### UNIVERSITI TEKNOLOGI MARA CAWANGAN PULAU PINANG

# CLASSIFICATION OF CLEFT LIP AMONG CHILDREN USING ARTIFICIAL INTELLIGENCE

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### **AUTHOR'S DECLARATION**

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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#### ABSTRACT

Cleft lip abnormalities can cause a serious oral health issue if it is not treated properly in a timely manner. Having a child with a cleft lip can be expensive since the cleft will impact their entire psychological well-being and appearance in addition to their feeding and speaking development. However, the dearth of reliable medical resources in general hospitals, particularly in rural regions, makes the diagnosis of cleft subjective and variable between medical practitioners. Thus, this study aims to develop a model on the classification of cleft lip among children using Convolutional Neural Network (CNN). A total of 1956 cleft lip images, extracted from various internet websites was utilized in this study. Transfer learning architectures were used to assess the CNN's models, namely AlexNet, GoogLeNet, and ResNet-50 architectures after they were optimized using SGDM, ADAM, and RMSprop. ResNet-50 with ADAM optimizer achieved the highest accuracy of 94.53%. To improve the classification accuracy further, classifiers like Support Vector Machine (SVM), K-Nearest Neighbors (KNN), and Random Forest (RF) was embedded in the CNN to optimize the results. With an accuracy of 93.23%, GoogLeNet and RF classifier performed the best in classifying the type of cleft lip among children. This result shows that the developed model of CNN is able to increase the diagnosis accuracy while lowering misclassification. A graphical user interface (GUI) was created to allow medical professionals to easily categorize images for diagnosis. This study demonstrates the potential of deep learning can be used to improve medical diagnosis, even in environments with limited resources.

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