

ESTIMATION SYSTEM, DATA COMBINING SYSTEM,
AND RELATED METHODS

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This international application claims the benefit of Japanese Patent Application No. 2019-062455, filed on March 28, 2019 in the Japan Patent Office, and the entire disclosure of Japanese Patent Application No. 2019-062455 is incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to an estimation system, a data combining system, and related methods.

BACKGROUND ART

[0003] Consumer behaviors have conventionally been analyzed. For example, purchase behaviors of consumers have been analyzed to estimate prospective buyers of products. A technology to combine two or more types of data in relation to one individual by using integrated identification information is also known (see, Patent Document 1).

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0004] Patent Document 1: Japanese Unexamined Patent Application Publication No. 2018-005536

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] However, those conventional methods of collecting and combining two or more types of data cannot analyze features of individuals whose data are lacking.

[0006] Desirably, one aspect of the present disclosure can provide a technology to estimate a feature of a target indirectly from obtainable data.

MEANS FOR SOLVING THE PROBLEMS

[0007] An estimation system according to one aspect of the present disclosure includes a first acquisition unit, a second acquisition unit, a model construction unit, a target-data acquisition unit, and an estimation unit. The first acquisition unit is configured to obtain first data. The first data includes one of data with respect to two or more first targets representing a first feature of each of the two or more first targets, or data representing the two or more first targets having the first feature in common.

[0008] The second acquisition unit is configured to obtain second data representing a second feature of each of the two or more first targets. The model construction unit is configured to construct, based on the first feature and the second feature of each of the two or more first targets determined from the first data and the second data, an estimation model configured to estimate the first feature from the second feature.

[0009] The target-data acquisition unit is configured to obtain target data representing the second feature of a second target. The estimation unit is configured to estimate the first feature of the second target based on the target data through use of the estimation model.

[0010] Even in a circumstance where data in relation to the first feature of the second target cannot be obtained, this estimation system can estimate the first feature of the second target based on data representing the second feature commonly possessed by the first target and the second target. Thus, this estimation system enables an indirect estimation of the first feature of the second target that cannot be directly determined.

[0011] According to one aspect of the present disclosure, the first target may be a person, and the second target may be a person. The second feature may be a feature in relation to a telecommunication-involving behavior of the

person. The second acquisition unit may obtain, as the second data, first behavior-history data in relation to each of the two or more first targets from a database system. The target-data acquisition unit may obtain, as the target data, second behavior-history data in relation to the second target from the database system. The database system may store, with respect to two or more persons, behavior history data in relation to the telecommunication-involving behavior of each of the two or more persons, where the first behavior-history data and the second behavior-history data may be stored as the behavior-history data.

[0012] According to one aspect of the present disclosure, the telecommunication-involving behavior may be a behavior of an associated person where related information of the behavior of the associated person is transmitted to the database system through telecommunication, and where the behavior of the associated person is recorded in the behavior history data based on the related information.

[0013] According to one aspect of the present disclosure, the telecommunication-involving behavior may be an online behavior, where the online behavior is a behavior of the associated person in an online space. The behavior history data of each of the two or more persons in the database system may include online behavior history data in relation to the online behavior of an associated person. The online behavior history data may be stored in connection with an online identifier of the associated person.

[0014] According to one aspect of the present disclosure, the first data may include information that enables discrimination of the online identifier associated with each of the two or more first targets. The second acquisition unit may obtain, as the second data, online behavior history data connected with the online identifier associated with each of the two or more first targets from the database system.

[0015] According to one aspect of the present disclosure, in response to an input of data that enables discrimination of an online identifier associated with the

second target, the target-data acquisition unit may obtain, as the target data, the online behavior history data connected with the online identifier associated with the second target from the database system.

[0016] According to one aspect of the present disclosure, the online behavior may include an access behavior to web pages.

[0017] According to one aspect of the present disclosure, the telecommunication-involving behavior may be an offline behavior of the associated person detected by an electronic device disposed in a real space. Information in relation to an offline behavior of the associated person detected by the electronic device may be transmitted to the database system through telecommunication. The behavior history data of each of the two or more persons in the database system may include offline behavior history data in relation to a behavior of the associated person detected by the electronic device.

[0018] According to one aspect of the present disclosure, the first feature maybe a dynamic feature. Similarly, the second feature may be a dynamic feature. The first data may include information that enables discrimination of a change in the first feature. The second data may include information that enables discrimination of a change in the second feature. The target data may include information that enables discrimination of a change in the second feature.

[0019] Based on the change in the first feature and the change in the second feature, the model construction unit may be configured to construct an estimation model configured to estimate a change in the first feature from a change in the second feature. The estimation unit may be configured to estimate a change in the first feature of the second target based on the target data through use of the estimation model. A load of collecting data in relation to a dynamic feature is higher than a load of collecting data in relation to a static feature. Thus, it is valuable that a change in a dynamic feature can be estimated.

- [0020] According to one aspect of the present disclosure, each of the two or more first targets and the second target may be a person. The person may be construed as one of an individual, or a cluster including two or more individuals. According to one aspect of the present disclosure, each of the two or more first targets and the second target may be a consumer. The consumer may be one of an individual or a cluster including two or more individuals.
- [0021] According to one aspect of the present disclosure, the first feature may be a feature in relation to a first behavior of the consumer. The second feature may be a feature in relation to a second behavior of the consumer.
- [0022] According to one aspect of the present disclosure, the first data may be data representing behavior history in relation to the first behavior of each of the two or more first targets. The second data may be data representing behavior history in relation to the second behavior of each of the two or more first targets. The target data may be data representing behavior history in relation to the second behavior of the second target.
- [0023] The model construction unit may be configured to construct an estimation model configured to estimate a change of state in relation to the first behavior of the second target from the target data based on a behavior history in relation to the first behavior of each first target determined in accordance with the first data, and based on a behavior history in relation to the second behavior of each first target determined in accordance with the second data.
- [0024] According to one aspect of the present disclosure, the first feature may be a feature in relation to presence or absence of execution of a first behavior. Based on the second feature of each of the two or more first targets, the model construction unit may be configured to construct, as the estimation model, an estimation model configured to estimate a possibility of execution of the first behavior from the second feature. The estimation unit may be configured to estimate a possibility that the second target executes the first behavior

through use of the estimation model.

[0025] The estimation system may include a third acquisition unit configured to obtain third data with respect to two or more second targets representing a third feature of each of the two or more second targets. The target-data acquisition unit may be configured to obtain data representing the second feature of each of the two or more second targets as the target data. The estimation unit may estimate the first feature of each of the two or more second targets based on the target data through use of the estimation model. The estimation unit may be configured to output data representing the first feature and the third feature of each of the two or more second targets as data expanded from the third data.

[0026] According to one aspect of the present disclosure, an estimation system may be provided. The estimation system includes a first acquisition unit configured to obtain first data representing two or more first targets having a common feature in relation to presence or absence of execution of a first behavior; a second acquisition unit configured to obtain second data representing a feature in relation to a second behavior of each of the two or more first targets determined from the first data; a model construction unit configured to construct, based on a feature in relation to the second behavior of each of the two or more first targets determined from the second data, an estimation model configured to estimate a possibility of execution of the first behavior from a feature in relation to the second behavior as the estimation model; a target-data acquisition unit configured to obtain target data representing a feature in relation to the second behavior of a second target; and an estimation unit configured to estimate a possibility that the second target executes the first behavior based on the target data through use of the estimation model.

