

What is claimed is:

CLAIMS

1. A computer-implemented system comprising:
 - one or more computers;
 - one or more data storage devices in data communication with the one or more computers, storing:
 - a training data repository that includes a first plurality of training data sets belonging to a client entity and received over a network from a client computing system;
 - a plurality of training functions; and
 - instructions that, when executed by the one or more computers, cause the one or more computers to perform operations comprising:
 - generating a plurality of trained predictive models using the plurality of training functions and the first plurality of training data sets;
 - generating a respective effectiveness score for each of the plurality of trained predictive models, wherein each effectiveness score represents an estimation of the effectiveness of its respective trained predictive model;
 - selecting a first trained predictive model for the client entity from among the plurality of trained predictive models based on the respective effectiveness scores;
 - and
 - providing access to the first trained predictive model to a user authorized by the client entity to access the first trained predictive model.

2. The computer-implemented system of claim 1, wherein the plurality of trained predictive models includes one or more trained updateable predictive models, and wherein the operations further comprise:

- generating a retrained updateable predictive model using a previously-trained updateable predictive model, the training function that was used to generate the previously-trained updateable predictive model, and one or more new training data sets belonging to the client entity;

- generating an effectiveness score for the retrained updateable predictive model;

- selecting a second trained predictive model for the client entity from among the retrained updateable predictive model and the plurality of trained predictive models based on the respective effectiveness scores; and

- providing access to the second trained predictive model to a user authorized by the client entity to access the second trained predictive model.

3. The computer-implemented system of claim 2, wherein the operations further comprise:

- determining, before generating the retrained updateable predictive model, that at least one of the following conditions is true: (i) an amount of training data in a training data queue is greater than or equal to a threshold amount; (ii) a predetermined amount of time is reached or exceeded; or (iii) a request to update the previously-trained updateable predictive model is received.

4. The computer-implemented system of claim 1, wherein the operations further comprise:

- generating a plurality of new trained predictive models using the plurality of training functions and a second plurality of training data sets belonging to the client entity;

- generating a respective effectiveness score for each of the plurality of new trained predictive models;

- selecting a second trained predictive model for the client entity from among previously-trained predictive models and the plurality of new trained predictive models based on the respective effectiveness scores; and

- providing access to the second trained predictive model to a user authorized by the client entity to access the second trained predictive model.

5. The computer-implemented system of claim 4, wherein the operations further comprise:
determining, before generating the plurality of new trained predictive models, that at least one of the following conditions is true: (i) a predetermined amount of time is reached or exceeded; or (ii) a request to generate new trained predictive models is received.
6. The computer-implemented system of claim 4, wherein the second plurality of training data sets includes one or more new training data sets and one or more training data sets from the first plurality of training data sets.
7. The computer-implemented system of claim 4, wherein the second plurality of training data sets does not include any of the training data sets included in the first plurality of training data sets.
8. The computer-implemented system of claim 1, wherein the operations further comprise:
receiving input data and a request for a predictive output using the first trained predictive model from a computing system operable by the user;
generating the predictive output using the input data and the first trained predictive model; and
providing the predictive output to the computing system operable by the user.
9. The computer-implemented system of claim 1, wherein: generating a plurality of trained predictive models comprises applying one of the training functions to one of the training data sets to generate a set of parameters that form one of the trained predictive models; and
the operations further comprise:
maintaining the training data repository according to a data retention policy that defines rules determining which training data to retain and which training data to delete from the repository.

10. A computer-implemented method comprising:

receiving a first plurality of training data sets belonging to a client entity from a client computing system over a network;

generating a plurality of trained predictive models using a plurality of training functions and the first plurality of training data sets;

generating a respective effectiveness score for each of the plurality of trained predictive models;

selecting a first trained predictive model for the client entity from among the plurality of trained predictive models based on the respective effectiveness scores; and

providing access to the first trained predictive model to a user authorized by the client entity to access the first trained predictive model.

11. The computer-implemented method of claim 10, wherein the plurality of trained predictive models includes one or more trained updateable predictive models, and wherein the method further comprises:

generating a retrained updateable predictive model using a previously-trained updateable predictive model, the training function that was used to generate the previously-trained updateable predictive model, and one or more new training data sets belonging to the client entity;

generating an effectiveness score for the retrained updateable predictive model, wherein each effectiveness score represents an estimation of the effectiveness of its respective trained predictive model;

selecting a second trained predictive model for the client entity from among the retrained updateable predictive model and the plurality of trained predictive models based on the respective effectiveness scores; and

providing access to the second trained predictive model to a user authorized by the client entity to access the second trained predictive model.

