

Kumazawa Laboratory

Medical Image Diagnosis and Product Inspection by Deep Learning

Laboratory for Future Interdisciplinary Research of Science and Technology Imaging Science and Engineering Research Center http://kuma2.isl.titech.ac.jp/

- Image Recognition for Factory Automation
- · Automated Medical Image Diagnosis for Medical Images
- Surveillance and Sensing Technologies for Safe Society and Disaster Countermeasures

Tactile Feedback Technologies for Virtual Reality

We are investigating image recognition techniques for product inspection, robot vision in factory lines and automated medical diagnosis to detect pathological abnormality. In addition to the classical image recognition techniques, novel technologies including deep learning and original machine learning tecniques are applied. Successful results have been obtained for foreign object detection in food products, cancer detection in MRI images, pedestrian tracking in congested space and so on.







The upper images are test images that were not used for learning. The middle images show the positions of. The lower images show the likelihood od cancer computed by the Residual. A high likelihood is shown by a hot color.

• A kind of CNN Convolutional Neural Network) : Residual Network is applied to detect cancers in MRI images. Each rectangular in the figure represents a layer of the neural network.

The function of the layer is coded by its color. Three numerical numbers represent the number of convolution filter patterns and the size of the two dimensional array of neurons of each layer



Foreign Objects in Frozen Fried Chicken are Detected by Deep Neural Networks.

Foreign objects exist in dotted orange ellipses in the left images.

The estimated likelihood of foreign object is indicated by Heat Map (high probability is shown by high temperature color (red)) in the right image.