# Covid-19 Recognition in CT Scans using Artificial Intelligence (AI) guided tools

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**CSC 761**

**Advanced Artificial Intelligence**

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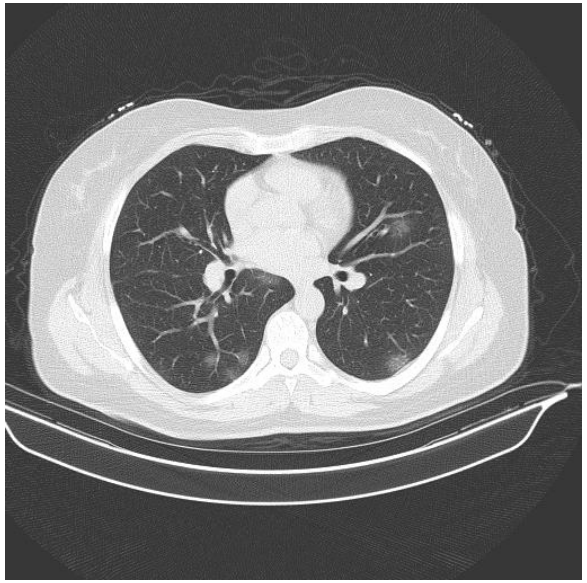
May 04, 2022

UNIVERSITY OF SOUTH DAKOTA

# Overview

- In this research, we build AI-guided tools to detect Covid-19 positive cases using chest X-ray image.
- Inception V3 and U-net models have been leveraged to build automated Covid-19 screening.
- Results show performance improvement and further possibilities.

