

CLAIMS

1. A computer-implemented method for evaluating risk, comprising:

obtaining, by a computer system from a data storage, a plurality of transactions each comprising a plurality of data dimensions, wherein some of the plurality of transactions are labelled as risky transactions and some of the plurality of transactions are labelled as safe transactions;

obtaining, by the computer system from the plurality of transactions, at least one of the plurality of data dimensions as an output space and the plurality of data dimensions other than the at least one data dimension as an input space;

initializing, by the computer system, a first mapping from the input space to a latent space and a second mapping from the latent space to the output space, wherein the first mapping comprises mapping the input space to the latent space according to an inverse of a generalized linear model;

training, by the computer system using the plurality of transactions as training data, the first mapping and the second mapping to generate a Bezier surface in a simulation space as a boundary that divides the plurality of transactions with a threshold percentage of the risky transactions falling on one side of the boundary and a threshold percentage of the safe transactions falling on another side of the boundary, wherein the simulation space comprises the input space and the output space;

obtaining, by the computer system from one or more devices, a proposed transaction that comprises the plurality of data dimensions;

mapping, by the computer system, the proposed transaction to the output space in the simulation space according to the trained first mapping and the trained second mapping by inputting the plurality of data dimensions of the proposed transaction to the input space; and

in response to finding the proposed transaction falling on the one side of the Bezier surface associated with the risky transactions, preventing, by the computer system, or delaying, by the computer system, execution of the proposed transaction in the one or more devices; or

in response to finding the proposed transaction falling on the another side of the Bezier surface associated with the safe transactions, permitting, by the computer system, execution of the proposed transaction in the one or more devices.

2. The method of claim 1, wherein:

the training the first mapping and the second mapping to generate the Bezier surface comprises: optimizing the first mapping and the second mapping to generate at least a first Bezier surface corresponding to a high risk level and a second Bezier surface corresponding to a low risk level;

in response to finding the proposed transaction falling on the one side of the Bezier surface, preventing or delaying execution of the proposed transaction comprises:

in response to finding the proposed transaction above the first Bezier surface and the second Bezier surface, preventing execution of the proposed transaction, and

in response to finding the proposed transaction between the first Bezier surface and the second Bezier surface, performing a verification step as a condition for permitting execution of the proposed transaction; and

in response to finding the proposed transaction falling on the another side of the Bezier surface, permitting execution of the proposed transaction comprises: in response to finding the proposed transaction below the first Bezier surface and the second Bezier surface, permitting execution of the proposed transaction.

3. The method of any of claims 1 and 2, wherein:

the input space comprises a feature vector;

the output space comprises an output vector; and

the latent space comprises two or more parametric coordinates.

4. The method of claim 3, wherein:

the output vector is differentiable.

5. The method of any of claims 1-4, wherein:

the plurality of data dimensions comprise one or more of the following: transaction time, transaction location, transaction frequency, user history, transaction amount, and risk level.

6. The method of any of claims 1-5, wherein:

the plurality of data dimensions comprise at least three data dimensions; and

the at least three data dimensions comprise a risk level of a transaction sender, a risk level of a transaction recipient, and a transaction amount.

7. The method of any of claims 1-6, wherein:

the training the first mapping comprises solving a first order H-data dimensional equation; and the latent space comprises H data dimensions.

8. The method of any of claims 1-7, wherein:

the training the first mapping and the second mapping comprises optimizing the first mapping and the second mapping through reinforcement learning.

9. The method of any of claims 1-8, wherein:

the generalized linear model maps the latent space to the input space through a link function.

10. The method of claim 9, wherein:

the link function comprises an identity function, a log function, or a logit function.

11. The method of any of claims 1-10, wherein:

the second mapping comprises mapping the latent space to the output space through an H-data dimensional Bernstein polynomial.

12. A system for evaluating risk, comprising:

one or more processors; and

one or more computer-readable memories coupled to the one or more processors and having instructions stored thereon that are executable by the one or more processors to perform the method of any of claims 1-11.

13. An apparatus for evaluating risk comprising a plurality of modules for performing the method of any of claims 1-11.

14. A non-transitory computer-readable storage medium configured with instructions executable by one or more processors to cause the one or more processors to perform the method of any of claims 1-11.