12. The computer-implemented method of claim 11, further comprising:

determining, before generating the retrained updateable predictive model, that at least one of the following conditions is true: (i) an amount of training data in a training data queue is greater than or equal to a threshold amount; (ii) a predetermined amount of time is reached or exceeded; or (iii) a request to update the previously-trained updateable predictive model is received.

13. The computer-implemented method of claim 10, further comprising:

generating a plurality of new trained predictive models using the plurality of training functions and a second plurality of training data sets belonging to the client entity;

generating a respective effectiveness score for each of the plurality of new trained predictive models;

selecting a second trained predictive model for the client entity from among previously-trained predictive models and the plurality of new trained predictive models based on the respective effectiveness scores; and

providing access to the second trained predictive model to a user authorized by the client entity to access the second trained predictive model.

14. The computer-implemented method of claim 13, further comprising:

determining, before generating the plurality of new trained predictive models, that at least one of the following conditions is true: (i) a predetermined amount of time is reached or exceeded; or (ii) a request to generate new trained predictive models is received.

15. The computer-implemented method of claim 13, wherein the second plurality of training data sets includes one or more new training data sets and one or more training data sets from the first plurality of training data sets.

16. The computer-implemented method of claim 13, wherein the second plurality of training data sets does not include any of the training data sets included in the first plurality of training data sets.

17. A computer-readable storage device encoded with a computer program product, the computer program product comprising instructions that when executed on one or more computers cause the one or more computers to perform operations comprising:

- receiving a first plurality of training data sets belonging to a client entity from a client computing system over a network;

- generating a plurality of trained predictive models using a plurality of training functions and the first plurality of training data sets;

- generating a respective effectiveness score for each of the plurality of trained predictive models, wherein each effectiveness score represents an estimation of the effectiveness of its respective trained predictive model;

- selecting a first trained predictive model for the client entity from among the plurality of trained predictive models based on the respective effectiveness scores; and

- providing access to the first trained predictive model to a user authorized by the client entity to access the first trained predictive model.

18. The computer-readable storage device of claim 17, wherein the operations further comprise:

- generating a retrained updateable predictive model using a previously-trained updateable predictive model, the training function that was used to generate the previously-trained updateable predictive model, and one or more new training data sets belonging to the client entity;

- generating an effectiveness score for the retrained updateable predictive model;

- selecting a second trained predictive model for the client entity from among the retrained updateable predictive model and the plurality of trained predictive models based on the respective effectiveness scores; and

- providing access to the second trained predictive model to a user authorized by the client entity to access the second trained predictive model.

19. The computer-readable storage device of claim 18, wherein the operations further comprise:

determining, before generating the retrained updateable predictive model, that when at least one of the following conditions is true: (i) an amount of training data in a training data queue is greater than or equal to a threshold amount; (ii) a predetermined amount of time is reached or exceeded; or (iii) a request to update the previously-trained updateable predictive model is received.

20. The computer-readable storage device of claim 17, wherein the operations further comprise:

generating a plurality of new trained predictive models using the plurality of training functions and a second plurality of training data sets belonging to the client entity;

generating a respective effectiveness score for each of the plurality of new trained predictive models;

selecting a second trained predictive model for the client entity from among previously-trained predictive models and the plurality of new trained predictive models based on the respective effectiveness scores; and

providing access to the second trained predictive model to a user authorized by the client entity to access the second trained predictive model.

21. The computer-readable storage device of claim 20, wherein the operations further comprise:

determining, before generating the plurality of new trained predictive models, that at least one of: (i) a predetermined amount of time is reached or exceeded; or (ii) a request to generate new trained predictive models is received.

22. The computer-readable storage device of claim 20, wherein the second plurality of training data sets includes one or more new training data sets and one or more training data sets from the first plurality of training data sets.

23. The computer-readable storage device of claim 20, wherein the second plurality of training data sets does not include any of the training data sets included in the first plurality of training data sets.

