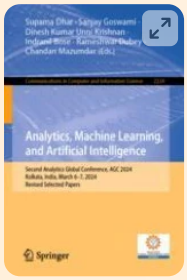

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Second Analytics Global Conference, AGC 2024, Kolkata, India, March 6–7, 2024, Revised Selected Papers

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Included in the following conference series:

AGC: Analytics Global Conference

Conference proceedings info: AGC 2024.

About this book

This book constitutes the refereed proceedings of the Second Analytics Global Conference on Analytics, Machine Learning, and Artificial Intelligence, AGC 2024, held in Kolkata, India, during March 6-7, 2024.

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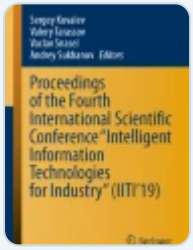

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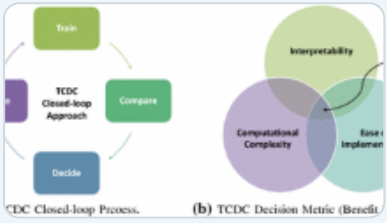

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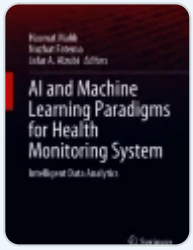

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Accessibility Information

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Bibliographic Information

Book Title
Analytics, Machine Learning, and Artificial Intelligence

Book Subtitle
Second Analytics Global Conference, AGC 2024, Kolkata, India, March 6–7, 2024, Revised Selected Papers

Editors
Suparna Dhar, Sanjay Goswami, Dinesh Kumar Unni Krishnan, Indranil Bose, Rameshwar Dubey, Chandan Mazumdar

Series Title
Communications in Computer and Information Science

DOI
https://doi.org/10.1007/978-3-031-75157-8

Publisher
Springer Cham

eBook Packages
Artificial Intelligence (R0), Springer Nature Proceedings excluding Computer Science

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Softcover ISBN
978-3-031-75156-1
Published: 21 November 2024

eBook ISBN
978-3-031-75157-8
Published: 20 November 2024

Series ISSN
1865-0929

Series E-ISSN
1865-0937

Edition Number
1

Number of Pages
X, 267

Number of Illustrations
51 b/w illustrations, 84 illustrations in colour

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Lung-UNet: A Modified UNet-Based DNN for COVID Lung Segmentation from Chest X-Ray and CT-Scan Images

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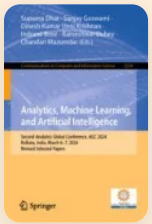

Analytics, Machine Learning, and Artificial Intelligence

(AGC 2024)

Sanjib Saha

Part of the book series: Communications in Computer and Information Science ((CCIS,volume 2224))

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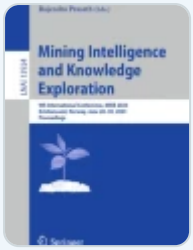
Abstract

In severe cases, COVID-19 progresses to pneumonia, leading to suffocation, breathlessness, and, in extreme instances, multi-organ failure and death. In response to

these challenges, extracting and analyzing lung patterns can be beneficial through a deep neural network (DNN) based lung segmentation. The proposed DNN comprises numerous distinct operations. The filter size of the 3 × 3 convolution operation followed by ReLU extracts feature maps of large images in individual tiles. The max pooling operation reduces the image size of the feature map. It propagates the maximum activation from each 2 × 2 window to the next feature map and increases feature channels by a factor of two. It results in a spatial contraction and assigns all features into a singular output vector. In the expansion pathway, the upconvolution operation maps each feature vector to a 2 × 2 output window followed by 3 × 3 convolution and ReLU. It concatenates with the corresponding high-resolution features obtained from the contracting pathway. The resulting segmentation map comprises two channels designated for foreground and background classes. The image size of the feature map varies from 512 × 512 to 32 × 32 and vice versa. The feature channel (no. of filter) ranges from 32 to 512 and vice versa. The proposed model is analyzed with different values of parameters like kernel or filter size, number of filter, pooling strategies, optimizer, learning rate, activation function, loss function, batch size and epochs. The best hyperparameter values are obtained, and training procedures are improved in the proposed modified UNet. By leveraging this advanced architecture, the segmentation process benefits from extracting low-level and high-level properties using encoders, skip connections and decoders. It combines data from different resolutions to emphasize critical areas. Our results, based on publicly accepted image datasets of chest X-rays and CT-scans from Kaggle, demonstrate the effectiveness of our proposed method. The metrics such as accuracy and dice coefficient are used for quantitative evaluation. The proposed lung segmentation model's training, validation and test accuracy is 95%, 94.8% and 92.1% for X-ray images and 95.1%, 94.4%, and 91.2% for CT-scan images. The performance of the proposed model is comparable with existing models and can used by clinicians in diagnosing and monitoring COVID-19 cases.



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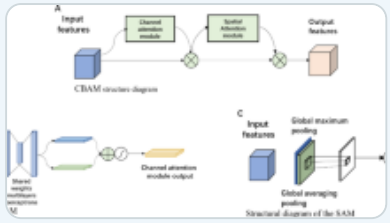

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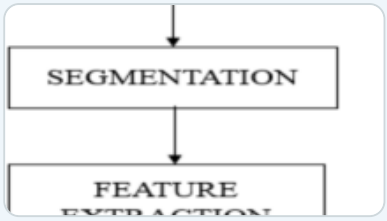

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Cite this paper

Saha, S. (2025). Lung-UNet: A Modified UNet-Based DNN for COVID Lung Segmentation from Chest X-Ray and CT-Scan Images. In: Dhar, S., Goswami, S., Unni Krishnan, D.K., Bose, I., Dubey, R., Mazumdar, C. (eds) Analytics, Machine Learning, and Artificial Intelligence.

AGC 2024. Communications in Computer and Information Science, vol 2224. Springer, Cham. https://doi.org/10.1007/978-3-031-75157-8_18

.RIS .ENW .BIB

DOI
https://doi.org/10.1007/978-3-031-75157-8_18

Published
21 November 2024

Publisher Name
Springer, Cham

Print ISBN
978-3-031-75156-1

Online ISBN
978-3-031-75157-8

eBook Packages
Artificial Intelligence (R0)
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Keywords

Deep Neural Network | U-Net | Lung Segmentation, | Chest X-ray | Chest CT

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