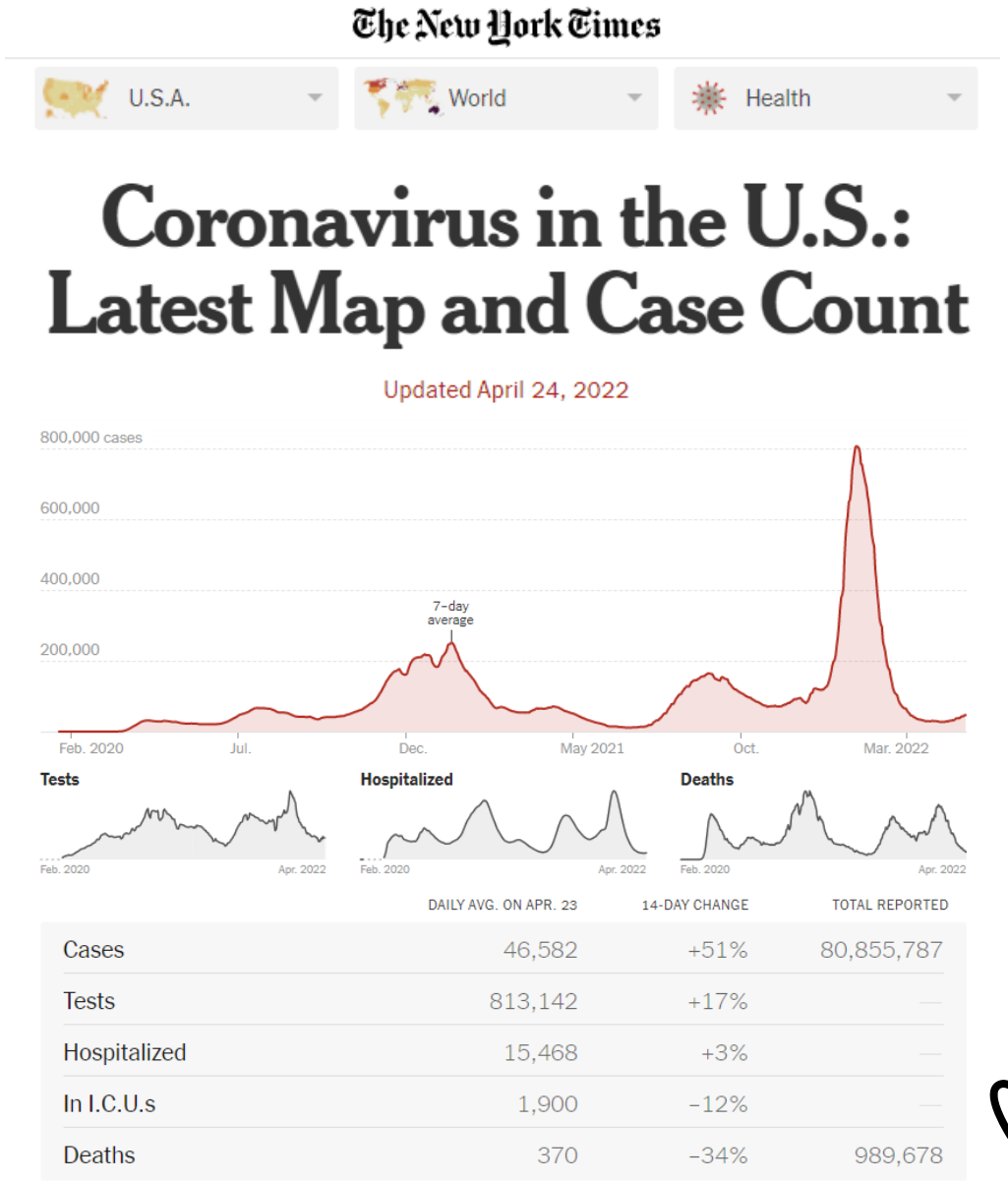


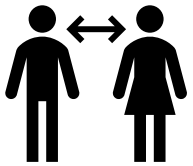
Covid-19

Healthy

# Motivation

- Since December 2019, the infection rate of Covid-19 cases has been very high.
- In such infectious disease, early detection tools would help largely to mitigate the spread and save lives.



# Literature Review


- A. A. Farid, G. I. Selim, H. Awad, and A. Khater, “A novel approach of ct images feature analysis and prediction to screen for corona virus disease (covid-19),” Int. J. Sci. Eng. Res, vol. 11, no. 3, pp. 1–9, 2020.text

- D. Singh, V. Kumar, and M. Kaur, “Classification of covid-19 patients from chest ct images using multi-objective differential evolution–based convolutional neural networks,” European Journal of Clinical Microbiology & Infectious Diseases, pp. 1–11, 2020.

- A. M. Hasan, M. M. AL-Jawad, H. A. Jalab, H. Shaiba, R. W. Ibrahim, and A. R. AL-Shamasneh, “Classification of covid-19 coronavirus, pneumonia and healthy lungs in ct scans using q-deformed entropy and deep learning features,” Entropy, vol. 22, no. 5, p. 517, 2020.

# Literature Review (continue..)

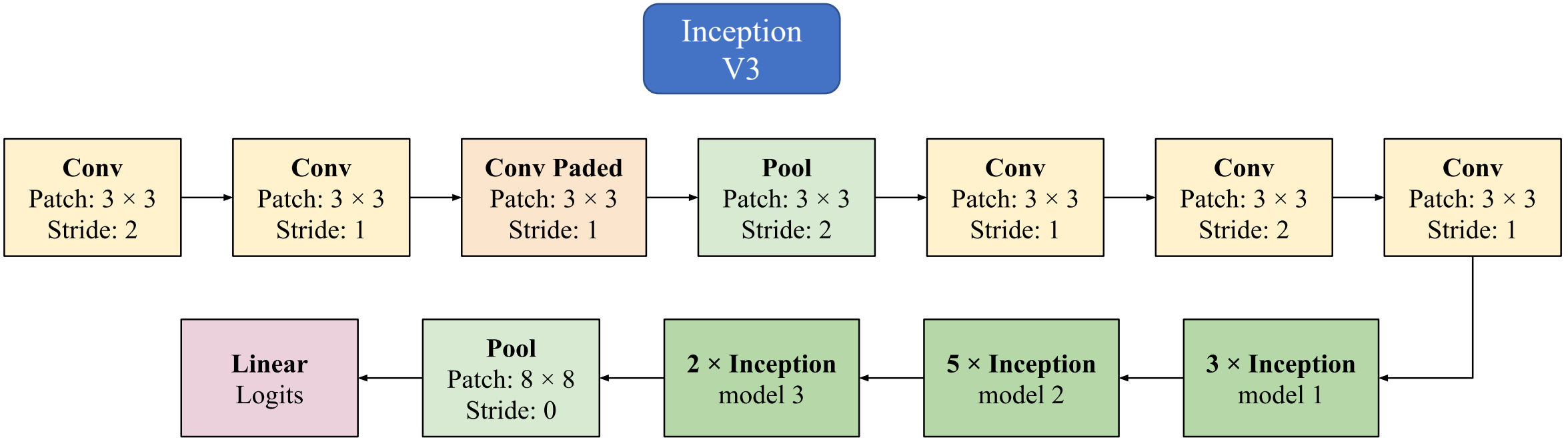

- S. Hu, Y. Gao, Z. Niu, Y. Jiang, L. Li, X. Xiao, M. Wang, E. F. Fang, W. Menpes-Smith, J. Xia, et al., "Weakly supervised deep learning for covid-19 infection detection and classification from ct images," IEEE Access, vol. 8, pp. 118869–118883, 2020.

- X. Wang, X. Deng, Q. Fu, Q. Zhou, J. Feng, H. Ma, W. Liu, and C. Zheng, "A weakly-supervised framework for covid-19 classification and lesion localization from chest ct," IEEE Transactions on Medical Imaging, 2020.

- X. Wu, H. Hui, M. Niu, L. Li, L. Wang, B. He, X. Yang, L. Li, H. Li, J. Tian, et al., "Deep learning-based multi-view fusion model for screening 2019 novel coronavirus pneumonia: a multicentre study," European Journal of Radiology, p. 109041, 2020.

