

What is claimed is:

1. A neural network model training method, comprising the steps of:
training a deep neural network model according to training samples in a training set to obtain a trained deep neural network model;
performing data verification on all reference samples in a reference set according to the trained deep neural network model to obtain a model prediction value of each reference sample in all reference samples, and the reference set comprising a verification set and/or a test set;
calculating a difference measurement index between the model prediction value of each reference sample and an actual annotation corresponding to each reference sample, and each reference sample being pre-annotated with data;
taking target reference samples of which the difference measurement index is lower than or equal to a preset threshold in all the reference samples as comparison samples;
calculating a similarity between the training sample in the training set and each of the comparison samples;
taking the training sample of which the similarity with the comparison sample meets a preset amplification condition as a sample to be amplified;
performing data amplification on the sample to be amplified to obtain a target training sample; and
taking the target training sample as the training sample in the training set to train the trained deep neural network model until the model prediction values of all verification samples in the verification set meet a preset training ending condition,
wherein the neural network model training method is used for image classification wherein training samples in the training set are pre-annotated with data such that a prediction value is used to characterize the accuracy of image classification.
2. The neural network model training method as claimed in claim 1, wherein the step of taking the target training sample as the training sample in the training set to train the

trained deep neural network model until the model prediction values of all verification samples in the verification set meet a preset training ending condition comprises the step of:

taking the target training sample as the training sample in the training set to train the trained deep neural network model until the difference measurement index corresponding to each verification sample of all the verification samples in the verification set is lower than or equal to the preset threshold.

3. The neural network model training method as claimed in claim 1 or 2, wherein the step of calculating a difference measurement index between the model prediction value of each reference sample and an actual annotation corresponding to each reference sample comprises the steps of:

determining a type of the difference measurement index used by the trained deep neural network model; and

calculating the difference measurement index between the model prediction value of each reference sample and the actual annotation corresponding to each reference sample, according to the type of the difference measurement index.

4. The neural network model training method as claimed in claim 3, wherein the step of determining a type of the difference measurement index used by the trained deep neural network model comprises the steps of:

acquiring a preset index corresponding list, the preset index list comprising a corresponding relationship between the type of the difference measurement index and a model function indicator character, and the model function indicator character being used to indicate the function of the deep neural network model;

determining the model function indicator character corresponding to the trained deep neural network model; and

determining the type of the difference measurement index used by the trained deep neural network model, according to the corresponding relationship between the difference measurement index and the model function indicator character, and the model function

indicator character corresponding to the trained deep neural network model.

5. The neural network model training method as claimed in claim 4, wherein the type of the difference measurement index comprises cross-entropy coefficient, ~~Jaccard coefficient and dice coefficient~~, the model function indicator character indicating that the deep neural network model is used for image classification is corresponding to the cross-entropy coefficient, ~~the model function indicator character indicating that the deep neural network model is used for image segmentation is corresponding to the Jaccard coefficient or dice coefficient.~~

6. The neural network model training method as claimed in claim 1 or 2, wherein the step of calculating a similarity between the training samples in the training set and each of the comparison samples comprises the steps of:

performing feature extraction on each training sample of the training set according to a preset feature extraction model to obtain a feature vector of each training sample, the preset ~~_image~~ feature extraction model being a feature extraction model trained based on a convolutional neural network;

performing feature extraction on the comparison sample according to the preset feature extraction model to obtain a feature vector of each comparison sample; and

calculating the similarity between the training sample in the training set and the comparison sample according to the feature vector of each training sample and the feature vector of each comparison sample.

7. The neural network model training method as claimed in claim 6, wherein the step of calculating the similarity between the training sample in the training set and the comparison sample according to the feature vector of each training sample and the feature vector of each comparison sample comprises the steps of:

calculating a cosine distance between the feature vector of each training sample and the feature vector of each comparison sample; and

taking the cosine distance between the feature vector of each training sample and the feature vector of each comparison sample as the similarity between each training sample

and each comparison sample.