[0027] According to one aspect of the present disclosure, a data combining system may be provided. A data supply system may include a first acquisition unit, a second acquisition unit, a third acquisition unit, a fourth

acquisition unit, and a data combining unit.

[0028] In the data combining system, the first acquisition unit may be configured to obtain two or more sets of first feature data in relation to two or more first targets. Each of the two or more sets of first feature data may represent a first feature of an associated first target.

[0029] The second acquisition unit may be configured to obtain two or more sets of second feature data in relation to the two or more first targets. Each of the two or more sets of second feature data may represent a second feature of an associated first target.

[0030] The third acquisition unit may be configured to obtain two or more sets of third feature data in relation to the two or more second targets. Each of the two or more sets of third feature data may represent a third feature of an associated second target.

[0031] The fourth acquisition unit may be configured to obtain two or more sets of fourth feature data in relation to the two or more second targets. Each of the two or more sets of fourth feature data may represent the second feature of an associated second target.

[0032] The data combining unit may be configured to determine two or more combinations of a first target and a second target based on the second feature of each of the two or more first targets determined from the two or more sets of second feature data and based on the second feature of each of the two or more second targets determined from the two or more sets of fourth feature data, where each of the combinations of the first target and the second target has at least a similarity in the second feature.

[0033] The data combining unit may be configured to connect first feature data of an associated first target with third feature data of an associated second target for each combination, and to generate a combined database representing the first feature and the third feature of each combination.

[0034] This data combining system can connect the first feature with the third feature based on the similarity in the second feature. Thus, in a circumstance

where the first feature of the second target cannot be determined directly from the data, the first feature of the second target can be indirectly estimated from the combined database.

[0035] According to one aspect of the present disclosure, the data combining unit may be configured to connect the first feature data of the associated first target with the third feature data of the associated second target for each combination via second feature data of the associated first target and fourth feature data of the associated second target. The data combining unit may be configured to accordingly generate, as the combined database, a combined database representing the first feature, the second feature, and the third feature for each combination.

[0036] According to one aspect of the present disclosure, each of the two or more first targets and the second target in the data combining system may be a person. The person may be construed to be one of an individual or a cluster including two or more individuals. The second feature may be a feature in relation to a telecommunication-involving behavior of the person. The second feature may be a feature in relation to an online behavior.

[0037] According to one aspect of the present disclosure, the second acquisition unit may be configured to obtain, as the two or more sets of second feature data, behavior history data connected with an online identifier associated with each of the two or more first targets from database system; the database system stores, with respect to two or more online users, behavior history data in relation to an online behavior of each of the two or more online users in connection with an online identifier of an associated online user. In this case, the two or more sets of first feature data may include information that enables discrimination of an online identifier associated with each of the two or more first targets.

[0038] The fourth acquisition unit may be configured to obtain, as the two or more sets of fourth feature data, behavior history data connected with an online identifier associated with each of the two or more second targets from

the database system. In this case, the two or more sets of third feature data may include information that enables discrimination of an online identifier associated with each of the two or more second targets.

[0039] According to one aspect of the present disclosure, a computer-implemented estimation method may be provided. The estimation method may include obtaining first data including one of data with respect to two or more first targets representing a first feature of each of the two or more first targets, or data representing the two or more first targets having the first feature in common; obtaining second data representing a second feature of each of the two or more first targets; constructing, based on the first feature and the second feature of each of the two or more first targets determined from the first data and the second data, an estimation model configured to estimate the first feature from the second feature; obtaining target data representing the second feature of a second target; and estimating the first feature of the second target based on the target data through use of the estimation model.

[0040] According to one aspect of the present disclosure, a computer-implemented estimation method may be provided. The estimation method may include obtaining the first data representing two or more first targets having a common feature in relation to presence or absence of execution of a first behavior; obtaining second data representing a feature in relation to a second behavior of each of the two or more first targets determined from the first data; constructing, as the estimation model, based on the feature in relation to the second behavior of each of the two or more first targets determined from the second data, an estimation model configured to estimate a possibility of execution of the first behavior from the feature in relation to the second behavior; obtaining target data representing a feature in relation to the second behavior of the second target; and estimating a possibility that the second target executes the first behavior based on the target data through use of the estimation model.

[0041] According to one aspect of the present disclosure, a computer-implemented data combination method may be provided. The data combination method may include obtaining two or more sets of first feature data in relation to two or more first targets, each of the two or more sets of first feature data representing a first feature of an associated first target; obtaining two or more sets of second feature data in relation to the two or more first targets, each of the two or more sets of second feature data representing a second feature of an associated first target; obtaining two or more sets of third feature data in relation to two or more second targets, each of the two or more sets of third feature data representing a third feature of an associated second target; obtaining two or more sets of fourth feature data in relation to two or more second targets, each of the two or more sets of fourth feature data representing the second feature of an associated second target; connecting the first feature data of the first target with the third feature data of the second target for two or more combinations of a first target and a second target based on the second feature of each of the two or more first targets determined from the two or more sets of second feature data and based on the second feature of each of the two or more second targets determined from the two or more sets of fourth feature data, wherein each of the two or more combinations of the first target and the second target has at least a similarity in the second feature; and generating a combined database representing the first feature and the third feature of each combination.

[0042] According to one aspect of the present disclosure, a computer program including instructions to cause a computer to perform the aforementioned estimation method may be provided. According to one aspect of the present disclosure, a computer program including instructions to cause a computer to perform the aforementioned data combination method may be provided.

[0043] According to one aspect of the present disclosure, a computer program including instructions to cause a computer to perform a process responding to the aforementioned estimation system may be provided. According to one

aspect of the present disclosure, a computer program including instructions to cause a computer to perform a process responding to the aforementioned data combining system may be provided.

[0044] According to one aspect of the present disclosure, the computer program may be recorded in a non-transitory computer readable recording medium.

BRIEF DESCRIPTION OF THE DRAWINGS

[0045] FIG. 1 is a diagram describing an estimation method of a first embodiment.

FIG. 2 is a diagram describing system configuration and peripheral configuration of an information processing system of the first embodiment.

FIG. 3 is a flowchart showing a model construction process performed by a processor.

FIG. 4 is an explanatory diagram illustrating an estimation model structuring.

FIG. 5 is a flowchart showing an estimation process performed by the processor.

FIG. 6 is a flowchart showing a model construction process of a second embodiment.

FIG. 7A is a diagram showing a structure of a purchase history database after expansion.

FIG. 7B is a diagram showing a structure of a purchase history database after expansion.

FIG. 8 is an explanatory diagram illustrating discrimination of a change of state.

FIG. 9 is a flowchart showing estimation process of the second embodiment.

FIG. 10A is a diagram showing a structure of a client database before and after expansion.

