



IS-GEO EXCHANGE

AN INTERNATIONAL COLLABORATION TO TEACH AND DEVELOP
INTELLIGENT SYSTEMS FOR GEOSCIENCE APPLICATIONS

Suzanne A. Pierce and Ritu Arora

Texas Advanced Computing Center and
Jackson School of Geosciences

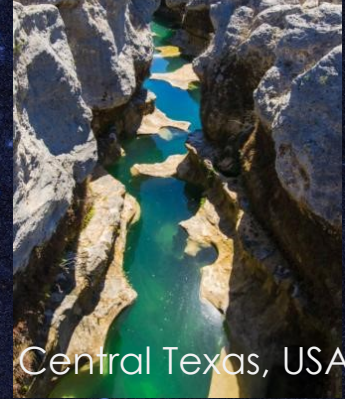
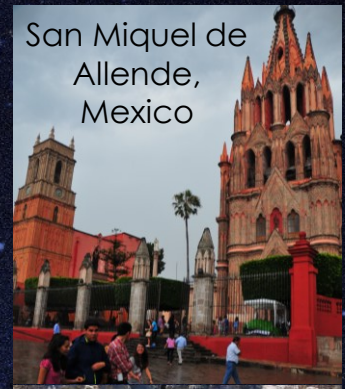
The University of Texas at Austin

Enrique Cabral-Cano and Gibran Fuentes

Institutos de Geofísica and
Matemáticas Aplicadas

Universidad Nacional Autonoma de Mexico

- ▶ **Emerging Research Frontier:** Introduction to Intelligent Systems for Geosciences
- ▶ **Interdisciplinary:** The program includes instructors from Geosciences and Computing Sciences and recruits students across disciplines as well.
- ▶ **Hands-on Research Experience:** Teaching through application. Students collect data in the field and from remote sensing repositories, create/develop applications to analyze the data that they collect, integrate that with simulation outputs or processed information and report results.
- ▶ **Team-based learning:** Students from both GEO and CISE are matched in teams to generate final projects.

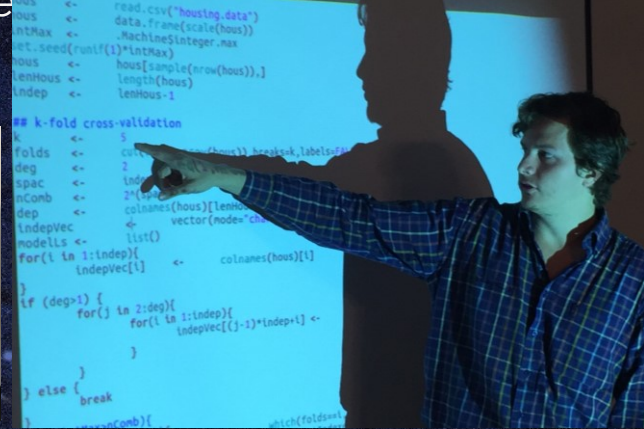
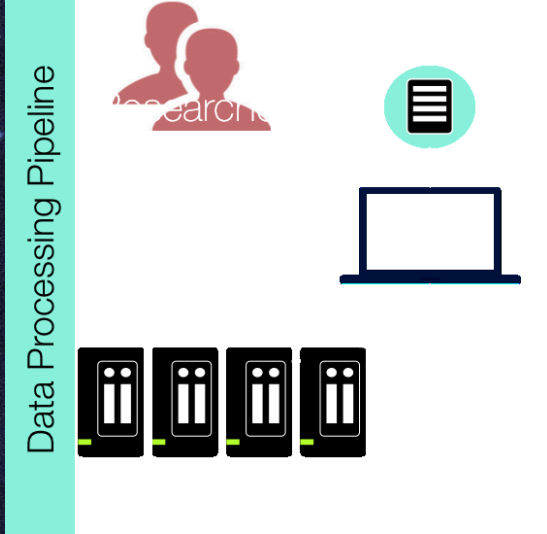


IS-GEO DUAL INTERNATIONAL EXCHANGE PROGRAM

6-WEEK SUMMER COURSE IN MEXICO AND THE UNITED STATES



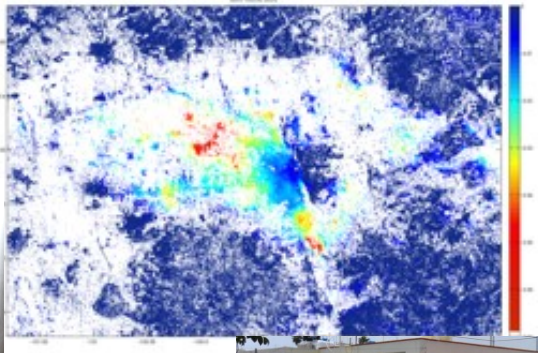
- ▶ **Stampede and Wrangler @TACC:** Students begin the course with an HPC exercise
- ▶ **Data Lifecycle and Pipeline:** Students develop and implement workflows for Geoscientists from the field to final analysis and using best practices for data management of digital objects



Student presents his code from exercise

DATA INTENSIVE COMPUTING

FROM DAY 1



- ▶ **Celaya, Mexico Case Study:** Seismic movement due to groundwater pumping
- ▶ **Subsidence Hazard Mapping:** Collect field observation of fault trace throughout city of Celaya, Mexico
- ▶ **Automate Decision Support Workflows:** Combine satellite data, field data, to processed velocity maps to identify high risk areas for seismic shifts

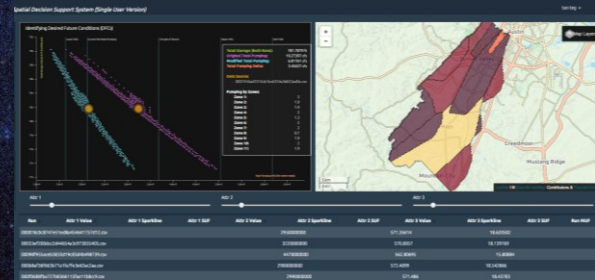


DATA COLLECTION, ANNOTATION, & ANALYSIS



- ▶ **Central Texas Case Study:** Advancing Interactive workspaces to evaluate optimization and management options for Common Pool Resources
- ▶ **Scientific Uncertainty:** Compare response scenarios for pumping and recharge conditions
- ▶ **Test Robustness of Candidate Solutions:** Multi-attributed solutions under dynamic urban conditions and landuse change

GROUNDWATER AVAILABILITY MACHINE LEARNING FOR DSS





- ▶ **3D Cave Mapping Study, Central Texas:** Testing computer vision libraries and hardware to capture cave conditions
- ▶ **Compare DIY and Commercial Hardware:** Implement 2 workflows with 1) Kinect camera and point cloud library scripts and 2) Structure Sensor and Scanect
- ▶ **Convert data formats and Vis:** Process datasets to generate 3D immersive visualization and large format 3D printing



DATA COLLECTION AND ACCESS

