 12:00 – 2:00pm, JGB 4.216F

Prerequisites:

Basic mathematics (calculus, linear algebra.) Programming experience is helpful.

Textbook:

Jupyter notebooks.

Course Web Page: Use Canvas

Homework: Weekly assignments with computer exercises.

Grading:

60% weekly computational assignments
20% class participation
20% final exam

100%

Homework assignments policy:

The two lowest homework grades will be dropped to allow for missed assignments.

No classes:

August 28 – September 1: IMAGE conference
September 4: Labor Day
November 20–24: Fall break

Final exam:

December 11, 10:30 am – 12:30 pm

Students with disabilities:

The university is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Disability & Access (D&A). Please refer to the D&A website for more information: [http://diversity.utexas.edu/disability/](http://diversity.utexas.edu/disability/). If you are already registered with D&A, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course.