Dr. Cécile DeWitt-Morette
France-UT Endowed Excellence Grants
- 2019-2020 Awardees -

Dean Spears
Assistant Professor
Department of Economics
The University of Texas at Austin

Stéphane Zuber
Researcher (Directeur de Recherche) at CNRS and
Associate Professor at Paris School of Economics
Centre d'Économie de la Sorbonne

Population, Climate Change, and Sustainability: A Grand Challenge facing Economics, Demography, and Public Policy, $10,000

Today there are over 7 billion people. By 2055, the UN projects that there will be over 9 billion. Population growth and climate policy crucially influence one another. More people emit more carbon pollution. Eventually, climate change is likely to change mortality and fertility rates in developing countries. Patterns of population change also matter because more people will suffer harm from climate change if the population grows in climate-vulnerable regions. Nevertheless, population issues are largely omitted from leading climate policy models. For example, William Nordhaus' model won the 2018 economics Nobel, but does not allow for population policy or incorporate effects of climate change on population. Improving climate models and informing policy requires an interdisciplinary collaboration among researchers who study the role of population in social and economic welfare, demography, and climate policy. This project will bring UT-Austin and French collaborators together for two purposes. First, a workshop in Austin will assemble a larger group of visitors and presenters. It will lead to a published collection co-edited by the Texas and France co-PIs (Spears and Zuber). Second, a smaller group will remain in Austin for a few days to launch new, ongoing collaborations to improve population within models for climate policy.

Ngoc Tran
Assistant Professor
Department of Mathematics
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Francois Massol
Directeur de Recherche
Uunité Evolution, Ecologie et Paléontologie (Evo-Eco-Paléo)) CNRS
University of Lille

SCAPIN: Structural Change Assessment in Plant-pollinator Interaction Networks, $10,000

Plant-pollinator interactions are critical to ecological systems and agriculture. Long-term changes in these networks could lead to local extinctions and failed crops. Early detection and prediction of such events amidst local and global climate changes is an urgent and complex challenge.

This project develops and tests novel methods to detect structural changes between networks. The proposed method is interpretable, has firm theoretical foundations, allows comparisons across different networks, and is easy to use for ecologists. The underlying technique solves the abstract problem of large network comparisons, and thus readily applies to other networks in ecology, neuroscience and social sciences.

The new method will be tested on expert-identified, monthly-measured plant-pollinator networks, acquired by PI Massol's group between 2016 and 2017, across six grasslands in Hauts-de-France, Normandie, and Occitanie, France. This is one of the largest and most detailed plant-pollinator datasets available.

Significance. This project improves knowledge and monitoring of ecological systems, identifies adverse and positive mechanisms that lead to ecological changes, and potentially offers solutions to restore and stabilize plant-pollinator networks. Its success will open up new collaborations between mathematics and ecology as a whole, with UT and France researchers in the lead.

Joel Peterson Johnson
Associate Professor,
and J. Nalle Gregory Chair in Sedimentary Geology
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Michal Tal
Assistant Professor
Department of Geographie
Aix-Marseille Université
Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement (CEREGE)

Predicting river channel changes during floods from high-resolution topographic data, $10,000

Rivers provide water resources and support unique ecosystems, both of which benefit human society when managed and maintained sustainably. Rivers can also be hazards; flood risks and uncertainties are increasing in many places due to both anthropogenic climate change and land use changes. Predicting how the beds and banks of gravel-bed rivers will erode, deposit and evolve during individual floods and sequences of floods is fundamental to sustainable management of rivers in mountain environments. We propose to combine (i) analyses of erosion and deposition based on high-resolution measurements of river channel topography before and after floods with (ii) numerical modeling of flood flow to predict the evolution of river channels. We will compare and contrast existing high-resolution topographic data from two field sites: the Buëch (an alpine braided river in SE France), and Trachyte Creek and tributaries (channels draining the Henry Mountains, Utah, USA). We will also investigate how the spatial distribution of vegetation in both field sites influences local erosion and deposition in ways that cannot be predicted from local topography and modeled flow alone.

