Apparatus and Method for Computerized Analysis of Interstitial Infiltrates in Chest Images Using Artificial Neural Networks (ANNs)

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Technology description

Description

An automated computer-aided diagnosis (CAD) method and system using artificial neural networks (ANNs) for the quantitative analysis of image data. Three separate ANNs were applied for detection of interstitial disease on digitized two-dimensional chest images. The first ANN was trained with horizontal profiles in regions of interest (ROIs) selected from normal and abnormal chest radiographs. The second ANN was trained using vertical output patterns obtained from the 1st ANN for each ROI. The output value of the 2nd ANN was used to distinguish between normal and abnormal ROIS with interstitial infiltrates. If the ratio of the number of abnormal ROIs to the total number of all ROIs in a chest image was greater than a certain threshold level, the chest image was considered abnormal. In addition, the third ANN was applied to distinguish between normal and abnormal chest images where the chest image was not clearly normal or abnormal. The ANN trained with image data learns some statistical properties associated with interstitial infiltrates in chest radiographs. In addition, the same technique can be applied to higher-dimensional data (e.g., three-dimensional data and four-dimensional data including time-varying three-dimensional data).
Claim 1: An apparatus for generating a partial diagnosis based on image data, the apparatus comprising: a plurality of one-dimensional neural networks connected in a tree of levels, the tree of levels comprising a) a plurality of first-level one-dimensional neural networks receiving strips of two-dimensional image data and outputting one-dimensional image data, and b) a second-level one-dimensional neural network receiving the one-dimensional data output from the plurality of first-level networks and outputting a partial diagnosis.

Institution

University of Chicago

联系我们

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com