

What is claimed is:

1. A method for implementing a machine learning modeling process, executed by at least one computing device, the method comprising:

obtaining configuration information set by a user for at least part of the machine learning modeling process, wherein the configuration information is configured to represent an execution strategy of the at least part of the machine learning modeling process, and the configuration information comprises a first part and a second part, an execution strategy of the first part has been determined, and an execution strategy of the second part is to be determined;

determining the execution strategy of the second part by using automated machine learning; and

executing the at least part of the machine learning modeling process based on the execution strategy of the first part and the determined execution strategy of the second part, to obtain a result corresponding to the at least part of the machine learning modeling process; and

outputting a current execution result to the user in real time during executing the at least part of the machine learning modeling process; and obtaining an adjustment made by the user to the configuration information during executing the at least part of the machine learning modeling process, and executing the at least part of the machine learning modeling process based on the adjusted configuration information,

wherein the method further comprises:

obtaining data description information, wherein the data description information describes at least one of: one or more types of data, attributes of the data, and relationships between the data and the attributes; and

obtaining a data model based on the data description information, the data model configured to structurally represent the data, the attributes and the relationships,

wherein the configuration information is set by the user based on the data model, and the configuration information is configured to represent an execution strategy of implementing the at least part of the machine learning modeling process based on at least one of the data and the attributes represented by the data model,

wherein determining the execution strategy of the second part by using the automated machine learning comprises:

step A1, obtaining data for executing the at least part of the machine learning modeling process based on the data model;

step A2, assigning a value to the execution strategy of the second part;

step A3, performing the at least part of the machine learning modeling process for the data based on the execution strategy of the first part and the value-assigned execution strategy of the

second part, to obtain a result corresponding to the at least part of the machine learning modeling process;

step A4, evaluating the result; and

obtaining evaluation results of a plurality of execution strategies with different values of the second part based on the steps A1 to A4, and determining an execution strategy with a desired evaluation result as the execution strategy of the second part.

2. The method according to claim 1, wherein determining the execution strategy of the second part by using the automated machine learning comprises:

evaluating a plurality of execution strategies with different values in a decision space of the second part, the decision space is configured to represent a value set of the execution strategies of the second part; and

determining an execution strategy with a desired evaluation result as the execution strategy of the second part.

3. The method according to claim 2, wherein evaluating the plurality of execution strategies with different values in the decision space of the second part comprises:

S1, performing the at least part of the machine learning modeling process based on the execution strategy of the first part and a value-assigned execution strategy of the second part to obtain a result corresponding to the at least part of the machine learning modeling process;

S2, evaluating the result;

S3, re-assigning a value to the execution strategy of the second part based on an evaluation result; and

repeating S1-S3 until a predetermined condition is satisfied, to obtain evaluation results of the plurality of execution strategies with different values of the second part.

4. The method according to claim 1, wherein obtaining the evaluation results of the plurality of execution strategies with different values of the second part based on the steps A1 to A4 and determining the execution strategy with the desired evaluation result as the execution strategy of the second part comprises:

step A5, re-assigning a value to the execution strategy of the second part based on an evaluation result; and

repeating the steps A3 to A5 until a predetermined condition is satisfied, and determining the execution strategy with the desired evaluation result as the execution strategy of the second part.

5. The method according to any of claims 1 to 4, wherein executing the at least part of the machine learning modeling process based on the execution strategy of the first part and the determined execution strategy of the second part to obtain the result corresponding to the at least part of the machine learning modeling process comprises:

obtaining data for executing the at least part of the machine learning modeling process based

on the data model; and

executing the at least part of the machine learning modeling process for the data based on the execution strategy of the first part and the determined execution strategy of the second part, to obtain the result corresponding to the at least part of the machine learning modeling process.

6. The method according to claim 1, wherein,

the first part comprises one or more first execution steps, and the first execution step comprises a first input, a first processing function, and a first output;

the second part comprises one or more second execution steps, the second execution step comprises a second input, a second processing function, and a second output, and at least one of the second input, the second processing function and the second output is to be determined.

7. The method according to claim 6, wherein,

the first input comprises one or more first entities, the first entity is configured to perform at least one of: representing an object with a predetermined meaning in a machine learning field; and performing a predetermined action;

the second input comprises one or more second entities, the second entity is configured to perform at least one of: representing an object with a predetermined meaning in the machine learning field; and performing a predetermined action.

8. The method according to claim 7, wherein at least one of the first entity and the second entity comprises at least one of:

a data entity, configured to represent data in a machine learning context, capable of performing an action of obtaining actual data;

an attribute entity, configured to represent an attribute of a data entity, capable of performing an action of obtaining actual data corresponding to the attribute;

a constant entity, configured to represent a constant, and having a value of the constant stored therein;

a variable entity, configured to represent a variable, and having a value of the variable stored therein; and

a model entity, configured to represent a model in the machine learning context, capable of performing at least one of: training a model, and predicting by using the model.

9. The method according to claim 8, wherein the second entity further comprises a decision entity, the decision entity is configured to represent a decision expected to be determined by a machine, capable of performing at least one of: generating a decision, and obtaining an optimal decision.

