



2012 Alliance Research Internship Program in Sustainable Development (3 months) between Columbia University and Ecole Polytechnique

Created in 2002, the Alliance Program is a transatlantic joint-venture between Columbia University, the Ecole Polytechnique, Sciences Po and the Université Paris I Panthéon-Sorbonne.

Since 2008, the Alliance Research Internship Program allows students from the Ecole Polytechnique to complete a three-month internship project in a research center at Columbia University.

Internship Description

- Research projects are available at the International Research Institute for Climate and Society (IRI), the Lenfest Center and the Urban Design Lab.
- Students work with a faculty member, who acts as an academic advisor and supervises their research project.
- Internships take place from April to June 2012 (3 months)
- Internships are not paid. Students are responsible for finding housing.

Applications

- To apply, students will send their application to the Alliance Program to lb2808@columbia.edu
- Applications must include: a CV, a cover letter (1 page), and a letter of recommendation. For confidentiality matters, the letters of recommendation will be sent directly to the Alliance Program by email.
- All materials must be submitted in English.

Deadline: January 25, 2012

Contact

Lauranne BARDIN, Alliance Program Assistant Director

Email: lb2808@columbia.edu

For more information

Alliance Program: <http://www.columbia.edu/cu/alliance/>

IRI: <http://portal.iri.columbia.edu/portal/server.pt>

Urban Design Lab: <http://www.urbandesignlab.columbia.edu/>

Lenfest Center: <http://www.energy.columbia.edu/>

IRI – INTERNSHIP OFFERS 2012

1) Semantically-enhanced interface for assembling data-processing pipelines.

Mentor: Benno Blumenthal

Project Description: To further incorporate semantic web technologies into climate data management, we would like to host an intern to help build a semantically-enhanced interface for assembling data-processing pipelines for global climate data analysis. The intern would be enhancing the current semantic database which describes both datasets and functions that can be applied to the datasets, and use that database to construct a system that creates analyses based on semantic expressions of the user's needs. Climate data has become an important part of cross-disciplinary research and applications. Semantically enhanced interfaces will facilitate the guided use of climate data by scientists and engineers who are outside the climate science community.

Requirements: strong interest in semantics web technologies and informatics; some knowledge of data analysis. Additional useful skills include Java, RDF, OWL or other semantic web experience, and writing web services.

2) Semantic Metadata Interoperability

Mentor: Benno Blumenthal

Position Description: We seek an intern to extend/build rule-based frameworks for translating data objects, as part of underway efforts to increasingly utilize semantic technologies for climate data management. Our current framework is RDF/OWL based with custom extensions. Intern projects could range from developing/implementing/improving interoperability frameworks (relationships that fire rules for translation), to using frameworks that we have developed for translation between existing data standards and web services. Data interoperability among agencies, nations, and continents and data re-use have been hindered by the use of diverse metadata standards. We are building frameworks to interconnect these standards, and prepare for global federated data search and access services.

Requirements: strong interest in semantic web technologies and informatics. Useful knowledge includes semantic technologies like OWL, SWRL and developing OWL standards, experience with rule-based systems, data standards, or web services.

4) Data assimilation of remotely sensed soil moisture and vegetation into crop simulation models

Mentor: Amor VM Ines

Project description: We have been developing an integrated modeling framework for predicting crop response that can assimilate remotely sensed vegetation and soil moisture data within the growing season using an ensemble kalman filter (EnKF). This approach was done with the aim of improving crop model performance to simulate yields at reasonable lead-time before the end of the growing season. Apparently, crop models are very useful for forecasting crop yields because of their ability to simulate

crop response as a function of climate, soil, crop characteristics, and management practices. But because of model structure and input and forcing data errors, they are imperfect in simulating the truth. Improving the performance of a crop model without altering its internal model structure can be achieved by updating state-variables periodically with observations, so-called data assimilation. Remotely sensed data e.g., vegetation and soil moisture are potentially useful to be integrated because of their spatial and temporal extents allowing crop predictions over larger regions. Key to data assimilation is the concept of errors, error modeling and error estimation. Data assimilation melds the relative errors in dynamical models and observations. The melded estimates do not degrade the valuable information from a dynamic model but tend to enhance its information content. By assimilating remotely sensed data into a crop model, the accuracy of results will improve, and consequently reduce crop forecast variance. The integrated modeling framework has been developed with DSSAT crop models. In this project, we aim to develop, test and validate it in Uruguay for soybean, maize and pasture modeling.