FIG. 10B is a diagram showing a structure of a client database of a

different example, including client data of individual clusters.

FIG. 11 is a diagram illustrating system configuration and peripheral configuration of an information processing system of a third embodiment.

FIG. 12 is a diagram illustrating a data combination method of the third embodiment.

FIG. 13 is a flowchart showing a data combination process performed by a processor.

FIG. 14 is a diagram showing a structure of a first behavior database before and after expansion.

FIG. 15 is a diagram showing a structure of a second behavior database before and after expansion.

FIG. 16 is a diagram illustrating a structure of a combined database.

FIG. 17A is a diagram illustrating a method for collecting data in relation to an online behavior.

FIG. 17B is a diagram illustrating a method of collecting data in relation to an offline behavior.

EXPLANATION OF REFERENCE NUMERALS

[0046] 1...information processing system; 11...processor; 13...memory; 15...storage; 17...communication interface; 20...data collecting system; 30...user system; 40...purchase-data collecting system; 50...first behavior-data collecting system; 60...online-behavior-data collecting system; 70...second behavior-data collecting system; B1, B2, B3...purchase history database; B5, B6, B7...client database; B11, B12...first behavior database; B21, B22...second behavior database; B30...combined database; D1...first data; D2...second data; D3...online behavior data; D4...teacher data; D5...score data; D7...offline behavior data; D11...first behavior data; D12...expanded first behavior data; D21...second behavior data; D22...expanded second behavior data; L1...first consumer list; L2...second consumer list; M...estimation model; EL...electronic device;

TM...communication terminal.

MODE FOR CARRYING OUT THE INVENTION

[0047] Hereinafter, example embodiments of the present disclosure will be explained with reference to the drawings.

[0048] [First Embodiment]

As shown in FIG. 1, an information processing system 1 of the present embodiment is configured to estimate a first behavior of a second consumer group C2 based on first data D1 on a first behavior of a first consumer group C1, and second data D2 on a second behavior of the first consumer group C1 and a second behavior of the second consumer group C2.

[0049] The information processing system 1 constructs an estimation model M for estimating the first behavior from the second behavior based on a relationship between the first behavior of the first consumer group C1 determined from the first data D1 and the second behavior of the first consumer group C1 determined from the second data D2.

[0050] The information processing system 1 estimates the first behavior of the second consumer group C2 based on the estimation model M, and the second behavior of the second consumer group C2 determined from the second data D2. The estimation includes estimating a past behavior and predicting a future behavior.

[0051] As shown in FIG. 2, the information processing system 1 includes a processor 11, a memory 13, a storage 15, and a communication interface 17. The processor 11 is configured to perform a process in accordance with a computer program stored in the storage 15.

[0052] The memory 13 includes a ROM and a RAM. The storage 15 stores the computer program, and various data. Examples of the storage 15 include a hard disk drive, and a solid-state drive.

[0053] The communication interface 17 is configured to be communicable with an external device through a network. The information processing system 1

is configured to be communicable with a data collecting system 20 through the communication interface 17. The data collecting system 20 is configured to collect data in relation to consumers. The information processing system 1 is further configured to be communicable with a user system 30. The user system 30 is an information processing system for a user who uses a service provided by the information processing system 1.

[0054] The information processing system 1 obtains the first data D1 on the first behavior of the first consumer group C1 from the user system 30 through telecommunication. The information processing system 1 further obtains, from the data collecting system 20, the second data D2 on the second behavior of the first consumer group C1 and the second behavior of the second consumer group C2. The information processing system 1 estimates the first behavior of the second consumer group C2 based on the first data D1 and the second data D2. The information processing system 1 provides the user system 30 with an estimation result.

[0055] Specific examples of the processes performed by the information processing system 1 will be explained with reference to a model construction process shown in FIG. 3 and an estimation process shown in FIG. 5. The model construction process and the estimation process are performed by the processor 11.

[0056] In these specific examples, the first behavior is a use-contract behavior of a consumer on a specific service provided for the consumer by a company, which corresponds to the user system 30. The second behavior is an online behavior of the consumer, in particular, an access behavior to a web page. The online behavior corresponds to a telecommunication-involving behavior of the consumer.

[0057] In specific examples described in FIG. 3 and FIG. 4, the information processing system 1 is configured to construct the estimation model M based on the online behavior of the consumer who has a record of making a use contract, and calculate a score in relation to a possibility of making a use

contract from the online behavior of the consumer who has no record of making a use contract through use of the estimation model M.

[0058] In present days, many consumers access the internet and browse web pages. Thus, data regarding the online behavior can be collected from many consumers. Furthermore, with a cookie (cookie) technology, data regarding the online behavior, such as web page access behavior, can be collected relatively easily. Due to these reasons, it is helpful to employ the online behavior as the second behavior in constructing a highly accurate estimation model M in relation to the first behavior.

[0059] The processor 11 starts the model construction process shown in FIG.3 in response to receiving an execution command for the model construction process from the user system 30 through the network.

[0060] In the model construction process, the processor 11 receives a first consumer list L1, which is a list of the first consumer group C1, from the user system 30 (S110). The first consumer list L1 shows consumers who have the record of making a use contract of the specific service among the consumers of the company that corresponds to the user system 30. For example, the first consumer list L1 is formed to list client IDs of the consumers. The client IDs are, for example, those administered by a company who provides the first consumer list L1.

[0061] In the subsequent S120, the processor 11 converts each client ID of the consumers listed in the first consumer list L1 to a cookie ID with reference to a conversion table (S120). The processor 11 can obtain the conversion table from the data collecting system 20. The cookie ID is an identifier issued to an online user (more specifically, to a web browser) based on the cookie technology.

[0062] The client ID and the cookie ID can be associated with each other with a support of the company who provides the first consumer list L1, for example. Such association can be achieved by embedding, into a web page of the company, a tag for issuing a cookie administered by the data collecting system

20.

[0063] In the subsequent S130, the processor 11 obtains, from the data collecting system 20, online behavior data D3 of each of the consumers listed in the first consumer list L1 based on the cookie ID. The data collecting system 20 stores the online behavior data D3 of the online users in connection with the associated cookie ID.

[0064] The data collecting system 20 is configured to generate and store the online behavior data D3 of the online users through the issuance of the cookie and behavior analyses of the online users performed with the cookie. The data collecting system 20 is configured to provide the information processing system 1 with the online behavior data D3 that is associated with the cookie ID designated by the information processing system 1.

[0065] The online behavior data D3 includes access history data of an associated online user to a web page, and data representing an affinity category of the associated online user. The access history data is behavior history data in relation to the access behavior of the associated online user to the web page.

[0066] More specifically, the access history data includes, for every web page accessed by the associated online user, identification information of the web page, and information on date and time of the access. The affinity category represents a category that interests and attracts the associated online user.

[0067] In the subsequent S140, the processor 11 uses two or more sets of the online behavior data D3 associated with the consumers in the first consumer list L1 and constructs the estimation model M for calculating the possibility of making a use contract of the specific service from the two or more sets of the online behavior data D3.