10. The method according to claim 9, wherein the configuration information further comprises an optimization step with a determined execution strategy, an input of the optimization step comprises the result of the at least part of the machine learning modeling process, a

processing function of the optimization step is a target definition function, the target definition function is configured to evaluate the result to obtain a target entity, the target entity is configured to represent an evaluation result, and the target entity is capable of executing at least one of: optimizing the evaluation result and calculating the evaluation result.

11. The method according to claim 10, wherein determining the execution strategy of the second part by using the automated machine learning comprises: executing the optimization step, wherein executing the optimization step comprises:

step B1, performing an actual data obtaining action on at least one of: an original data entity and an original attribute entity for executing the at least part of the machine learning modeling process, to obtain corresponding actual data;

step B2, performing a decision generation action on the decision entity to obtain a value of the decision entity;

step B3, performing the at least part of the machine learning modeling process for the actual data based on the execution strategy of the first part and a value-assigned execution strategy of the second part to obtain a result corresponding to the at least part of the machine learning modeling process;

step B4, performing a result evaluation action on the target entity;

obtaining evaluation results of a plurality of values of the decision entity based on the steps B1 to B4, and determining a value with a desired evaluation result as an optimal decision of the decision entity.

12. The method according to claim 11, wherein executing the at least part of the machine learning modeling process based on the execution strategy of the first part and the determined execution strategy of the second part to obtain the result corresponding to the at least part of the machine learning modeling process comprises:

performing an actual data obtaining action on at least one of: an original data entity and an original attribute entity for executing the at least part of the machine learning modeling process, to obtain corresponding actual data;

obtaining an optimal decision of the decision entity; and

performing the at least part of the machine learning modeling process for the actual data based on the execution strategy of the first part and the determined execution strategy of the second part, to obtain the result corresponding to the at least part of the machine learning modeling process.

13. The method according to any of claims 1 to 12, further comprising:

translating the configuration information into a language or an instruction corresponding to a back-end engine.

14. The method according to claim 13, wherein the back-end engine includes a computational

graph engine and an execution engine, and the method further comprises:

generating, by the computational graph engine, a first computational graph based on the language or the instruction, wherein the first computational graph is configured to represent an implementation flow of determining the execution strategy of the second part;

wherein determining the execution strategy of the second part by using automated machine learning comprises:

determining the execution strategy of the second part by calling, by the computational graph engine, the execution engine to execute the first computational graph.

15. The method according to claim 14, further comprising:

generating, by the computational graph engine, a second computational graph based on the language or the instruction, wherein the second computational graph is configured to represent an implementation flow of at least part of the machine learning modeling process;

wherein executing the at least part of the machine learning modeling process based on the execution strategy of the first part and the determined execution strategy of the second part to obtain the result corresponding to the at least part of the machine learning modeling process comprises:

obtaining the result corresponding to the at least part of the machine learning modeling process by calling, by the computational graph engine, the execution engine to execute the second computational graph.

16. A system for implementing a machine learning modeling process, comprising:

an interaction device, configured to obtain configuration information set by a user for at least part of the machine learning modeling process, wherein the configuration information is configured to represent an execution strategy of the at least part of the machine learning modeling process, and the configuration information comprises a first part and a second part, an execution strategy of the first part has been determined, and an execution strategy of the second part is to be determined; and

a machine learning processing device, configured to determine the execution strategy of the second part by using automated machine learning, and execute the at least part of the machine learning modeling process based on the execution strategy of the first part and the determined execution strategy of the second part to obtain a result corresponding to the at least part of the machine learning modeling process;

wherein the interaction device is further configured to output a current execution result to the user in real time during executing the at least part of the machine learning modeling process; obtain an adjustment made by the user to the configuration information during executing the at least part of the machine learning modeling process, and the machine learning processing device is further configured to execute the at least part of the machine learning modeling process based on

the adjusted configuration information; obtain data description information, wherein the data description information describes at least one of: one or more types of data, attributes of the data, and relationships between the data and the attributes; and

obtain a data model based on the data description information, the data model configured to structurally represent the data, the attributes and the relationships,

wherein the configuration information is set by the user based on the data model, and the configuration information is configured to represent an execution strategy of implementing the at least part of the machine learning modeling process based on at least one of the data and the attributes represented by the data model,

wherein determining the execution strategy of the second part by using the automated machine learning comprises:

step A1, obtaining data for executing the at least part of the machine learning modeling process based on the data model;

step A2, assigning a value to the execution strategy of the second part;

step A3, performing the at least part of the machine learning modeling process for the data based on the execution strategy of the first part and the value-assigned execution strategy of the second part, to obtain a result corresponding to the at least part of the machine learning modeling process;

step A4, evaluating the result; and

obtaining evaluation results of a plurality of execution strategies with different values of the second part based on the steps A1 to A4, and determining an execution strategy with a desired evaluation result as the execution strategy of the second part.

17. A computer-readable storage medium having instructions stored thereon, wherein when the instructions are executed by at least one computing device, the at least one computing device is caused to perform the method according to any of claims 1 to 15.