CLASSIFICATION OF CHEST X-RAY IMAGES OF LUNG DISEASES USING DEEP CONVOLUTIONAL NEURAL NETWORK

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(20PCJ02085)

DECEMBER, 2022

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS OF ENGINEERING (M.Eng.) DEGREE IN COMPUTER ENGINEERING IN THE DEPARTMENT OF ELECTRICAL AND INFORMATION ENGINEERING, COLLEGE OF ENGINEERING, COVENANT UNIVERSITY, OTA, OGUN STATE

DECEMBER, 2022

ACCEPTANCE

This is to attest that this dissertation has been accepted in partial fulfilment of the requirements for the award of the degree of Masters of Engineering in Computer Engineering in the Department of Electrical and Information Engineering, College of Engineering, Covenant University, Ota, Nigeria.

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DECLARATION

I, OLAYIWOLA, JOY OLUWABUKOLA (20PCJ02085) declare that this dissertation is a representation of my work and is written and implemented by me under the supervision of Dr. Joke A. Badejo of the Department of Electrical and Information Engineering, Covenant University, Ota, Nigeria. I attest that this dissertation has in no way been submitted either wholly or partially to any other university or institution of higher learning for the award of a masters' degree. All information cited from published and unpublished literature has been duly referenced.

OLAYIWOLA, JOY OLUWABUKOLA

Signature and Date

CERTIFICATION

This is to certify that the research work "**CLASSIFICATION OF CHEST X-RAY IMAGES OF LUNG DISEASES USING DEEP CONVOLUTIONAL NEURAL NETWORK**" is an original research work carried out by **OLAYIWOLA, JOY OLUWABUKOLA (20PCJ02085),** meets the requirements and regulations governing the award of Masters of Engineering (M.Eng.) degree in Computer Engineering from the Department of Electrical and Information Engineering, College of Engineering, Covenant University, Ota, and is approved for its contributions to knowledge and literary presentation.

Dr. Joke A. Badejo
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(Head of Department) **Signature and Date**

Prof. Jonathan GanaKolo
(External Examiner) **Signature and Date**

Prof. Akan B. Williams
(Dean, School of Postgraduate Studies) **Signature and Date**

DEDICATION

This research work is dedicated first and foremost to God Almighty, the custodian of all wisdom, knowledge, and understanding, for His grace and favour throughout the duration of carrying out this research. Then to my family for their endless support and love.

ACKNOWLEDGMENTS

My profound gratitude goes firstly to God Almighty for His unspeakable gifts wherewith He has so lavishly poured upon me, and His daily benefits that I enjoy, most pertinent of which is life itself.

My sincere appreciation goes to the Chancellor, Covenant University, Dr. David O. Oyedepo, whose words have always been a constant reminder that anything is possible and achievable. Thank you very much sir, and may your legacy outlive you. Also, to the Vice Chancellor, Professor Abiodun H. Adebayo, the Dean School of Postgraduate Studies, Prof. Akan B. Williams, the Head of Department Electrical and Information Engineering Department, Prof. Emmanuel Adetiba of Covenant University for all their tireless pursuits in seeing to the realization of vision 10:2022 for Covenant University being among the top ten Universities in the World. May God Almighty immensely reward all your efforts.

My deep appreciation goes to my amiable supervisor, Dr. Joke A. Badejo for her kind-heartedness, support, mentorship, and advice she gave to me through the stages of this research work enabling me to complete it in time. The word “well done” from her to me, give me a lot of courage in achieving success. Thank you very much, ma, God Almighty will bless you and yours. Many thanks also to the entire Academic and Non-Academic staff in the Department of Electrical and Information Engineering. May the good Lord reward you all for your investments in my life. Also, to our Departmental PG representative Dr.Ayokunle A. Awelewa, I really appreciate you, sir. Thanks for all you do. God bless you and reward your labour of love.

I also want to appreciate deeply my colleagues; Adetola, Emmanuel, Oghor, Emeka, Kingsley, Kennedy, Andrew, and Innocent, to name a few, whose contributions were invaluable all through my postgraduate studies. God bless you all and reward you abundantly.

I also appreciate the HOD (Engr. D.W.S. Alausa) and staff of the Department of Computer Engineering, Federal Polytechnic, Ilaro, Ogun State, for the support given to me during this program. I also appreciate the following people for their immense support; Dr. Afolabi Olajide, Opeyemi Dada, Mr.& Mrs Olufemi Ige, and Mrs Jegede O.W. to mention a few, God rewards your labour of love.

My heartfelt and deep appreciation goes to my darling husband Mr. AdewoleOlayiwola and my children (Great Nations) for their love, moral & financial support, and prayers. My heartfelt appreciation also goes to my parents, Elder & Mrs Abayomi Osasona, Elder &DcnAyoadeFajinmi, and Dr.& Mrs Taiwo Obateru who has always been there for me and stood in prayers for my destiny. Words cannot express how indebted I am to you. I pray you will live long enough to reap the benefits of the seeds you have sown in my life and that of my siblings. I love you. God bless you all.

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ABSTRACT

The accurate diagnosis of lung disease in infected patients is a crucial step in coping with and combating such diseases. Lung opacity, tuberculosis, COVID-19, bacterial pneumonia,and viral pneumonia are examples of infectious diseases that similarly affect the lungs. Classifying accurately which of these diseases (lung opacity, tuberculosis, COVID-19, bacterial pneumonia, and viral pneumonia or normal) an image of chest X-ray is being infected with despite the similarities in the images is crucial. Therefore, this research aimed at developing a convolutional neural network, CNN-based model to classify the lung diseases. In this research work, four convolutional neural network models, MobileNetV2, Resnet-50, ResNet-101, and AlexNet were empirically analysed in order to classify lung diseases from images of chest X-rays. The models were utilised in three classification modes: 6-subclass (lung opacity, tuberculosis, COVID-19, bacterial pneumonia, viral pneumonia, and normal), 5-subclass (lung opacity, viral pneumonia, COVID-19, tuberculosis, and normal), and 4-subclass (lung opacity, viral pneumonia, COVID-19, and normal); to investigate the effect of high interclass similarity. The retrained ResNet-50 architecture provided the best classification accuracy with 97.22%, 92.14%, and 96.08% for 6-subclass, 5-subclass, and 4-subclass respectively. Nevertheless, ResNet-101 has the lowest classification accuracy with 78.12% and 79.49% for 6-subclass and 5-subclass respectively while MobileNetV2 has the lowest classification accuracy of 88.89% for 4-subclass. The findings suggest that the ResNet-50 model can be applied to accurately diagnose lung diseases from chest images of X-rays even with high interclass similarity. Also, this corroborates the success of adopting computer-aided detection (CAD) systems designed for decision support in theclassification of lung diseases.

Keywords: Lung disease, Deep Learning, Diagnosis, ResNet-50, MobileNetV2, Transfer Learning.