A cordial invitation to the opening talk of the
Brown Bag Seminar
Recent Developments in Data Science:

Reviving an old formulation with a new idea: On solving the p-center problem via a projection-based approach

By
Markus Sinnl

Date:	27.06.2024 (Thursday) at 12:00 pm
Location:	WIWI (SR 026)
Link and further information:	Course 39740 Seminar: Doctoral Seminar "Recent Developments in Data Science" in Stud.IP

Abstract:

The p-center problem (pCP) is a fundamental problem in location science, where we are given customer demand points and possible facility locations, and we want to choose p of these locations to open a facility such that the maximum distance of any customer demand point to its closest open facility is minimized. The pCP has applications in locating emergency services, such as ambulances or fire stations, and vaccination centers, and in relief actions in humanitarian crises. Furthermore, the pCP is used for clustering of large-scale data, for feature selection and in computer vision. State-of-the-art solution approaches solve the pCP in an iterative fashion by repeatedly solving set cover problems.
The classical integer programming (IP) formulation of the pCP is usually dismissed due to its size and bad linear programming (LP)-relaxation bounds.

We present a novel solution approach that works on a new IP formulation that can be obtained by a projection from the classical formulation. The formulation is solved by means of branch-and-cut, where cuts for demand points are iteratively generated. We describe an innovative way to use lower bound information to obtain stronger cuts. We show that the LP-relaxation bound of our strengthened formulation coincides with the best known (semi-relaxation) bound in literature.

Finally, we present a computational study on instances from the literature with up to more than 700,000 customers and locations. Our solution algorithm is competitive with highly sophisticated set-cover-based solution algorithms.

Speaker:

Markus Sinnl

Markus Sinnl completed his doctorate in Statistics and Operations Research at the University of Vienna in 2015. He received both the Dissertation Award of the Austrian Society for Operations Research and the Dissertation Award of the INFORMS Section on Location Analysis.
After completing his doctorate, he worked as a post-doctoral researcher at the Institute for Statistics and Operations Research at the University of Vienna. This was followed by research work at INRIA Lille-Nord Europe in France and in 2019 he joined the Institute of Production and Logistics Management at the JKU Linz as a postdoctoral researcher. Since July 2023, he is Professor of Business Analytics and Technology Transformation at the JKU Linz. He is currently Principal Investigator of the FWF project "Preventing epidemics in networks using integer programming". In the current business administration research ranking of Wirtschaftswoche, he is ranked 12th in the ranking of researchers under 40 and 34th in the general ranking based on research performance over the last 5 years. His research interests include (nonlinear) integer programming, bilevel optimization and facility location.