CLAIMS

1. A computer-implemented system comprising:
 - one or more computers;
 - one or more data storage devices in data communication with the one or more computers,storing:
 - a training data repository that includes client training data comprising a first plurality of training data sets belonging to a client entity and received over a network;
 - a plurality of training functions; and
 - instructions that, when executed by the one or more computers, cause the one or more computers to perform operations comprising:
 - generating a plurality of trained predictive models using the plurality of training functions and a first sample of the client training data;
 - determining a respective accuracy of each of the plurality of trained predictive models using a different, second sample of the client training data;
 - receiving, over the network one or more new training data sets belonging to the client entity, wherein each of the one or more new training data sets is new relative to the first plurality of training data sets;
 - updating the client training data to include the one or more new training data sets;
 - generating a plurality of new trained predictive models using the plurality of training functions and a different, third sample of the client training data;
 - determining, a respective accuracy of each of the plurality of new trained predictive models using a different, fourth sample of the client training data;
 - generating a respective effectiveness score for each of the plurality of trained predictive models and each of the plurality of new trained predictive models using the determined accuracy of its respective trained predictive model;
 - receiving, over the network from a client computing system, a first prediction request and first input data;
 - selecting a first trained predictive model to service the first prediction request from among the plurality of trained predictive models and the plurality of new trained predictive models based on the respective effectiveness scores;
 - running the first trained predictive model on the first input data to generate a predictive output; and

providing, to the client computing system, the predictive output in response to the first prediction request.

2. The computer-implemented system of claim 1, wherein the plurality of trained predictive models includes one or more trained updateable predictive models, and wherein the operations further comprise:

generating a retrained updateable predictive model using a previously-trained updateable predictive model, the training function that was used to generate the previously-trained updateable predictive model, and a different, fifth, sample of the client training data;

determining an accuracy of the retrained updateable predictive model using a different, sixth sample of data of the client training data;

generating an effectiveness score for the retrained updateable predictive model using the determined accuracy of the retrained updateable predictive model;

receiving a second prediction request and second input data;

selecting a second trained predictive model to service the second prediction request from among the retrained updateable predictive model and the plurality of trained predictive models based on the respective effectiveness scores; and

running the second trained predictive model on the second input data in response to the second prediction request.

3. The computer-implemented system of claim 2, wherein the operations further comprise:

determining, before generating the retrained updateable predictive model, that at least one of the following conditions is true: (i) an amount of training data in a training data queue is greater than or equal to a threshold amount; (ii) a predetermined amount of time is reached or exceeded; or (iii) a request to update the previously-trained updateable predictive model is received.

4. The computer-implemented system of claim 1, wherein the operations further comprise:

determining, before generating the plurality of new trained predictive models, that at least one of the following conditions is true: (i) a predetermined amount of time is reached or exceeded; or (ii) a request to generate new trained predictive models is received.

5. The computer-implemented system of claim 1, wherein the third sample of client training data includes one or more of the new training data sets and one or more training data sets from

the first plurality of training data sets.

6. The computer-implemented system of claim 1, wherein the third sample of client training data does not include any of the training data sets included in the first plurality of training data sets.

7. The computer-implemented system of claim 1, wherein the operations further comprise: maintaining the training data repository according to a data retention policy that defines rules determining which training data to retain and which training data to delete from the repository based on one or more of the following: respective dates of receipts of the training data and respective properties of the training data.

8. A computer-implemented method comprising:
receiving, over a network, client training data comprising a first plurality of training data sets belonging to a client entity;
generating a plurality of trained predictive models using a plurality of training functions and a first sample of the client training data;
determining a respective accuracy of each of the plurality of trained predictive models using a different, second sample of the client training data; receiving, over the network one or more new training data sets belonging to the client entity, wherein each of the one or more new training data sets is new relative to the first plurality of training data sets;
updating the client training data to include the one or more new training data sets;
generating a plurality of new trained predictive models using the plurality of training functions and a different, third sample of the client training data;
determining, a respective accuracy of each of the plurality of new trained predictive models using a different, fourth sample of the client training data;
generating a respective effectiveness score for each of the plurality of trained predictive models and each of the plurality of new trained predictive models using the determined accuracy of its respective trained predictive model;
receiving, over the network from a client computing system, a first prediction request and first input data;
selecting a first trained predictive model to service the first prediction request from among the plurality of trained predictive models and the plurality of new trained predictive models based on the respective effectiveness scores;

running the first trained predictive model on the first input data to generate a predictive output; and

providing, to the client computing system, the predictive output in response to the first prediction request.

9. The computer-implemented method of claim 8, wherein the plurality of trained predictive models includes one or more trained updateable predictive models, and wherein the operations further comprise:

generating a retrained updateable predictive model using a previously-trained updateable predictive model, the training function that was used to generate the previously-trained updateable predictive model, and a different, fifth, sample of the client training data;

determining an accuracy of the retrained updateable predictive model using a different, sixth sample of data of the client training data;

generating an effectiveness score for the retrained updateable predictive model using the determined accuracy of the retrained updateable predictive model;

receiving a second prediction request and second input data;

selecting a second trained predictive model to service the second prediction request from among the retrained updateable predictive model and the plurality of trained predictive models based on the respective effectiveness scores; and

running the second trained predictive model on the second input data in response to the second prediction request.