8. A neural network model training apparatus, comprising:

a training module, for training a deep neural network model according to training samples in a training set to obtain a trained deep neural network model;

a verification module, for performing data verification on all reference samples in the reference set according to the trained deep neural network model, trained by the training module, to obtain a model prediction value of each reference sample in all reference samples, and the reference set comprising a verification set and/or a test set;

a first calculation module, for calculating a difference measurement index between the model prediction value of each reference sample, obtained by the verification module, and an actual annotation corresponding to each reference sample, and each reference sample being pre-annotated with data;

a first determination module, for taking target reference samples of which the difference measurement index, calculated by the first calculation module, is lower than or equal to a preset threshold in all the reference samples as comparison samples;

a second calculation module, for calculating a similarity between the training sample in the training set and each of the comparison samples determined by the first determining module;

a second determination module, for taking the training sample of which the similarity with the comparison sample, calculated by the second calculation module, meets a preset amplification condition as a sample to be amplified;

an amplification module, for performing data amplification on the sample to be amplified, determined by the second determining module, to obtain a target training sample; and

the training module, for taking the target training sample, obtained by the amplification module, as the training sample in the training set to train the trained deep neural network model until the model prediction values of all verification samples in the verification set meet a preset training ending condition;

wherein the neural network model training apparatus is used for image classification wherein training samples in the training set are pre-annotated with data such that a prediction value is used to characterize the accuracy of image classification.

9. The neural network model training apparatus as claimed in claim 8, wherein the training module is further provided for taking the target training sample as the training sample in the training set to train the trained deep neural network model until the difference measurement index corresponding to each verification sample of all the verification samples in the verification set is lower than or equal to the preset threshold.
10. The neural network model training apparatus as claimed in claim 8 or 9, wherein the first calculation module is further provided for:
 - determining a type of the difference measurement index used by the trained deep neural network model; and
 - calculating the difference measurement index between the model prediction value of each reference sample and the actual annotation corresponding to each reference sample, according to the type of the difference measurement index.
11. A computer device, comprising a memory, a processor, and computer readable instructions stored in the memory and run in the processor, wherein the processor executes the computer readable instructions to implement the steps of:
 - training a deep neural network model according to training samples in a training set to obtain a trained deep neural network model;
 - performing data verification on all reference samples in a reference set according to the trained deep neural network model to obtain a model prediction value of each reference sample in all reference samples, and the reference set comprising a verification set and/or a test set;
 - calculating a difference measurement index between the model prediction value of each reference sample and an actual annotation corresponding to each reference sample, and each reference sample being pre-annotated with data;

taking target reference samples of which the difference measurement index is lower than or equal to a preset threshold in all the reference samples as comparison samples;

calculating a similarity between the training sample in the training set and each of the comparison samples;

taking the training sample of which the similarity with the comparison sample meets a preset amplification condition as a sample to be amplified;

performing data amplification on the sample to be amplified to obtain a target training sample; and

taking the target training sample as the training sample in the training set to train the trained deep neural network model until the model prediction values of all verification samples in the verification set meet a preset training ending condition;

wherein the ~~step of training a~~ deep neural network model is used for image classification wherein training samples in the training set are pre-annotated with data such that a prediction value is used to characterize the accuracy of image classification.

12. The computer device as claimed in claim 11, wherein the step of taking the target training sample as the training sample in the training set to train the trained deep neural network model until the model prediction values of all verification samples in the verification set meet a preset training ending condition comprises the step of:

taking the target training sample as the training sample in the training set to train the trained deep neural network model until the difference measurement index corresponding to each verification sample of all the verification samples in the verification set is lower than or equal to the preset threshold.

13. The computer device as claimed in claim 11 or 12, wherein the step of calculating a difference measurement index between the model prediction value of each reference sample and an actual annotation corresponding to each reference sample comprises the steps of:

determining a type of the difference measurement index used by the trained deep neural network model; and

calculating the difference measurement index between the model prediction value of each reference sample and the actual annotation corresponding to each reference sample, according to the type of the difference measurement index.