[0068] More specifically, the processor 11 can generate two or more sets of teacher data D4 based on the online behavior data D3 of the consumers who have the record of making a use contract obtained in S130. As shown in FIG. 4, each teacher data D4 may be a combination of a web page access history

and the affinity category of the consumer determined from the associated online behavior data D3, and the score in relation to the possibility of making a use contract.

[0069] For example, in the teacher data D4, the web page access history can be represented in an array of numerical values showing existence or nonexistence of access to individual web pages or an array of the numbers of access to individual web pages. The score can be represented in use-contract probability (%). All of the consumers in the first consumer list L1 have the record of making a use contract. Thus, the score can be set to a value 100. Two or more sets of the teacher data D4 may include teacher data on a consumer who have no record of contract; the teacher data is generated based on the online behavior data D3 of the consumer who is not included in the first consumer list L1.

[0070] As a consequence of machine learning using the aforementioned two or more sets of the teacher data D4, the processor 11 can construct the estimation model M for calculating the score in relation to the use-contract probability in response to an input of the web page access history and the affinity category. The estimation model M is a mathematical model. Examples of the estimation model M include a logistic regression model, a Bayesian inference model, and a neural network model.

[0071] In the subsequent S150, the processor 11 outputs the constructed estimation model M. Then, the processor 11 ends the model construction process. In 150, the processor 11 can store the estimation model M in the memory 13 or the storage 15. Alternatively, the processor 11 can transmit the estimation model M to the user system 30.

[0072] The processor 11 further starts the estimation process shown in FIG. 5 in response to receiving an execution command for the estimation process from the user system 30 through the network.

[0073] Once the estimation process is started, the processor 11 receives a second consumer list L2, which is a list of the second consumer group C2,

from the user system 30 (S210). The second consumer list L2 shows consumers who are subjects for an estimation of the possibility of making a use contract of the aforementioned specific service. The second consumer list L2 is also configured to include a list of the client IDs of the consumers similarly to the first consumer list L1.

[0074] In the subsequent S220, the processor 11 converts each of the client IDs of the consumers listed in the second consumer list L2 to cookie IDs likewise the process in S120. In the subsequent S230, the processor 11 obtains, from the data collecting system 20, the online behavior data D3 of each of the consumers listed in the second consumer list L2 based on the cookie ID.

[0075] In the subsequent S240, the processor 11 obtains the estimation model M. In S240, the processor 11 can obtain the estimation model M from the user system 30. Alternatively, the processor 11 can obtain the estimation model M by reading the estimation model M of the user system 30, which is constructed and stored in the storage 15 in the model construction process, from the storage 15.

[0076] In the subsequent S250, the processor 11 calculates the score in relation to the use-contract probability of each of the consumers listed in the second consumer list L2 through use of the estimation model M. For each of the consumers, the processor 11 can calculate the score of the associated consumer by inputting, in the estimation model M, the combination of the web page access history and the affinity category determined by the online behavior data D3 of the associated consumer. The processor 11 thereby estimates the possibility of making a use contract of the specific service for each of the consumers in the second consumer group C2.

[0077] In the subsequent S260, the processor 11 transmits score data D5 to a transmission source of the second consumer list L2. The score data D5 is data of the second consumer list L2 plus the score associated with each consumer in the second consumer list L2. Then, the processor 11 ends the estimation process.

[0078] In the information processing system 1 of the present embodiment explained above, the first consumer list L1 representing the consumers having a common feature in relation to the use contract, more specifically, the consumers having a record of making a use contract, can be obtained (S110). The online behavior data D3 that shows the feature in relation to the online behavior of each consumer in the first consumer list L1 is obtained (S130).

[0079] In addition, based on the feature in relation to the use contract and the feature in relation to the online behavior of each consumer in the first consumer list L1, the processor 11 constructs the estimation model M for estimating the possibility of making a use contract, as a feature in relation to the use contract, from the feature in relation to the online behavior (S140).

[0080] Then, the second consumer list L2 that shows the consumers who are subjects for the estimation of the possibility of making a use contract is obtained (S210). The online behavior data D3 of each consumer in the second consumer list L2 is obtained (S230).

[0081] Consequently, for each of the consumers in the second consumer list L2, the possibility of making a use contract of the associated consumer is estimated based on the online behavior data D3 of the associated consumer (S250). In the information processing system 1 of the present embodiment, the possibility of making a use contract of the second consumer group C2 is thus estimated from the record of making a use contract of the first consumer group C1.

[0082] Through a productive use of obtainable data, the information processing system 1 of the present embodiment can thus estimate consumer behaviors that cannot be determined directly from the obtainable data. This makes the information processing system 1 very valuable.

[0083] [Second Embodiment]

The information processing system 1 of the second embodiment is different from that of the first embodiment in that the processor 11 is configured to perform the model construction process shown in FIG. 6 and

the estimation process shown in FIG. 9 instead of the processes shown in FIG. 3 and FIG. 5. Except for this difference, the information processing system 1 of the second embodiment is configured in a manner similar to that of the first embodiment. Thus, hereinafter, the model construction process and the estimation process performed by the processor 11 will be selectively explained.

[0084] The processor 11 starts the model construction process shown in FIG.6 in response to fulfillment of a given condition. The processor 11 can start the model construction process in accordance with a command from an operator of the information processing system 1.

[0085] Once the model construction process shown in FIG. 6 is started, the processor 11 obtains, from a purchase-data collecting system 40, a purchase history database B1 on a purchase behavior of the first consumer group C1 (S310). The purchase history database B1 includes purchase history data of each of the first consumers.

[0086] The purchase history data includes identification information of a purchased product and information on date and time of the purchase for every purchase of the associated consumer in an online space and an offline space in connection with a consumer ID, which is identification information of the associated consumer.

[0087] The purchase-data collecting system 40 may be a system of a company who operates the information processing system 1, or a system of a different company. The processor 11 can obtain the purchase history database B1 through the network.

[0088] In the subsequent S320, the processor 11 determines the cookie ID of each consumer based on the consumer ID included in the purchase history data of each consumer. Similarly to the first embodiment, the cookie ID can be determined by obtaining the conversion table from the data collecting system 20. The consumer ID and the cookie ID can be associated with each other by embedding a tag into a web page that handles the consumer ID.

[0089] In the subsequent S330, the processor 11 obtains the online behavior data D3 associated with each of the first consumers from the data collecting system 20 based on the cookie ID and expands the purchase history database B1. FIG. 7A shows a purchase history database B2 after the expansion. The purchase history database B2 after the expansion includes records representing the purchase history, the web page access history, and the affinity category for each of the first consumers.

[0090] In the subsequent S340, the processor 11 determines, for each of the first consumers, a change of state of the consumer from the purchase history of the consumer shown in associated records. Consequently, the processor 11 expands the purchase history database B2 to add data representing the change of state to the records of each of the first consumers. The data representing the change of state includes information that enables discrimination of the state of the associated consumer in each point of time.

[0091] FIG. 7B shows a purchase history database B3 after the expansion. The purchase history database B3 after the expansion includes records representing the purchase history, the change of state, the web page access history, and the affinity category for each of the first consumers.