10. The computer-implemented method of claim 9, further comprising:

determining, before generating the retrained updateable predictive model, that at least one of the following conditions is true: (i) an amount of training data in a training data queue is greater than or equal to a threshold amount; (ii) a predetermined amount of time is reached or exceeded; or (iii) a request to update the previously-trained updateable predictive model is received.

11. The computer-implemented method of claim 8, further comprising:

determining, before generating the plurality of new trained predictive models, that at least one of the following conditions is true: (i) a predetermined amount of time is reached or exceeded; or (ii) a request to generate new trained predictive models is received.

12. The computer-implemented method of claim 8, wherein the third sample of client training data includes one or more new training data sets and one or more training data sets from the first plurality of training data sets.

13. The computer-implemented method of claim 8, wherein the third sample of client training data does not include any of the training data sets included in the first plurality of training data sets.

14. A computer-readable storage device encoded with a computer program product, the computer program product comprising instructions that when executed on one or more computers cause the one or more computers to perform operations comprising:

- receiving, over a network, client training data comprising a first plurality of training data sets belonging to a client entity;

- generating a plurality of trained predictive models using a plurality of training functions and a first sample of the client training data;

- determining a respective accuracy of each of the plurality of trained predictive models using a different, second sample of the client training data;

- receiving, over the network one or more new training data sets belonging to the client entity, wherein each of the one or more new training data sets is new relative to the first plurality of training data sets;

- updating the client training data to include the one or more new training data sets;

- generating a plurality of new trained predictive models using the plurality of training functions and a different, third sample of the client training data;

- determining, a respective accuracy of each of the plurality of new trained predictive models using a different, fourth sample of the client training data;

- generating a respective effectiveness score for each of the plurality of trained predictive models and each of the plurality of new trained predictive models using the determined accuracy of its respective trained predictive model;

- receiving, over the network from a client computing system, a first prediction request and first input data;

- selecting a first trained predictive model to service the first prediction request from among the plurality of trained predictive models and the plurality of new trained predictive models based on the respective effectiveness scores;

running the first trained predictive model on the first input data to generate a predictive output; and

providing, to the client computing system, the predictive output in response to the first prediction request.

15. The computer-readable storage device of claim 14, wherein the plurality of trained predictive models includes one or more trained updateable predictive models, and wherein the operations further comprise:

generating a retrained updateable predictive model using a previously-trained updateable predictive model, the training function that was used to generate the previously-trained updateable predictive model, and a different, fifth, sample of the client training data;

determining an accuracy of the retrained updateable predictive model using a different, sixth sample of data of the client training data;

generating an effectiveness score for the retrained updateable predictive model using the determined accuracy of the retrained updateable predictive model;

receiving a second prediction request and second input data; selecting a second trained predictive model to service the second prediction request from among the retrained updateable predictive model and the plurality of trained predictive models based on the respective effectiveness scores; and

running the second trained predictive model on the second input data in response to the second prediction request.

16. The computer-readable storage device of claim 15, wherein the operations further comprise:

determining, before generating the retrained updateable predictive model, that when at least one of the following conditions is true: (i) an amount of training data in a training data queue is greater than or equal to a threshold amount; (ii) a predetermined amount of time is reached or exceeded; or (iii) a request to update the previously-trained updateable predictive model is received.

17. The computer-readable storage device of claim 14, wherein the operations further comprise:

determining, before generating the plurality of new trained predictive models, that at least one of: (i) a predetermined amount of time is reached or exceeded; or (ii) a request to generate

new trained predictive models is received.

18. The computer-readable storage device of claim 14, wherein the third sample of client training data includes one or more new training data sets and one or more training data sets from the first plurality of training data sets.

19. The computer-readable storage device of claim 14, wherein the third sample of client training data does not include any of the training data sets included in the first plurality of training data sets.

20. The computer-implemented system of claim 1, wherein the operations further comprise:
determining a respective resource usage for running each of the plurality of trained predictive models; and
generating a respective effectiveness score for each of the plurality of trained predictive models using its respective determined resource usage.

21. The computer-implemented method of claim 8, wherein the method further comprises:
determining a respective resource usage for running each of the plurality of trained predictive models; and
generating a respective effectiveness score for each of the plurality of trained predictive models using its respective determined resource usage.

22. The computer-readable storage device of claim 14, wherein the operations further comprise:
determining a respective resource usage for running each of the plurality of trained predictive models; and
generating a respective effectiveness score for each of the plurality of trained predictive models using its respective determined resource usage.