14. The computer device as claimed in claim 13, wherein the step of determining a type of the difference measurement index used by the trained deep neural network model comprises the steps of:

acquiring a preset index corresponding list, the preset index list comprising a corresponding relationship between the type of the difference measurement index and a model function indicator character, and the model function indicator character being used to indicate the function of the deep neural network model;

determining the model function indicator character corresponding to the trained deep neural network model; and

determining the type of the difference measurement index used by the trained deep neural network model, according to the corresponding relationship between the difference measurement index and the model function indicator character, and the model function indicator character corresponding to the trained deep neural network model.

15. The computer device as claimed in claim 14, wherein the type of the difference measurement index comprises cross-entropy coefficient, ~~Jaccard coefficient and dice coefficient~~, the model function indicator character indicating that the deep neural network model is used for image classification is corresponding to the cross-entropy coefficient, ~~the model function indicator character indicating that the deep neural network model is used for image segmentation is corresponding to the Jaccard coefficient or dice coefficient.~~

16. One or more non-volatile computer readable storage stored with computer programs, wherein when the computer readable instructions executed by one or more processors, one or more processors are caused to implement the following steps:

training a deep neural network model according to training samples in a training set to obtain a trained deep neural network model;

performing data verification on all reference samples in a reference set according to the trained deep neural network model to obtain a model prediction value of each reference sample in all reference samples, and the reference set comprising a verification set and/or a test set;

calculating a difference measurement index between the model prediction value of each reference sample and an actual annotation corresponding to each reference sample, and each reference sample being pre-annotated with data;

taking target reference samples of which the difference measurement index is lower than or equal to a preset threshold in all the reference samples as comparison samples;

calculating a similarity between the training sample in the training set and each of the comparison samples;

taking the training sample of which the similarity with the comparison sample meets a preset amplification condition as a sample to be amplified;

performing data amplification on the sample to be amplified to obtain a target training sample; and

taking the target training sample as the training sample in the training set to train the trained deep neural network model until the model prediction values of all verification samples in the verification set meet a preset training ending condition;

wherein the ~~step of training a~~ deep neural network model is used for image classification wherein training samples in the training set are pre-annotated with data such that a prediction value is used to characterize the accuracy of image classification.

17. The non-volatile computer readable storage as claimed in claim 16, wherein the step of taking the target training sample as the training sample in the training set to train the trained deep neural network model until the model prediction values of all verification samples in the verification set meet a preset training ending condition comprise the step of:

taking the target training sample as the training sample in the training set to train the

trained deep neural network model until the difference measurement index corresponding to each verification sample of all the verification samples in the verification set is lower than or equal to the preset threshold.

18. The non-volatile computer readable storage as claimed in claim 16 or 17, wherein the step of calculating a difference measurement index between the model prediction value of each reference sample and an actual annotation corresponding to each reference sample comprises the steps of:

determining a type of the difference measurement index used by the trained deep neural network model; and

calculating the difference measurement index between the model prediction value of each reference sample and the actual annotation corresponding to each reference sample, according to the type of the difference measurement index.

19. The non-volatile computer readable storage as claimed in claim 18, wherein the step of determining a type of the difference measurement index used by the trained deep neural network model comprises the steps of:

acquiring a preset index corresponding list, the preset index list comprising a corresponding relationship between the type of the difference measurement index and a model function indicator character, and the model function indicator character being used to indicate the function of the deep neural network model;

determining the model function indicator character corresponding to the trained deep neural network model; and

determining the type of the difference measurement index used by the trained deep neural network model, according to the corresponding relationship between the difference measurement index and the model function indicator character, and the model function indicator character corresponding to the trained deep neural network model.

20. The non-volatile computer readable storage as claimed in claim 19, wherein the type of the difference measurement index comprises cross-entropy coefficient, ~~Jacquard coefficient and dice coefficient~~, the model function indicator character indicating that the

deep neural network model is used for image classification is corresponding to the cross-entropy coefficient, ~~the model function indicator character indicating that the deep neural network model is used for image segmentation is corresponding to the Jaccard coefficient or dice coefficient.~~