[0092] In the present embodiment, estimation of a probability of change of the second consumer group C2 to a particular state is conceivable. In this case, in S340, the processor 11 can determine a change of each of the first consumers from a non-specific state Z1 to a specific state Z2. For example, the non-specific state Z1 corresponds to a state in which no product of a specific type is purchased; and the specific state Z2 corresponds to a state in which a product of a specific type is purchased. One example of the product of a specific type can be a product in relation to childbirth.

[0093] FIG. 8 conceptually explains a method of determining the change of state. In the example in FIG. 8, the purchase history of the consumer shows that first products represented by circles are purchased prior to time T1 on a timeline, and second products represented by squares are purchased after the

time T1.

[0094] In a case where the purchase history data shows such a change in purchasing, the processor 11 determines that the state is the non-specific state Z1 prior to the time T1, in which the second product is not purchased, and that the state is the specific state Z2 after the time T1, in which the second product is purchased. The processor 11 consequently add, to the records of each consumer in the purchase history database B3, data representing that the state prior to the time T1 is the non-specific state Z1 and the state after the time T1 is the specific state Z2 as the data representing the change of state.

[0095] In the subsequent S350, the processor 11 constructs the estimation model M for estimating the change of state of the consumers from changes in the online behavior. More specifically, the processor 11 creates, as teacher data associated with each record in the purchase history database B3, teacher data representing the web page access history and the affinity category, and the change of state of the consumers.

[0096] In the teacher data, for every divided and defined section of a collection term of the web page access history, the web page access history can be represented in an array of numerical values showing existence or nonexistence of access to individual web pages or an array of the numbers of access to individual web pages. In the teacher data, the change of state of the consumers can be an array that includes values indicating the states of the consumers for every section.

[0097] Based on a group of such teacher data, the processor 11 can construct the estimation model M for estimating the change of state of the consumers from the web page access histories and the affinity categories of the consumers. The estimation model M may be a function that outputs the score in relation to the probability of the change of state of the consumer to a specific state in response to an input of the web page access history and the affinity category.

[0098] In the subsequent S360, the processor 11 stores the constructed

estimation model M in the storage 15. Consequently, the processor 11 ends the model construction process shown in FIG. 6.

[0099] The processor 11 further starts the estimation process shown in FIG. 9 in response to receiving the execution command for the estimation process from the user system 30 through the network. Once the estimation process is started, the processor 11 receives a client database B5 on the second consumer group C2 from the user system 30 (S410).

[0100] The client database B5 includes client data of each of second consumers who are clients of the user. Each client data includes a client ID of an associated consumer, and feature data of the associated consumer. The client ID is an ID administered by a company who uses the user system 30 and is different from the consumer ID included in the purchase history database B1.

[0101] In the subsequent S420, the processor 11 determines a cookie ID that individually corresponds to each of the second consumers based on the client ID included in the client data. In the subsequent S430, the processor 11 obtains, from the data collecting system 20, the online behavior data D3 of each of the second consumers based on the determined cookie ID.

[0102] In the subsequent S440, the processor 11 obtains the estimation model M by reading the estimation model M, constructed and stored in the model construction process, from the storage 15. In the subsequent S450, the processor 11 estimates the change of state of each of the second consumers based on the obtained estimation model M.

[0103] More specifically, the processor 11 can calculate the score in relation to the probability of the change of state to the specific state as a feature amount of the change of state. For each consumer, the processor 11 can calculate the score of the associated consumer by inputting, in the estimation model M, the combination of the web page access history and the affinity category identified from the online behavior data D3 of the associated consumer.

[0104] Consequently, the processor 11 expands the client database B5 by adding data representing the web page access history, the affinity category, and the

estimated change of state of the associated second consumer to the client data included in the client database B5 received in S410. FIG. 10A shows a client database B6 after the expansion.

[0105] The client database B6 after the expansion can include the score in relation to the probability of the change of state of each of the second consumers to the specific state. The processor 11 transmits the client database B6 after the expansion to the user system 30 (S460).

[0106] The information processing system 1 of the present embodiment explained above can add information on the change of state of each consumer (for example, information on the probability of change to a specific state) to the client database B5 of the user.

[0107] As explained above, in the present embodiment, the client ID is converted to the cookie ID and thereby the online behavior data D3 associated with the client is obtained. Based on this online behavior data D3 and the estimation model M constructed in advance, the change of state of the consumer is estimated. The estimation model M is constructed based on a relationship between the change of state determined from the purchase history obtained in advance by data collection and the online behavior of the associated consumer.

[0108] The information processing system 1 of the present embodiment can thus estimate the change of state of the consumer, which can be determined from a change in the purchase behavior, from data on the online behavior which can be collected easier than data on the purchase history.

[0109] In the aforementioned embodiment, personal information is exchanged between the user system 30 and the information processing system 1. However, to protect the personal information, data can be exchanged between the systems not per individual but per cluster, which is a group of individuals.

[0110] For example, the client database B5 provided from the user system 30 to the information processing system 1 does not have to be client data per individual but may be client data per cluster. In this case, client data of each

cluster can be data in which features of clients who belong to the cluster are represented as a statistic along with their client IDs. The statistic may be an average value, for example.

[0111] In such a case, the processor 11 of the information processing system 1 can obtain, for each cluster, the online behavior data D3 that is connected with a cookie ID group associated with a client ID group indicated in the client data. The processor 11 can also calculate a statistic on the change of state for each cluster based on the online behavior data D3 and the estimation model M.

[0112] As shown in FIG. 10B, the processor 11 can be configured to transmit a client database B7 to the user system 30 in S460; the client database B7 includes, for each cluster, the client data represented in statistics, a statistic on the web page access history, a statistic on an affiliate category, and a statistic on the change of state.

[0113] [Third Embodiment]

Hereinafter, the information processing system 1 of a third embodiment will be explained. As shown in FIG. 11, the information processing system 1 of the third embodiment includes the same hardware configuration as the first embodiment. Meanwhile, the information processing system 1 of the third embodiment is different from those of the first embodiment and the second embodiment in that the information processing system 1 of the third embodiment is configured to combine a first behavior database B11, which is in relation to a first behavior of a first consumer group C3 that can be obtained from a first behavior-data collecting system 50, and a second behavior database B21, which is in relation to a second behavior of a second consumer group C4 that can be obtained from a second behavior-data collecting system 70.

[0114] As shown in FIG. 12, the combination is performed on grounds of the online behaviors of the first consumer group C3 and the second consumer group C4 in a circumstance where the first consumer group C3 lacks data on

the second behavior and the second consumer group C4 lacks data on the first behavior. In other words, the information processing system 1 of the present embodiment is configured to connect the data on the first behavior of the first consumers with the data on the second behavior of the second consumers based on similarities in the online behaviors to generate a new combined database B30.

[0115] In the first embodiment and the second embodiment, the features of the consumers are indirectly estimated from the online behavior through use of the estimation model M. In the present embodiment, however, those lacking data on the consumer behaviors is mutually complemented between databases by connecting the databases based on the similarities in the online behaviors, so that the features of the consumers can be indirectly and broadly estimated.

