

Skin Cancer Detection Using Convolutional Neural Network

Komlan Jean-Marie DANTODJI

Etudiant en M1 Big Data

Université Paris 8



December 17, 2020



Summary

2/23

- 1 Introduction
- 2 Issue
- 3 Background and Related works
- 4 Input image and Dataset
- 5 Differents step of detecting cancer in image
- 6 Discussions and results
- 7 Conclusion

Skin Cancer

3/23



FIGURE – Skin Cancer : From Google

Issue

4/23

- Find a way to diagnostic cancerous cells from image
- Extract features from the image
- Apply Convolutional Neuronal Network to layers

Background and Related works 1/2

5/23

- Robert Amelard et al :
Illumination correction and feature extraction framework based on high level intuitive feature implemented on skin images.
- A. Goshtasby D. Rosemanb S. Binesb C. Yuc A. Dhawand A. Huntleye L. Xua :
Back-propagation neural network (BNN) and Auto-associative neural network.

Background and Related works 2/2

6/23

- Ramteke et al. :
ABCD standard to recognize skin malignant growth
- Sibi Salim RB Aswin, J Abdul Jaleel. 2013 :
ANN Classifier using MATLAB for Skin Cancer Detection.

Input image and Dataset

7/23

- Image of patient's body
- Dataset of 23907 images from ISIC Archive

Chart of steps

8/23

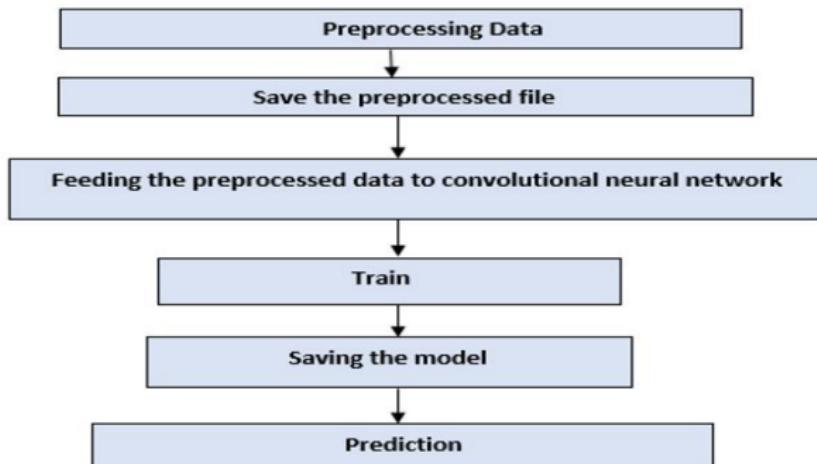


FIGURE – [1] Chart display steps of the model CNN, page 255

Step 1 : Preprocessing Data

9/23

- Convert all images to the gray-scale
- Resize images to reduce time of processing

Step 2 : Save the preprocessed file

10/23

- Binary labels : benign and malignant
- Classify each image of dataset to his class

Step 3 : Feeding the preprocessed data to CNN 1/3

11/23

$$\begin{matrix} 5 & 3 & 2 & 1 & 7 & 4 \\ 3 & 5 & 8 & 9 & 1 & 3 \\ 2 & 5 & 6 & 0 & 1 & 4 \\ 1 & 6 & 7 & 1 & 0 & 2 \\ 6 & 2 & 4 & 0 & 8 & 2 \\ 2 & 5 & 4 & 2 & 3 & 9 \end{matrix} * \begin{matrix} 1 & 0 & -1 \\ 1 & 0 & -1 \\ 1 & 0 & -1 \end{matrix}$$

FIGURE – [1] Gray-scale Image 6x6 and the 3x3 filter, page 256

$$\sum_{i=0}^{m-1} \sum_{j=0}^{m-1} X_{(n-i)(n-j)} Y_{(i+1)(j+1)}(1)$$

Step 3 : Result of Pooling 2/3

12/23

We get the result as follow :

-6	3	7	-1
-15	6	19	1
-8	12	8	-7
-6	10	4	-10

FIGURE – [1] 4x4 image after applying 3x3 filter to the gray-scale image,
page 257

