[CLAIMS]

[Claim 1**]**

A skin diagnosis method based on image analysis using deep learning performed by a processor, the method comprising the steps of:

acquiring a face image of a subject by photographing a target skin;

deriving shape or location information of a facial structure by recognizing feature points capable of identifying an individual in the acquired face image;

de-identifying the face image on the basis of the shape or location information of the facial structure such that personal information of an analysis target cannot be identified; and

visualizing and providing skin diagnosis results for items corresponding to artificial neural network models and symptom locations for each item by inputting the de-identified face images into a plurality of the artificial neural network models , respectively,

wherein the items may include at least one of diagnoses for wrinkles, pigmentation, pores, erythema, and aging.

[Claim 2**]**

The skin diagnosis method according to claim 1,

wherein the step of de-identifying the face image includes:

separating feature points and a background from the face image and removing a skin shape having the feature points;

dividing the face image from which the feature points have been removed into a plurality of patches; and

rearranging the plurality of patches by randomizing them.

[Claim 3**]**

The skin diagnosis method according to claim 1,

wherein the feature points are at least one of eyebrows, eyes, nose, and lips.

[Claim 4**]**

The skin diagnosis method according to claim 1,

wherein the each of the plurality of artificial neural network models is learned using a plurality of training samples as learning data, and

the plurality of training samples include transformations using a data augmentation technique.

[Claim 5**]**

The skin diagnosis method according to claim 4,

wherein the data augmentation technique includes at least one of random crop, blur, and flip processing.

[Claim 6**]**

The skin diagnosis method according to claim 1,

wherein the artificial neural network model for diagnosing the wrinkles is learned by adjusting parameters including the total number of a subject with detected wrinkles, an estimate of intensity (depth) compared to the surrounding undetected area in the subject with detected wrinkles, the total area with detected wrinkles, the length and width of the detected wrinkles, and

outputs analysis results for at least one among the number of wrinkles, intensity

(depth) of wrinkles, wrinkle area, wrinkle length, wrinkle width, distribution for each intensity, area, length or width of wrinkles, and wrinkle score.

[Claim 7**]**

The skin diagnosis method according to claim 1,

wherein the artificial neural network model for diagnosing the pigmentation is learned by adjusting parameters including the total number of a subject with detected pigmentation, an estimate of intensity compared to the surrounding undetected area in the subject with detected pigmentation, the total area with detected pigmentation, and

outputs analysis results for at least one among the number of pigmentation, intensity of pigmentation, pigmentation area, distribution for each intensity, area, length or width of pigmentation, and pigmentation score.

[Claim 8**]**

The skin diagnosis method according to claim 1,

wherein the artificial neural network model for diagnosing the pores is learned by adjusting parameters including the total number of a subject with detected pores, an estimate of intensity (depth) compared to the surrounding undetected area in the subject with detected pores, the total area with detected pores, pore length and pore width, and

outputs analysis results for at least one among the number of pores, intensity (depth) of pores, pore size, pore area, pore length, pore width, pore sagging (length to width ratio), distribution for each intensity, area, length, width or sagging of pores, and pore score.

[Claim 9**]**

The skin diagnosis method according to claim 1,

wherein the artificial neural network model for diagnosing the erythema is learned by adjusting parameters including the total number of a subject with detected erythema, an estimate of intensity compared to the surrounding undetected area in the subject with detected erythema, the total area with detected erythema, and outputs analysis results for at least one among the number of erythema, intensity of erythema, erythema area, distribution for each intensity or area of erythema, and erythema score.

[Claim 10**]**

The skin diagnosis method according to claim 1,

wherein the artificial neural network model for diagnosing the aging predicts age for facial aging or facial skin aging estimated from the face image by inputting at least one of the de-identified face image, the output result of a single artificial neural network model, and the value that integrates the output result of a plurality of artificial neural network models.

[Claim 11**]**

The skin diagnosis method according to claim 1,

wherein each of the plurality of artificial neural network models is an encoder-decoder structural model based on U-net model.

[Claim 12**]**

The skin diagnosis method according to claim 1,

wherein each of the plurality of artificial neural network models is learned in the form of an imageNet pre-trained weight based on ResNet.

[Claim 13**]**

The skin diagnosis method according to claim 1,

further comprising the step of evaluating at least one of antioxidant efficacy and whitening efficacy for a specific product based on skin diagnosis results for the above items.

[Claim 14**]**

The skin diagnosis method according to claim 1,

further comprising the step of, before inputting the de-identified face image into the plurality of artificial neural network models, respectively, obtaining information about the subject's skin concerns and lifestyle through a questionnaire,

wherein the result of skin diagnose is the one resulting from the subject's skin concerns and lifestyle.

[Claim 15**]**

The skin diagnosis method according to claim 14,

further comprising the step of recommending a specific product tailored to the subject's skin concerns and lifestyle or providing beauty eating habit, based on the result of skin diagnose.

[Claim 16**]**

A skin diagnosis system based on image analysis using deep learning, the system comprising:

an imaging unit that acquires a face image by photographing a target skin;

a face detection model that derives shape or location information of a facial structure by recognizing feature points capable of identifying an individual in the acquired face image;

a de-identification model that de-identifies the face image on the basis of the shape or location information of the facial structure such that personal information of an analysis

target cannot be identified; and

a plurality of artificial neural network models for each of at least one item among diagnoses for wrinkles, pigmentation, pores, erythema, and aging,

wherein the plurality of artificial neural network models receive the de-identified face image as input, and visualize and provide skin diagnosis results for items corresponding to the artificial neural network models and symptom locations for each item.