[0116] The combined database B30 can be generated by the processor 11 executing a data combination process shown in FIG. 13. Hereinafter, as an explanation of the information processing system 1 of the present embodiment, contents of the data combination process performed by the processor 11 in accordance with the computer program will be selectively described.

[0117] The processor 11 can start the data combination process shown in FIG.13 in accordance with a command from the operator of the information processing system 1. Once the data combination process is started, the processor 11 obtains the first behavior database B11 from the first behavior-data collecting system 50 (S510). The first behavior-data collecting system 50 is a system that collects data on the first behavior of the first consumer group C3.

[0118] The first behavior database B11 includes first behavior data D11 (see, FIG. 14) for each of the first consumers. The first behavior data D11 represents a feature in relation to the first behavior of the first consumer in connection with the consumer ID which is the identification information of the associated consumer.

[0119] Explanations hereinafter will be given on a premise that the first

behavior is the purchase behavior and that the first behavior data D11 is the purchase history data of the first consumer. Similarly to the purchase history data of the second embodiment, the first behavior data D11 includes the identification information of the purchased product and the information on date and time of the purchase for every purchase of the associated first consumer in connection with the consumer ID.

[0120] In the subsequent S520, the processor 11 determines the cookie ID associated with the consumer ID indicated in each first behavior data D11 included in the first behavior database B11. Similarly to the first embodiment, the cookie ID can be determined by obtaining the conversion table from an online-behavior-data collecting system 60.

[0121] Similarly to the data collecting system 20 of the first embodiment, the online-behavior-data collecting system 60 is configured to generate the conversion table between the consumer ID and the cookie ID through the issuance of the cookie and behavior analyses of the online users performed with the cookie. The online-behavior-data collecting system 60 is further configured to generate the online behavior data D3 of the online users and store the online behavior data D3 in connection with the cookie ID.

[0122] In the subsequent S530, the processor 11 obtains the online behavior data D3 associated with each of the first consumers from the online-behavior-data collecting system 60 based on the cookie ID and expands the first behavior database B11.

[0123] FIG. 14 shows a first behavior database B12 after the expansion. The first behavior database B12 after the expansion includes records representing features of the first behavior and the online behavior in connection with the associated consumer ID for each of the first consumers. According to the example illustrated in FIG. 14, the first behavior database B12 includes records representing the purchase history, the web page access history, and the affinity category. Hereinafter, these records are referred to as expanded first behavior data D12.

[0124] In the subsequent S540, the processor 11 obtains the second behavior database B21 from the second behavior-data collecting system 70. The second behavior-data collecting system 70 is a system that collects data on a second behavior of the second consumer group C4.

[0125] The second behavior database B21 includes second behavior data D21 (see, FIG. 15) that represents a feature of the second behavior of the second consumer in connection with an associated consumer ID for each of the second consumers. The consumer ID included in the second behavior data D21 may be construed as an independent ID different from the consumer ID included in the first behavior data D11.

[0126] Explanations hereinafter will be given using an example where the second behavior is a television-broadcasting viewing behavior and the second behavior data D21 is data representing a feature of the television-broadcasting viewing behavior of the second consumer. The second behavior data D21 may include identification information of a program viewed by the second consumer as a viewing history in connection with the consumer ID.

[0127] In the subsequent S550, the processor 11 determines the cookie ID associated with the consumer ID indicated in each second behavior data D21 included in the second behavior database B21. Similarly to the process in S520, the cookie ID can be determined by obtaining the conversion table from the online-behavior-data collecting system 60.

[0128] In the subsequent S560, the processor 11 obtains the online behavior data D3 associated with each of the second consumers from the online-behavior-data collecting system 60 based on the cookie ID and expands the second behavior database B21.

[0129] FIG. 15 shows a second behavior database B22 after the expansion. The second behavior database B22 after the expansion includes records representing features of the second behavior and the online behavior for each of the second consumers in connection with the associated consumer ID. According to the example illustrated in FIG. 15, the second behavior database

B22 includes records representing the viewing history, the web page access history, and the affinity category. Hereinafter, these records are referred to as expanded second behavior data D22.

[0130] Through executions of the processes from S510 to S560 explained above, the processor 11 adds variables in relation to the online behavior, more specifically, the web page access history and the affinity category, to the first behavior database B11 and the second behavior database B21 as common variables in relation to the feature of the consumer.

[0131] These common variables are used for a proper combination of the first behavior data D11 with the second behavior data D21. The present embodiment is discriminative in that the common variables in relation to the online behavior are added to each of a first behavior database B1 and a second behavior database B2 having no common variables by using the cookie technology.

[0132] In the subsequent S570, the processor 11 generates the combined database B30 based on similarity in the common variables, more specifically, based on similarity in the online behavior so as to connect the first behavior data D11 and the second behavior data D21 of the first consumers and the second consumers having a similarity with each other. The similarity used in this description should be construed broadly to include conformity.

[0133] For example, for each of the first consumers and the second consumers, the processor 11 represents the web page access history and the affinity category, which are the common variables, in vector format and generates a feature vector having the common variables as its components. As an evaluation value in relation to the similarity, the processor 11 calculates a distance (for example, cosine distance) on a feature space between the feature vector of the first consumer and the feature vector of the second consumer for every combination of the first consumers and the second consumers.

[0134] The processor 11 can generate the combined database B30 by combining the first behavior data D11 and the second behavior data D21 associated with

a combination of the first consumer and the second consumer having the shortest distance, that is, the highest similarity, based on the distance of each combination.

[0135] The combined database B30 may include one set of records made by integrating the first behavior data D11 and the second behavior data D21 associated with each combination of the first consumers and the second consumers which are subjects for combination. The combined database B30 may include one set of records made by integrating the expanded first behavior data D12 and the expanded second behavior data D22 associated with each combination.

[0136] As shown in FIG. 16, the combined database B30 may alternatively be configured to include combination relationship data D31 in addition to the first behavior database B11 or the first behavior database B12, and the second behavior database B21 or the second behavior database B22.

[0137] The combination relationship data D31 is data representing the combination relationship between the first behavior data D11 or the expanded first behavior data D12, and the second behavior data D21 or the expanded second behavior data D22. The combined database B30 may adopt a different configuration that allows cross-reference between data on the first behavior of the first consumers and associated data on the second behavior of the second consumers.

[0138] According to the information processing system 1 of the present embodiment explained above, it is possible to generate the combined database B30 on the consumers, which has more information and is valuable, by combining the data on the first behavior and the data on the second behavior, and by further combining such combination with the data on the online behavior.

[0139] Additionally, the first behavior data D11 in the first behavior database B11 and the second behavior data D21 in the second behavior database B21 may represent a feature in relation to the behavior of the consumers per cluster

to protect personal information.

[0140] For example, the first behavior data D11 and the second behavior data D21 may be configured to represent the behavior of persons who belong to an associated cluster in statistics. In this case, the first behavior data D11 and the second behavior data D21 can be configured to include a consumer ID group of the associated cluster. Likewise, the expanded first behavior data D12 and the expanded second behavior data D22 for each cluster can be configured to represent a feature in relation to the online behavior in statistics.