Requirements: basic understanding of crop simulation models; programming skills in Fortran, skills in GIS and remote sensing

LENFEST CENTER – INTERNSHIP OFFERS 2012

1) Reverse Osmosis Desalination:

Among the various desalination technologies available for creating fresh water, reverse osmosis has seen the largest growth in recent years and represents almost half of world desalination capacity. Contrary to current industry trends, we find significant energy savings potential through lower recovery rates. The intern will work with our researchers to construct a 2-D computational fluid dynamic (CFD) environment simulating the (steady-state) transport phenomena in membrane modules used in commercial operation. Preferred skills include computational fluid dynamics and basic thermodynamics.

2) Carbon foot-printing for corporate sustainability:

As part of a wider sustainability metrics effort for PepsiCo International, develop statistical predictive algorithm (based on multifactor regression models or possibly neural networks) to estimate carbon footprint of agricultural and packaging materials. Work hand-in-hand with researchers and graduate students in Pepsi project team at Lenfest Center.

3) Air Capture laboratory (one or more projects available):

We have numerous projects in our Air Capture Laboratory which involve making modifications to existing laboratory-scale test units and fabricating new models for dynamic, active displays. The Intern will have an opportunity to construct an experimental board which allows for experiments into capture sorbent performance. This summer we will also be integrating a syringe pump with the existing apparatus to control CO₂ concentrations during CO₂ adsorption experiments. The Intern will integrate hardware and work on the control logic needed to interface with Labview software used for

experimentation. We also will be constructing a travel-sized exhibit which would enable a researcher to use as a demonstration model to present air capture fundamentals. The intern will assist in the design and build exercise for this exhibit.

4) Laser-based ^{14}C analysis application in CO_2 geo-sequestration:

Radiocarbon (^{14}C , $\tau_{1/2}=5730$ years) is naturally occurring radioisotope produced naturally by cosmic radiation and made artificially by ^{14}N neutron capture. Although the ambient concentration is very low ($^{14}\text{C}/^{12}\text{C} \approx 10^{-12}$), the concentration of ^{14}C in fossil fuels is at least two orders of magnitude lower, making it an ideal quantitative inventory tool for tagging underground injections of anthropogenic CO_2 . Intern will work with Lenfest Center researchers to conduct experiments related to the newly designed C14 flow loop system. This research is part of a U.S. Department of Energy award for monitoring, verification, and analysis of CO_2 sequestration.

URBAN DESIGN LAB – INTERNSHIP OFFERS 2012

The Urban Design Lab (UDL) is an innovative research unit within The Earth Institute at Columbia University. The UDL mandate is research concentrated on the Built Environment, with emphasis on urban systems including water, waste and energy infrastructure, and present longer-term initiatives related to the interaction of food systems, natural hazards, and human capital in the cities already built and in the cities of the future.

The Urban Design Lab of The Earth Institute is offering the following positions for the Spring 2012

1) The Urban Design Lab requires an intern to complete the analyses of data, economic projections, and final visualization for an ongoing research in the South Coast of Haiti, where the region's ecological advantages will face increasing stress in the 21st century. The research is analyzing a proposal for a new social node of local environment and new enterprise between the towns of Port Salut and Port a Piment, an area slated as a potential touristic destination.

2) The Urban Design Lab requires an intern to format the results of an urban design studio in the city of Puerto Plata, Dominican Republic. Puerto Plata (San Felipe de Puerto Plata) is the third largest city in the Dominican Republic. With 327,510 habitants, this coastal city was the initial 15th century foundation of the New World. The intern will analyze the project outcomes and recommendations and compile and edit the Studio's research report.

3) The Urban Design Lab requires an intern to research the consequences of the life cycle of plastic, from its production, use, re-cycling, to the global consequences of the transoceanic plastic trash patch(es). The project is international, has a strong communication component, and will involve the City of New York, the scientific community, and the entrepreneurial world at the highest level.

4) The Urban Design Lab requires an intern who is Knowledgeable about modelling software and computer programming in order to contribute to the exploration of innovative visualizations of complex systems. The realization of a 3D representation of complex environmental research systems and their data sets have the goal of favoring a better understanding of interdisciplinary work and of facilitating constructive interactions between the various components of the systems.