Step 3 : Max Pooling 3/3

13/23

Extract more features

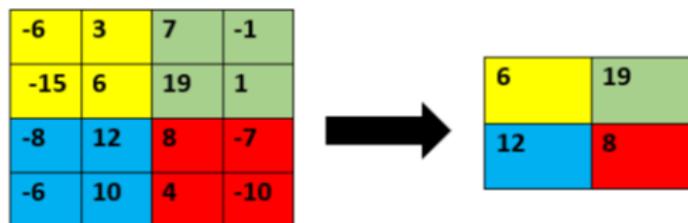


FIGURE – [1] Result after applying max pooling, page 257

Steps 4 and 5 : Train and save the model

14/23

- Train the model 200 times of epoch
- Save the model

Step 6 : Test and predict cancer

15/23

- Feed image to the model for prediction

$$Recall = \frac{TruePositive}{Positive} \quad (2)$$

$$Specificity = \frac{TrueNegative}{Negative} \quad (3)$$

$$Precision = \frac{TruePositive}{TruePositive + FalsePositive} \quad (4)$$

$$Score = \frac{2 * Precision * Recall}{Precision + Recall} \quad (5)$$

Neurons vs accuracy

16/23

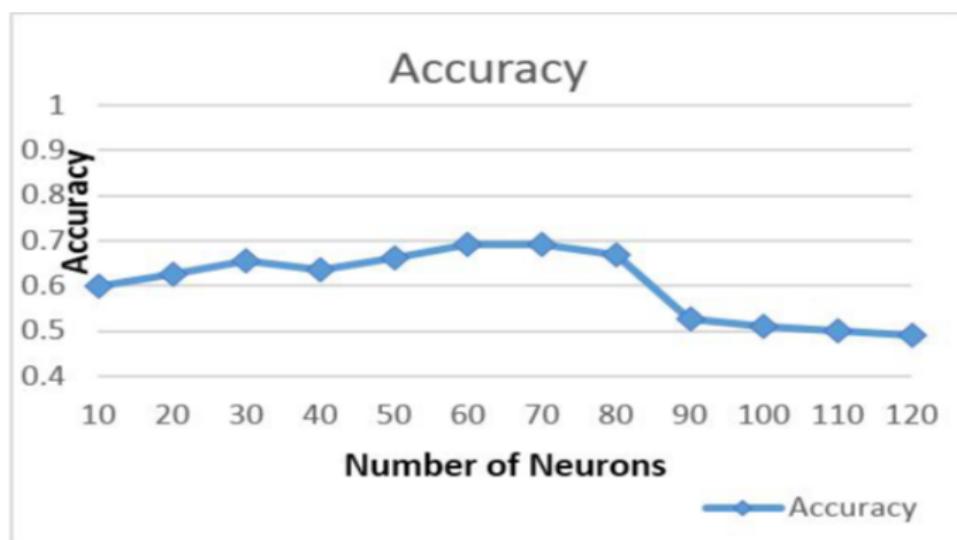


FIGURE – [1] Neurons vs accuracy, page 257

Iteration vs loss

17/23



FIGURE – [1] Iteration vs loss, page 258

Iteration vs accuracy

18/23

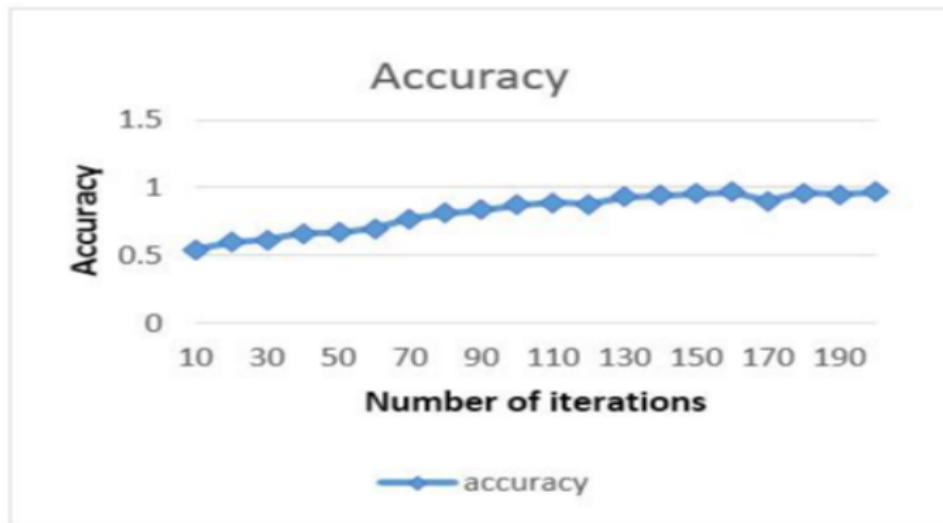


FIGURE – [1] Iteration vs accuracy, page 258

Iteration vs Mean Square Error

19/23

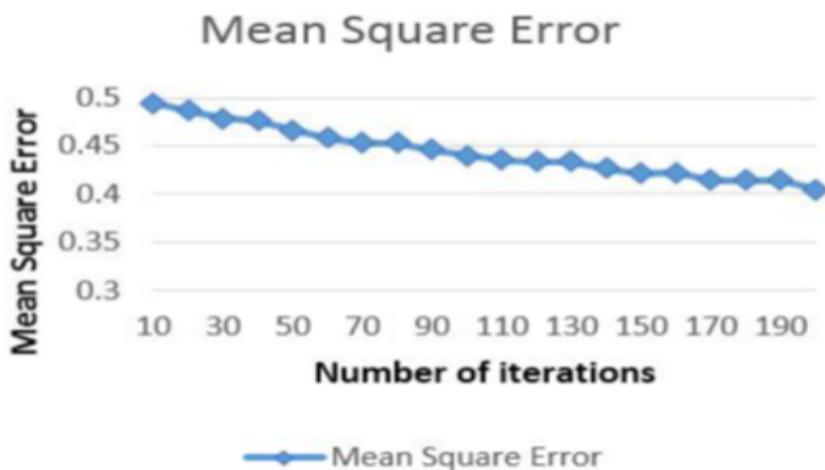


FIGURE – [1] Iteration vs Mean Square Error, page 258

Results

20/23

With this model using ISIC archive dataset we get the the result

$$Recall = 0.84$$

$$Precision = 0.8325$$

$$Score = 0.8325$$

according to [1].

Conclusion

21/23

- Helps dermatologist to diagnostic early skin cancer
- High accuracy with the model CNN

Référence

22/23

- ▶ Surajit Das Barman MAHAMUDUL HASAN Samia Islam. “Skin Cancer Detection Using Convolutional Neural Network”. In : *the 2019 5th International Conference* 3 (April 2019), p. 254-258.

Thank you for your attention...