Spatial Data Science Symposium 2021 Session Proposal:

Spatial Optimization for Planning and Decision-Making

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November 16, 2021

1 Summary of session

Name of the session	Spatial Optimization for Planning and Decision-Making.
Short description of the session	Spatial optimization is typically employed in the following example problems: location-allocation of resources and production sites, spatial optimization of monitoring network configurations, public facility location according to service standards, etc. This session will introduce these topics and more, including an introduction to mathematical / linear programming, an introduction to creating a spatial optimization and data science development environment within a Jupyter notebook, mathematically formalizing, solving, evaluating, and visualizing a spatial problem, and bi-objective frameworks and other extensions. Short presentations will be punctuated by hands-on coding tutorials.
Type of session	Tutorial
Names and affiliations of team members that will lead the session	Susan Burtner, Jiwon Baik, Seonga Cho, Vanessa Echeverri Figueroa, Evgeny Noi, B. Amelia Pludow, Enbo Zhou; University of California, Santa Barbara
Expected participation	Planners, Management

2 Additional details

The goal of this session is to introduce scholars who are new to spatial optimization the basic research components of formalizing and finding / evaluating solutions for a spatial planning problem. A general understanding of linear algebra and programming in Python may be needed, but our team members will try and introduce topics with a general scientific audience in mind and help with the hands-on coding tutorials as much as possible. The hands-on coding tutorials will be a part of a single toy example, enumerated in one Jupyter notebook.

Session participants will be led through the following topics:

- Description and characterization of a spatial optimization problem.
- Mathematical formulation of a toy example.
- Introduction to the packages used to solve optimization models in Python.
- Formalization of the toy problem in Python.
- Possible extensions of optimization models, such as bi-objective frameworks.
- Visualization / evaluation of the problem and solutions.

A team member (or a pair of members) will present for ten minutes or less on one of the above components to solving a spatial problem, applied through our toy example, and some of these presentations will then be followed by a section in the Jupyter notebook. As session participants try these sections themselves, our team members will virtually "walk around" to help answer any questions.

To ensure the session runs smoothly and on-time, it is likely that the team members will set up a digital repository (such as a Github repository) which will be sent to session participants in advance and that holds the data and Jupyter notebook that will be used during the tutorial.

3 Concluding remarks

This proposal is not immutable, if the symposium organizers have any ideas on how the session could be improved, please feel free to make suggestions and send them to sab00@ucsb.edu. Technical and other support will come from Professor Alan Murray and Dr. Jing Xu, also of the University of California, Santa Barbara, but their attendance of the symposium itself is uncertain at this time.