[0141] [Others]

The present disclosure shall not be limited to the aforementioned embodiments and may be applied in various modes. In the aforementioned embodiments, as shown in FIG. 17A for example, by embedding a tag G in a web page WP on the internet, the data collecting system 20 can issue the cookie ID to the online user who accessed the web page WP through a communication terminal TM. In addition, the client ID associated with the online user can be provided from the communication terminal TM of a source of access to the data collecting system 20 through telecommunication.

[0142] In a case where the online user who has already been issued the cookie ID accessed a different web page WP through the communication terminal TM, information that indicates such access behavior can be transmitted from the communication terminal TM to the data collecting system 20 along with the cookie ID through telecommunication. Upon receipt of this information, the data collecting system 20 can update the online behavior data D3 of the associated online user so that the access history to the new web page is recorded.

[0143] Recording of the consumer behavior through such telecommunication is possible also in the offline space, that is, the real space, through use of an electronic device EL equipped with a telecommunication function in place of the use of the tag G.

[0144] As shown in FIG. 17B for example, an IC card reader may be installed

in the real space as the electronic device EL. The IC card reader may be installed, for example, at a ticket gate to read an IC card 100 which corresponds to a ticket to use public transportation. The IC card 100 of such kind can be used as an electronic money card at the time of payment in retail stores in cities in some countries such as Japan. In a case where the IC card 100 is used in the retail stores, the company corresponding to the user system 30 can use identification information of the IC card 100 in place of or in addition to the client ID to provide the first consumer list L1 and a second consumer list L2.

[0145] In a case where the consumer uses the public transportation, the electronic device EL can transmit information that indicates the use of the public transportation along with the identification information of the IC card 100 to the data collecting system 20 in response to a behavior of the consumer to place the IC card 100 over the electronic device EL. Upon receipt of this information, the data collecting system 20 can update offline behavior data D7 on the travel of the associated consumer using the public transportation to record a use behavior of the public transportation. The data collecting system 20 can record the offline behavior data D7 for each consumer in place of or in addition to the online behavior data D3.

[0146] The data collecting system 20 is thus configured to update the offline behavior data D7 on the travel of each consumer using the public transportation. The data collecting system 20 is configured to provide the information processing system 1 with the offline behavior data D7 associated with the identification information of the IC card 100 designated by the information processing system 1.

[0147] Based on the identification information of the IC card 100 entered in the first consumer list L1, the processor 11 in the information processing system 1 can obtain the offline behavior data D7 from the data collecting system 20 in place of or in addition to the online behavior data D3 (S130). The processor 11 can construct the estimation model M based on the obtained

offline behavior data D7 (S140).

[0148] Based on the identification information of the IC card 100 entered in the second consumer list L2, the processor 11 can obtain the offline behavior data D7 from the data collecting system 20 (S230). The processor 11 can calculate the score based on the obtained offline behavior data D7 and the estimation model M (S250).

[0149] As can be understood from the context hereinbefore, the art of the present disclosure enables the use of one of the online behavior data or the offline behavior data, or both of the online behavior data and the offline behavior data, and in particular, the use of data on the telecommunication-involving behavior, to construct the estimation model.

[0150] The electronic device EL may be a POS (Point-Of-Sale) terminal; and the offline behavior data D7 may be POS data. Specific examples of the aforementioned telecommunication-involving behavior further include the following:

- a purchase behavior of the consumer settled electronically in electronic money and/or by credit card;
- travel of the consumer boarding a vehicle configured to transmit its positional coordinates to a center;
- travel of the consumer carrying a communication terminal configured to transmit its positional coordinates to a center; and
- a purchase behavior on the internet, a searching behavior on the internet, a content-access behavior on the internet, and a use behavior of a social networking service on the internet.

Thus, in place of the online behavior data D3 and the offline behavior data D7, consumer behavior data that describes two or more kinds of behavior histories with respect to the aforementioned online behaviors and offline behaviors may be used. The estimation model M may be constructed based on this consumer behavior data. Data expansion and/or data combination may be conducted through use of parameters in relation to the online

behaviors and the offline behaviors identified by this consumer behavior data as common variables.

[0151] In addition, the estimation model M may also be designed by using a decision tree or a regression tree. The estimation model M may be designed by using a generalized linear model such as a multiple regression. The estimation model M may be designed by using k-nearest neighbor algorithm.

[0152] The estimation model M may be designed by using a support vector machine (SVM). The estimation model M may be designed through a time series analysis of, for example, a state space model. The estimation model M may be designed through an ensemble learning or a deep learning. The ensemble learning may be achieved through bagging such as random forest, and boosting such as gradient boosting.

[0153] In the third embodiment, the features of the consumer that are connected with the features in relation to the online behaviors as the common variables are not limited to the aforementioned use-contract behavior, purchase behavior, and viewing behavior. For example, the features of the consumer that can be connected with the common variables may include lifestyle-related features, such as marriage, childbirth, graduation, employment, retirement, and building a house. In addition, as the change of the state of the consumer, a change in lifestyle of the consumer may be determined from the purchase history of the consumer.

[0154] Functions of one element in the aforementioned embodiments may be distributed to two or more elements. Functions of two or more elements may be integrated in one element. A part of configurations of the aforementioned embodiments may be omitted. At least a part of the configurations of the aforementioned embodiments may be added to or replaced with a different configuration of the aforementioned embodiments. Any and all modes included in the technical ideas defined by the languages recited in the claims are embodiments of the present disclosure.

[0155] Lastly, following are corresponding relationship between terms. The

information processing system 1 of the first and second embodiments corresponds to one example of an estimation system. The information processing system 1 of the third embodiment corresponds to one example of a data combining system.

[0156] The process of S110, S310, and S510 performed by the processor 11 corresponds to one example of the process performed by a first acquisition unit. The process of S120, S130, S320, S330, S520, and S530 performed by the processor 11 corresponds to one example of the process performed by a second acquisition unit.

[0157] The process of S140, S340, and S350 performed by the processor 11 corresponds to one example of the process performed by a model construction unit. The process of S220, S230, S420, and S430 performed by the processor 11 corresponds to one example of the process performed by a target-data acquisition unit. The process of S250, S260, S450, and S460 performed by the processor 11 corresponds to one example of the process performed by an estimation unit.

[0158] The process of S410 and S540 performed by the processor 11 corresponds to one example of the process performed by a third acquisition unit. The process of S550 and S560 performed by the processor 11 corresponds to one example of the process performed by a fourth acquisition unit. The process of S570 performed by the processor 11 corresponds to one example of the process performed by a data combining unit.

