CLAIMS

What is claimed is:

1. A query processing method, comprising:

determining query types of L queries to be performed on a target dataset, the target dataset including data of an object;

determining query sensitivity of each query type of the query types for the target dataset; and

determining, based on query sensitivity corresponding to each query of the L queries and a privacy budget parameter predetermined for a total set of the L queries, a noise power allocated to each query of the L queries, the determining comprising:

determining a sum of query sensitivities of the L queries based on the query sensitivity of each query; and

for any query, determining the noise power allocated to the query based on the query sensitivity of the query, the sum of the query sensitivities, and the privacy budget parameter.

2. The method according to claim 1, wherein the determining the query types of the L queries to be performed on the target dataset includes:

receiving L query requests for the target dataset, wherein each query request indicates a query type of the query request.

3. The method according to claim 1, wherein the determining the query types of the L queries to be performed on the target dataset includes:

obtaining a preconfigured number L of queries performable on the target dataset and a query type of each of the queries.

4. The method according to claim 1, wherein a query type is any one of following: a counting query, a maximum value query, a minimum value query, a mean value query, or a variance query.

5. The method according to claim 1, wherein the object is any one of following: a user, a commodity, or a business event.

6. The method according to claim 5, wherein the business event is any one of following:

registration, access, login, or payment.

7. The method according to claim 1, wherein the object is a user, and the data of the object is any one of following: age, gender, income, interests and hobbies, physiological indicators, or operation indicators.

8. The method according to claim 1, wherein the determining the query sensitivity of each query type of the query types for the target dataset includes:

for each query type of the query types, obtaining the query sensitivity corresponding to the query type based on a greatest absolute difference between a first result and a second result, wherein the first result is a result obtained by performing the type of query on the target dataset, and the second result is a result obtained by performing the type of query on an adjacent dataset of the target dataset.

9. The method according to claim 1 or 8, wherein the query types include a counting query, and the determining the query sensitivity of each query type of the query types for the target dataset includes:

determining the query sensitivity of the counting query to be a value of 1.

10. The method according to claim 1 or 8, wherein the query types include a maximum value query or a minimum value query, and the determining the query sensitivity of each query type of the query types for the target dataset includes:

determining a greatest value and a smallest value in the target dataset; and

determining a result of subtracting the smallest value from the greatest value as the query sensitivity of the maximum value query or the minimum value query.

11. The method according to claim 1 or 8, wherein the query types include a mean value query, and the determining the query sensitivity of each query type of the query types for the target dataset includes:

determining a greatest value in the target dataset; and

determining a ratio between an absolute value of the greatest value and an amount of data in the target dataset plus 1 as the query sensitivity of the mean value query.

12. The method according to claim 1 or 8, wherein the query types include a variance query, and

the determining the query sensitivity of each query type of the query types for the target dataset includes:

determining a greatest value and a smallest value in the target dataset; and

determining a product of following factors as the query sensitivity of the variance query: a square of a difference between the greatest value and the smallest value, an amount of data in the target dataset, and a reciprocal of a result obtained after a square operation is performed on the amount of data plus 1.

13. The method according to claim 1, wherein the determining the noise power allocated to the query based on the query sensitivity of the query, the sum of the query sensitivity, and the privacy budget parameter includes:

obtaining a variable value of a mean variable, wherein the variable value is determined based on a parameter value of the privacy budget parameter and a constraint relationship between the privacy budget parameter and the mean variable in a Gaussian mechanism of differential privacy; and

determining a product of following factors as the noise power of the query: the query sensitivity of the query, the sum of the query sensitivity, and a reciprocal of a result obtained after a square operation is performed on the variable value.

14. The method according to claim 1, wherein the privacy budget parameter includes a budget parameter and a relaxation parameter.

15. The method according to claim 1, further comprising: after determining the noise power allocated to each query,

for a target query in the L queries, determining an actually returned result of the target query by adding to an original query result of the target query a target noise sampled from a target noise distribution of differential privacy, wherein the target noise distribution is determined based on a noise power allocated to the target query.

16. The method according to claim 15, wherein the target noise distribution is Gaussian noise distribution, and the Gaussian noise distribution uses the noise power of the target query as a variance and uses 0 as a mean.

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

receiving a current query request for the target dataset, wherein the current query request corresponds to a current query type;

determining whether a number of processed requests corresponding to the current query type is less than a predetermined threshold, wherein query requests corresponding to the number of processed requests are directed to the target dataset; and

using the current query request as the target query in response to determining that the number of processed requests is less than the predetermined threshold.

18. A query processing apparatus, comprising:

a query type determining unit, configured to determine query types of L queries to be performed on a target dataset, the target dataset including data of a business object;

a sensitivity determining unit, configured to determine query sensitivity of each query type of the query types for the target dataset; and

a noise power determining unit, configured to determine, based on the query sensitivity corresponding to each query and a privacy budget parameter predetermined for a total set of the L queries, a noise power allocated to each query, the noise power determining unit being configured to:

determine a sum of query sensitivities of the L queries based on the query sensitivity of each query; and

for any query, determine the noise power allocated to the query based on the query sensitivity of the query, the sum of the query sensitivities, and the privacy budget parameter.

19. The apparatus according to claim 18, wherein the query type determining unit is configured to:

receive L query requests for the target dataset, wherein each query request indicates a query type of the query request.

20. The apparatus according to claim 18, wherein the query type determining unit is configured to:

obtain a number L of queries that can be performed that is preconfigured for the target dataset and a query type of each of the queries.

21. The apparatus according to claim 18, wherein the sensitivity determining unit is configured to:

for each query type of the query types, obtain the query sensitivity corresponding to the query type based on a greatest absolute difference between a first result and a second result, wherein the first result is a result obtained by performing the type of query on the target dataset, and the second result is a result obtained by performing the type of query on an adjacent dataset of the target dataset.

22. The apparatus according to claim 18, further comprising:

an actual result determining unit, configured to: for a target query in the L queries, determine an actually returned result of the target query as an original query result of the target query added with a target noise sampled from a target noise distribution of differential privacy, wherein the target noise distribution is determined based on the noise power allocated to the target query.

23. The apparatus according to claim 22, further comprising a target query determining unit, configured to:

receive a current query request for the target dataset, wherein the current query request corresponds to a current query type;

determine whether a number of processed requests corresponding to the current query type is less than a predetermined threshold, wherein query requests corresponding to the number of processed requests are directed to the target dataset; and

use the current query request as the target query in response to determining that the number of processed requests is less than the predetermined threshold.

24. A computer-readable storage medium, the computer-readable storage medium storing a computer program, wherein when the computer program is executed in a computer, the computer is enabled to perform the method according to any one of claims 1 to 17.