Lorenzo Pattaro Zonta, Dennis Orlando, Lorenzo Bodini, Filippo De Grandi

AmbuHop

NOI Hackathon

Challenge

Currently calculating the routes for each vehicle working for White Cross is tedious

Need for a helper algorithm:

- Automating pickup and delivery routes calculation
- Optimizing distance traveled and ambulance capacity (not enough ambulances!)
- Requirement to integrate it with their current software

Vehicle Routing Problem (VRP)

...with capacity and time windows

NP-Hard Algorithm, well documented and studied:

- BRAEKERS, Kris; RAMAEKERS, Katrien; VAN NIEUWENHUYSE, Inneke. The vehicle routing problem: State of the art classification and review. *Computers & industrial engineering*, 2016, 99: 300-313.

- SITEK, Paweł, et al. Optimization of capacitated vehicle routing problem with alternative delivery, pick-up and time windows: A modified hybrid approach. *Neurocomputing*, 2021, 423: 670-678.

- BYCHKOV, Ilya; BATSYN, Mikhail. A hybrid approach for the capacitated vehicle routing problem with time windows. *Optimization Problems and their Applications, Omsk, Russia*, 2018, 66-81.

Vroom

Well known software that specifically solves the (C)VRP(TW) problem, integrated in our API

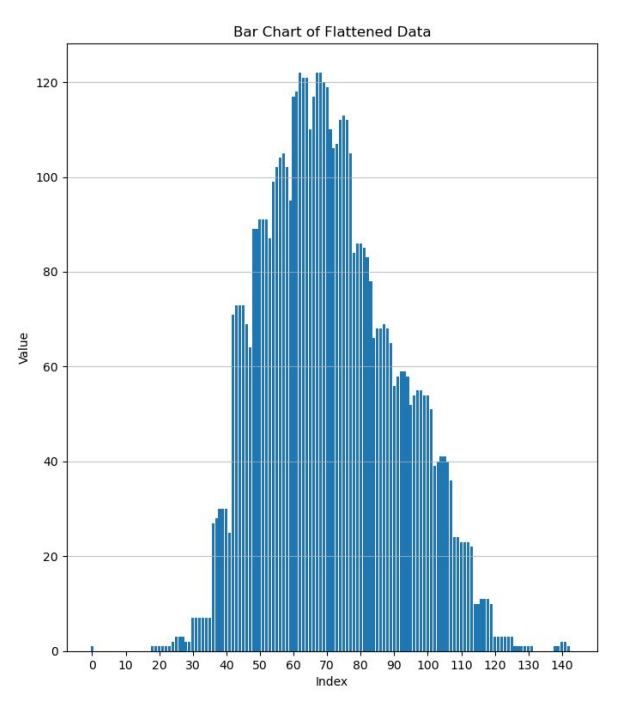
Features:

- Capacity for each vehicle
- Time Windows for destination (and pickup!)
- Calculates return routes
- Break times for operators
- Granular wait time after appointment end

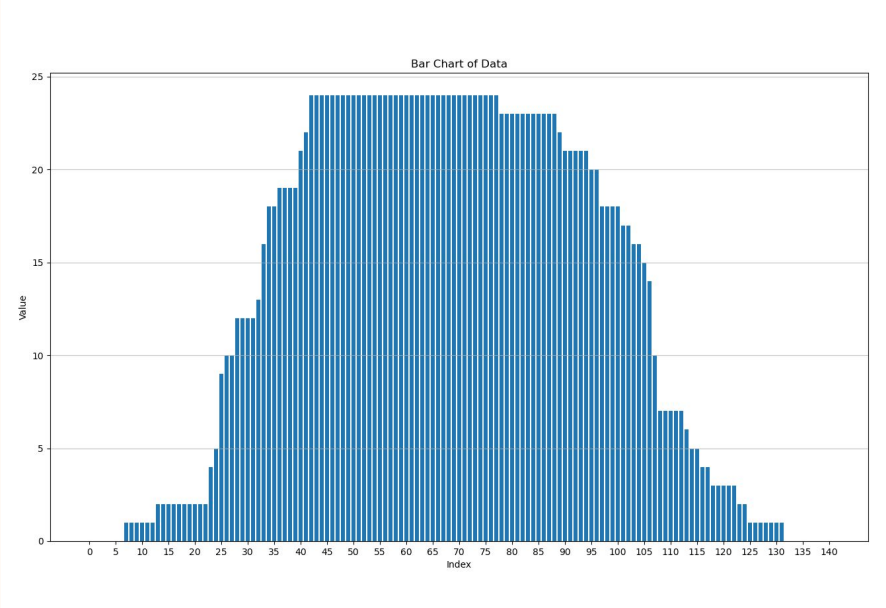
Vroom: https://github.com/VROOM-Project/vroom

To the Demo!

Some Data



People transported: ~560 (maybe?



People transported: ~390

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Thanks!

Ready to answer your questions!