

CLAIMS

1. A computer-implemented method for determining resource allocation, comprising:

- collecting, by an online decision system, historical data comprising a plurality of historical loan requests and a plurality of historical scores generated by a scoring model in the online decision system for a plurality of lenders based on the plurality of historical loan requests;
- constructing, by the online decision system, an optimization model based on the historical data, wherein the optimization model is configured to maximize a total amount of loans that would have been granted in the previous period of time;
- transforming, by the online decision system, the optimization model into a Lagrangian model comprising one or more multipliers corresponding to one or more constraints of the optimization model;
- solving, by the online decision system using a linear system, the Lagrangian model to determine one or more values of the one or more multipliers;
- updating, by the online decision system, the scoring model based on the one or more multipliers;
- receiving, by the online decision system, a resource request from a user;
- iterating, by the online decision system, through a plurality of entities to obtain a corresponding score for each entity using the updated scoring model based at least on:
 - a projected approval rate for the entity to approve the resource request,
 - a projected risk for the entity to serve the resource request, and
 - the one or more multipliers applied to the projected approval rate and the projected risk; and
- recommending, by the online decision system, one of the plurality of entities to serve the resource request for the user based on the corresponding score.

2. The method of claim 1, further comprising:

- constructing the optimization model based on the historical data, the optimization model comprising an objective function and the one or more constraints, wherein the objective function is to maximize a target value determined at least by the projected approval rates, and the one or more constraints correspond to the one or more multipliers; and

transforming the optimization model into a Lagrangian function to determine the one or more multipliers.

3. The method of any of the preceding claims, wherein the resource request is a loan request, the projected risk is determined based at least on a projected default rate associated with the user, a risk tolerance ratio associated with each entity, and a projected loan amount to be provided by each entity to the user; and

the historical data further comprise projected default rates associated with users of the previous period of time, risk tolerance ratios associated with the plurality of entities during the previous period of time, and loan amounts that were projected by the plurality of entities during the previous period of time.

4. The method of claim 3, wherein the one or more constraints comprise a first constraint for each entity that the risk tolerance ratio associated with the entity is no less than a ratio determined based at least on the projected default rate associated with the user and the projected loan amount to be provided to the user by the entity.

5. The method of claim 4, wherein the first constraint corresponds to a first multiplier, and the projected risk is associated with the first multiplier for obtaining the corresponding score for each entity.

6. The method of any of the preceding claims, wherein each entity is associated with a user flow percentage to determine a serving capacity of the entity for the previous period of time.

7. The method of claim 6, wherein the historical data further comprise a total number of users made requests during the previous period of time, and the serving capacity is determined based on a product of the user flow percentage associated with the entity and the total number of users made requests during the previous period of time.

8. The method of any of claims 6-7, wherein the one or more constraints further comprise a second constraint for each entity that a total number of users to be served by the entity is no more than the serving capacity of the entity.

9. The method of claim 8, wherein the second constraint corresponds to a second multiplier for obtaining the corresponding score for the entity.

10. The method of any of claims 6-9, wherein the user flow percentage associated with each entity is updated for a current period of time if a total number of users served by the entity during the previous period of time does not match the serving capacity of the entity for the previous period of time.

11. The method of any of the preceding claims, wherein the optimization model comprises decision variables, and the solution of the optimization model determines a binary value for each of the decision variables indicating whether to recommend a corresponding user to a corresponding entity.

12. The method of any of the preceding claims, wherein the recommending one of the plurality of entities to serve the resource request for the user comprises:

selecting the one entity with a highest corresponding score.

13. A system for determining resource allocation, comprising one or more processors and one or more non-transitory computer-readable memories coupled to the one or more processors and configured with instructions executable by the one or more processors to cause the system to perform the method of any of claims 1 to 12.

14. A non-transitory computer-readable storage medium for determining resource allocation configured with instructions executable by one or more processors to cause the one or more processors to perform the method of any of claims 1 to 12.

15. An apparatus for determining resource allocation comprising a plurality of modules for performing the method of any of the claims 1 to 12.