

Twelfth DIMACS Implementation Challenge: Vehicle Routing Problems Held in Memory of David S. Johnson



Implementation Challenges trace back to the early years of DIMACS and to the vision of David S. Johnson to use experimentation as a companion to theory to gain more holistic perspective on the performance of algorithms. The over-arching purpose of a Challenge is to assess the practical performance of algorithms for a particular problem class, while fostering

interactions that transfer ideas between research areas related to algorithms, data structures, implementation, and applications. This 12th DIMACS Implementation Challenge will be held in honor of David S. Johnson on the topic of Vehicle Routing Problems.

The Vehicle Routing Problem (VRP) and other related dispatch problems have been widely studied for over fifty years because they are of both practical relevance and theoretical interest. Designing efficient routes for vehicles performing distribution or service functions translates directly to cost savings, making vehicle routing a topic of great commercial interest. Moreover, the fact that it generalizes the Traveling Salesman Problem, but is substantially more difficult, has kept it in the sights of theoreticians for decades. The VRP exists in a myriad of variations that arise from practical considerations like vehicle capacities, delivery time windows, delays in road networks, and the ability to split deliveries.

Because of the expansive problem space, this Challenge will consider multiple VRP variants, representing a mix of classic VRP variants and newer variants inspired by practical considerations. The Challenge will address 7 or 8 problem variants, including some classics and some of the most challenging of the VRP family. These problems focus on features that are critical to bridging the gap between application and practice, but they lead to different structural characteristics favoring different solution approaches. The featured variants include: 1) Capacitated VRP (CVRP); 2) VRP with Time Windows (VRPTW); 3) Inventory Routing Problem (IRP); 4) VRP with Split Deliveries (VRPSD); 5) Electric VRPs; 6) Capacitated Arc Routing (CARP) in realistic city networks; 7) CARP with time-dependent costs; and 8) Dynamic Ridehailing (under consideration but not confirmed).

We invite participants to submit instances or additional variants for potential inclusion. While we expect some common ideas to be applied across all problems, there will also be some important and necessary differences between methods, creating a rich and multi-faceted exchange throughout the Challenge.

We will leverage existing sets of problems instances and augment them with larger and more challenging examples, based on real transportation networks and city maps when possible.

The Challenge will conclude with a workshop held at Rutgers University on April 6-8, 2022. The workshop will pay tribute to the many contributions of David S. Johnson during a special banquet and related activities. Teams participating in the Challenge should plan to submit a paper and present their work during the workshop if selected. Others are also invited to submit papers on novel methods for presentation at the workshop.

Organizing Committee: *Claudia Archetti* (ESSEC Business School), *Nick Kullman* (Facebook/Ursus), *Catherine McGeoch* (D-Wave Systems), *Jorge Mendoza* (HEC Montréal), *Panos Pardalos* (U Florida), *Mauricio Resende* (Amazon), *Eduardo Uchoa* (U Federal Fluminense), and *Thibaut Vidal* (Pontifical Catholic University of Rio).

- **Visit the VRP Challenge website:** <http://dimacs.rutgers.edu/programs/challenge/vrp/>
- **Follow the Challenge on twitter:** [@DIMACSCheckange](https://twitter.com/DIMACSCheckange)
- **Subscribe to the mailing list:** http://email.rutgers.edu/mailman/listinfo/dimacs_vrp_challenge
- **Email organizers:** dimacs_vrp_challenge_committee@email.rutgers.edu

March 31, 2021