Cornel Olariu
Research Scientist
Department of Geological Sciences
The University of Texas at Austin

Serge Berné
Emeritus Professor
Université de Perpignan Via Domitia

Sedimentary Systems Under Modern Sea level Rise: Reviewing the Stepped Transgression Model Using Geological Records From the Last Glacial Maximum and Ancient Systems, $10,000

The hypothesis is that modern shoreline transgression (landward migration of the shoreline caused by the relative sea-level rise) happens in "steps" rather than continuous. The alternation of slow and fast shoreline retreat seems to be the norm in ancient deposits and likely will happen during the future transgressions caused by global warming.

The shoreline is a highly dynamic boundary between non-marine (continental) and marine sedimentary systems. its position is dependent on the sediment flux to the coast and the relative rise/fall of the sea level. The global sea level is presently rising at a rate of ~3 mm/year caused by the melt of the polar ice cap. Significant attention is given to the possible land loss in river-delta systems during short (10s-100s years) scale that create significant social problems.

This project proposes to look at the transgression during longer time scale, 100s-1000s years, and not only to delta shorelines, but also at sedimentary processes happening on the continental shelf. The approach is to combine observations on previous shoreline transgression during last sea level cycle (U. Perpignan) and older (Cretaceous) deposits (UT Austin). The expected outcome is a model for future long-term transgression under different scenarios (sea-level rise rate, sediment supply, coastal morphologies).

Junfeng Jiao
Assistant Professor
Community and Regional Planning
The University of Texas at Austin

Basil Chaix
Research Director
Inserm (The French National Institute of Health and Medical Research)

Understanding the Relationship Between Air Pollution, Noise Exposure, Personal Transport Behavior and Health in Paris, France, $10,000

MobiliSense aims to explore the effects of air pollution and noise exposure related to personal transport habits on respiratory and cardiovascular health. Using GPS and mobile surveys, it has collected 1000 participants' transportation behavior, environmental perception, and health in Paris from 2015-2017. The objectives of MobiliSense are to quantify the contribution of personal transport to the air pollution and noise exposure of individuals; to compare the air pollution and noise exposure in the different transport modes; and to investigate whether transport-related personal exposure to air pollutants and noise are associated with short-term changes in respiratory and cardiovascular health.

This research will be co-led by Dr. Jiao from UT Austin and Dr. Basile Chaix (Research Director) at Inserm, the French National Institute of Health and Medical Research. They have formed close working relationships through previous research projects. Dr. Basile Chaix is the PI for a five-year (2015-2020) European Research Council study called MobilSense(ERC 647000), which this research will be based on.

Through this grant, Dr. Jiao will be able to join Dr. Chaix and conduct joint research using existing MobilSense data. The goal is to develop sustainable transportation and health policy recommendations for both Texas and France.

David Espinoza
Assistant Professor
Petroleum & Geosystems Engineering
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Matthieu Vandamme
Tenured Research Scientist
École des Ponts ParisTech

Jen-Michel Pereira
Professor of Geotechnical Engineering

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Poroelastic Monitoring of Carbon Dioxide Storage Sites, $10,000

The energy industry needs to address a transition towards a sustainable and zero-carbon emission future in order to mitigate climate change consequences partly due to greenhouse gas emission. One solution to facilitate the transition of fossil fuels towards a zero-carbon system is the capture and geological storage of carbon dioxide (CO_2) produced by fossil fuel power plants. For example, Norway has a tax incentive to capture and store CO_2. The energy industry already has the means to capture and inject CO2 in geological formations. However, large scale deployment of CO_2 geological storage necessitates robust and cost-effective monitoring techniques to track the short and long term fate of the injected CO2. This project will develop a theoretical background that will verify and enable the use of remote pressure sensors for monitoring of CO_2injection. The investigators will apply the theory of poroelasticity and inverse problems in order to predict the expected fluid pressure response in fluid-filled rocks due to remote perturbations. The proposed work has the potential to set a theoretical framework that will enable remote monitoring of injected fluids in geological formations. The project will be performed by a UT researcher, a UT GRA, and two French researchers.