CLAIMS

1. A method (100) for generating vehicle routes comprising

obtaining a plurality of bookings (102), each booking of the plurality of bookings comprising a pick-up and a drop-off location;

estimating (104), for each combination of two bookings of the plurality of bookings, a groupability by determining a cost ratio of the combination as a ratio of the cost of the combination to the sum of the cost of the two bookings taken separately, wherein a higher groupability represents a lower cost ratio, and a lower groupability represents a higher cost ratio;

identifying (106), based on the groupability, all bookings that are not groupable to any other booking of the plurality of bookings, as ungroupable bookings;

identifying (108), based on the groupability, all bookings that are groupable to at least one other booking of the plurality of bookings, as groupable bookings;

determining a vehicle route (110) by applying a vehicle routing problem (VRP) solver on the groupable bookings; and

adding the ungroupable bookings (112) to the vehicle route.

2. The method (100) of claim 1, further comprising generating, for each booking, a ranking of insertion position based on the cost ratio for each position in the vehicle route, and wherein the VRP solver updates the vehicle route based on the ranking.

3. The method of claim 1 or claim 2, wherein estimated groupabilities comprising the groupability for each combination of two bookings are stored in a groupability cache.

4. The method (100) of any of the previous claims, further comprising:

determining a feasibility of the combination, wherein the combination is unfeasible if at least one constraint of a plurality of constraints is not met, and wherein the combination is feasible if all constraints of the plurality of constraints is met;

if the combination is unfeasible, the groupability is set to represent that the combination is unfeasible, wherein

determining a vehicle route ignores combinations that are unfeasible.

5. The method (100) of any of the previous claims, wherein the VRP solver has an allotted time limit to determine the vehicle route.

6. A data processing system (400) for generating vehicle routes comprising

a computer (402) including a microprocessor (410) and a memory (420), wherein the memory is configured to be accessed by the microprocessor (410);

a communication interface (430) configured to obtain a plurality of bookings (452, 462), each booking of the plurality of bookings (452, 462) comprising a pick-up and a drop-off location;

wherein the computer (402) is configured to estimate, for each combination of two bookings of the plurality of bookings (452, 462), a groupability by determining a cost ratio of the combination as a ratio of the cost of the combination to the sum of the cost of the two bookings taken separately, wherein a higher groupability represents a lower cost ratio, and a lower groupability represents a higher cost ratio;

wherein the computer (402) is further configured to identify, based on the groupability, all bookings that are not groupable to any other booking of the plurality of bookings, as ungroupable bookings;

wherein the computer (402) is further configured to identify, based on the groupability, all bookings that are groupable to at least one other booking of the plurality of bookings, as groupable bookings;

wherein the computer (402) is further configured to determine a vehicle route by applying a vehicle routing problem (VRP) solver on the groupable bookings;

wherein the computer (402) is further configured to add the ungroupable bookings to the vehicle route; and

wherein the computer (402) is further configured to store the vehicle route in the memory (420).

7. The system (400) of claim 6, wherein the computer (402) is further configured to generate, for each booking, a ranking of insertion position based on the cost ratio for each position in the vehicle route, and to apply the VRP solver to update the vehicle route based on the ranking.

8. The system (400) of claim 6 or claim 7, wherein the memory (420) comprises a groupability cache configured to store estimated groupabilities comprising the groupability for each combination of two bookings.

9. The system (400) of any one of claims 6 to 8, wherein the computer (402) is configured to

determine a feasibility of the combination, wherein the combination is unfeasible if at least one constraint of a plurality of constraints is not met, and wherein the combination is feasible if all constraints of the plurality of constraints is met;

and if the combination is unfeasible, the groupability is set to represent that the combination is unfeasible, and

wherein the computer (402) is further configured to ignore combinations that are unfeasible when determining a vehicle route.

10. The system (400) of any one of claims 6 to 9, wherein the computer (402) is further configured to limit an allotted time for the VRP to determine the vehicle route.

11. The system (400) of any one of claims 6 to 10, wherein the communication interface (430) is further configured to send the vehicle route to the one or more vehicles or drivers (470, 480, 490).

12. A non-transitory computer-readable medium storing computer executable code comprising instructions for generating vehicle routes according to the method of any one of claims 1 to 5.