CLAIMS

1. An estimation system comprising:

a first acquisition unit configured to obtain first data with respect to two or more first target persons, the first data representing a first feature of each of the two or more first target persons, or representing the two or more first target persons having the first feature in common;

a second acquisition unit configured to obtain second data representing a second feature of each of the two or more first target persons, the second feature being different from the first feature;

a model construction unit configured to construct, based on the first feature and the second feature of each of the two or more first target persons determined from the first data and the second data, an estimation model configured to estimate the first feature from the second feature;

a target-data acquisition unit configured to obtain target data representing the second feature of a second target person; and

an estimation unit configured to estimate the first feature of the second target person based on the target data through use of the estimation model,

wherein the second feature is a feature in relation to a telecommunication-involving behavior,

wherein the second acquisition unit obtains, as the second data, the behavior-history data in relation to each of the two or more first target persons from a database system that stores the behavior-history data in relation to the telecommunication-involving behavior of each of two or more target persons,

wherein the target-data acquisition unit is configured to obtain, as the target data, the behavior-history data in relation to the second target person from the database system, and

wherein the telecommunication-involving behavior is a behavior of an associated target person, wherein related information of the behavior of the associated target person is transmitted to the database system through telecommunication, and

wherein the behavior of the associated target person is recorded in the behavior-history data based on the related information.

2. The estimation system according to claim 1,
wherein the first data includes information that enables discrimination of a change in the first feature,
wherein the second data includes information that enables discrimination of a change in the second feature,
wherein, based on the change in the first feature and the change in the second feature, the model construction unit constructs, as the estimation model, an estimation model configured to estimate a change in the first feature from a change in the second feature, and
wherein, based on the target data, the estimation unit estimates a change in the first feature of the second target person through use of the estimation model.

3. The estimation system according to claim 1 or 2,
wherein each of the two or more first target persons and the second target person is an individual or a cluster.

4. The estimation system according to any one of claims 1 to 3,
wherein the telecommunication-involving behavior is an online behavior,
wherein the online behavior is a behavior of a target person in an online space,
wherein the database system is a database system that stores the behavior-history data in relation to the online behavior of each of the two or more target persons in connection with an online identifier of each of the two or more target persons,
wherein the first data includes information that enables discrimination of the online identifier associated with each of the two or more first target persons,
wherein the second acquisition unit obtains, as the second data, the behavior-history data connected with the online identifier associated with each of the two or more first target persons from the database system, and

wherein, in response to an input of data that enables discrimination of the online identifier associated with the second target person, the target-data acquisition unit obtains, as the target data, the behavior-history data connected with the online identifier associated with the second target person from the database system.

5. The estimation system according to claim 4,

wherein the online behavior includes an access behavior to web pages.

6. The estimation system according to any one of claims 1 to 5,

wherein the first feature is a feature in relation to presence or absence of execution of a specific behavior of a target person,

wherein, based on the second feature of each of the two or more first target persons, the model construction unit constructs, as the estimation model, an estimation model configured to estimate a possibility of execution of the specific behavior from the second feature, and

wherein the estimation unit estimates a possibility that the second target person executes the specific behavior through use of the estimation model.

7. The estimation system according to any one of claims 1 to 6,

wherein the second target person includes two or more second target persons,

wherein the estimation system further includes a third acquisition unit configured to obtain third data representing a third feature of each of the two or more second target persons,

wherein the target-data acquisition unit is configured to obtain the behavior-history data of each of the two or more second target persons as the target data, and

wherein the estimation unit estimates the first feature of each of the two or more second target persons based on the target data through use of the estimation model and outputs data representing the first feature and the third feature of each of the two or more second target persons as data expanded from the third data.

8. An estimation system comprising:

a first acquisition unit configured to obtain first data representing two or more first target persons having a common feature in relation to presence or absence of execution of a specific behavior;

a second acquisition unit configured to obtain second data representing a feature in relation to a telecommunication-involving behavior of each of the two or more first target persons determined from the first data, the telecommunication-involving behavior being different from the specific behavior;

a model construction unit configured to construct, based on the feature in relation to the telecommunication-involving behavior of each of the two or more first target persons determined from the second data, an estimation model configured to estimate a possibility of execution of the specific behavior from the feature in relation to the telecommunication-involving behavior;

a target-data acquisition unit configured to obtain target data representing a feature in relation to the telecommunication-involving behavior of a second target person; and

an estimation unit configured to estimate a possibility that the second target person executes the specific behavior based on the target data through use of the estimation model,

wherein the second acquisition unit obtains, as the second data, behavior-history data in relation to each of the two or more first target persons from a database system that stores the behavior-history data in relation to the telecommunication-involving behavior of each of two or more target persons,

wherein the target-data acquisition unit is configured to obtain, as the target data, the behavior-history data in relation to the second target person from the database system, and

wherein the telecommunication-involving behavior is a behavior of an associated target person, wherein related information of the behavior of the associated target person is transmitted to the database system through telecommunication, and wherein the behavior of the associated target person is recorded in the behavior-history

data based on the related information.

9. A computer program that causes a computer to function as the first acquisition unit, the second acquisition unit, the model construction unit, the target-data acquisition unit, and the estimation unit in the estimation system according to any one of claims 1 to 8.

10. A computer-implemented estimation method comprising:

- obtaining first data with respect to two or more first target persons, the first data representing a first feature of each of the two or more first target persons, or representing the two or more first target persons having the first feature in common;
- obtaining second data representing a second feature of each of the two or more first target persons, the second feature being different from the first feature;
- constructing, based on the first feature and the second feature of each of the two or more first target persons determined from the first data and the second data, an estimation model configured to estimate the first feature from the second feature;
- obtaining target data representing the second feature of a second target person;
- and
- estimating the first feature of the second target person based on the target data through use of the estimation model,
- wherein the second feature is a feature in relation to a telecommunication-involving behavior,
- wherein the obtaining of the second data is obtaining, as the second data, behavior-history data associated with each of the two or more first target persons from a database system that stores the behavior-history data in relation to the telecommunication-involving behavior of each of two or more target persons,
- wherein the obtaining of the target data is obtaining, as the target data, the behavior-history data in relation to the second target person from the database system,
- and
- wherein the telecommunication-involving behavior is a behavior of an

associated target person, wherein related information of the behavior of the associated target person is transmitted to the database system through telecommunication, and wherein the behavior of the associated target person is recorded in the behavior-history data based on the related information.

11. A computer-implemented estimation method comprising:

obtaining first data representing two or more first target persons having a common feature in relation to presence or absence of execution of a specific behavior;

obtaining second data representing a feature in relation to a telecommunication-involving behavior of each of the two or more first target persons determined from the first data, the telecommunication-involving behavior being different from the specific behavior;

constructing, based on the feature in relation to the telecommunication-involving behavior of each of the two or more first target persons determined from the second data, an estimation model configured to estimate a possibility of execution of the specific behavior from the feature in relation to the telecommunication-involving behavior;

obtaining target data representing a feature in relation to the telecommunication-involving behavior of a second target person; and

estimating a possibility that the second target person executes the specific behavior based on the target data through use of the estimation model,

wherein the obtaining of the second data is obtaining, as the second data, behavior-history data in relation to each of the two or more first target persons from a database system that stores the behavior-history data in relation to the telecommunication-involving behavior of each of two or more target persons,

wherein the obtaining of the target data is obtaining, as the target data, the behavior-history data in relation to the second target person from the database system, and

wherein the telecommunication-involving behavior is a behavior of an associated target person, wherein related information of the behavior of the associated

target person is transmitted to the database system through telecommunication, and wherein the behavior of the associated target person is recorded in the behavior-history data based on the related information.