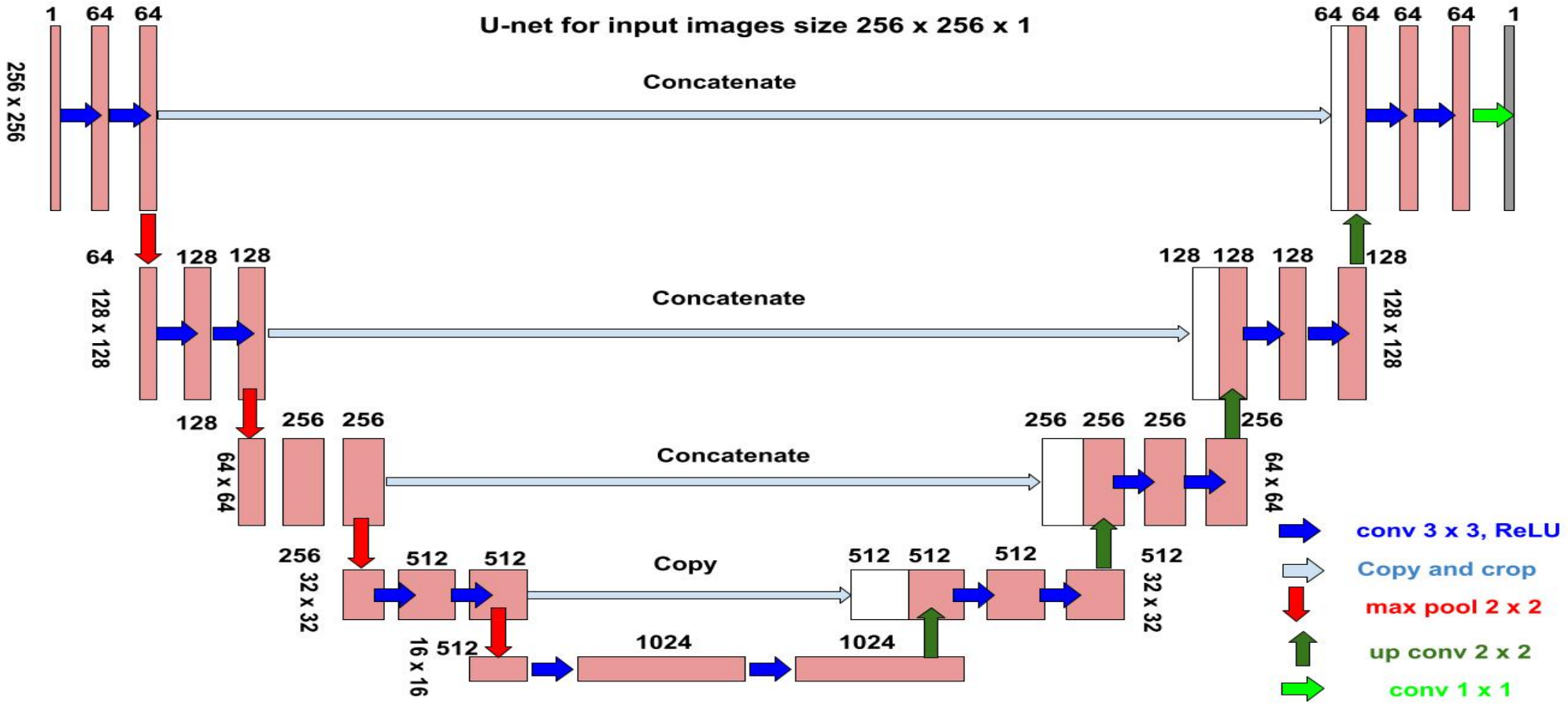
- X. Xu, X. Jiang, C. Ma, P. Du, X. Li, S. Lv, L. Yu, Q. Ni, Y. Chen, J. Su, et al., "A deep learning system to screen novel coronavirus disease 2019 pneumonia," Engineering, 2020.

# Proposed Methodology

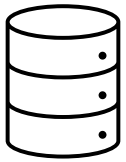


# Proposed Methodology

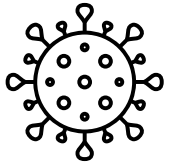
U-net



# Data Collection



| CT Scan Images | Collections |
|---|---|
| Covid-19 CT Scans | 1,267 |
| Healthy CT Scans | 543 |
| **Total CT Scan Images** | **1,810** |



Experiment: **1,810** CT Scans (**1,267** Covid-19 positive & **543** Healthy)

Kaggle dataset: https://www.kaggle.com/datasets/hgunraj/covidxct?select=2Aimages

# Results

**Inception V3**

| Folds | **Accuracy** | **AUC** |
|---|---|---|
| Fold-1 | 0.5103 | 0.5071 |
| Fold-2 | 0.9655 | 0.9655 |
| Fold-3 | 0.9517 | 0.9581 |
| Fold-4 | 0.9862 | 0.9862 |
| Fold-5 | 0.9758 | 0.9756 |
| Mean (μ) | 0.8779 | 0.8785 |
| σ | 0.2059 | 0.2079 |

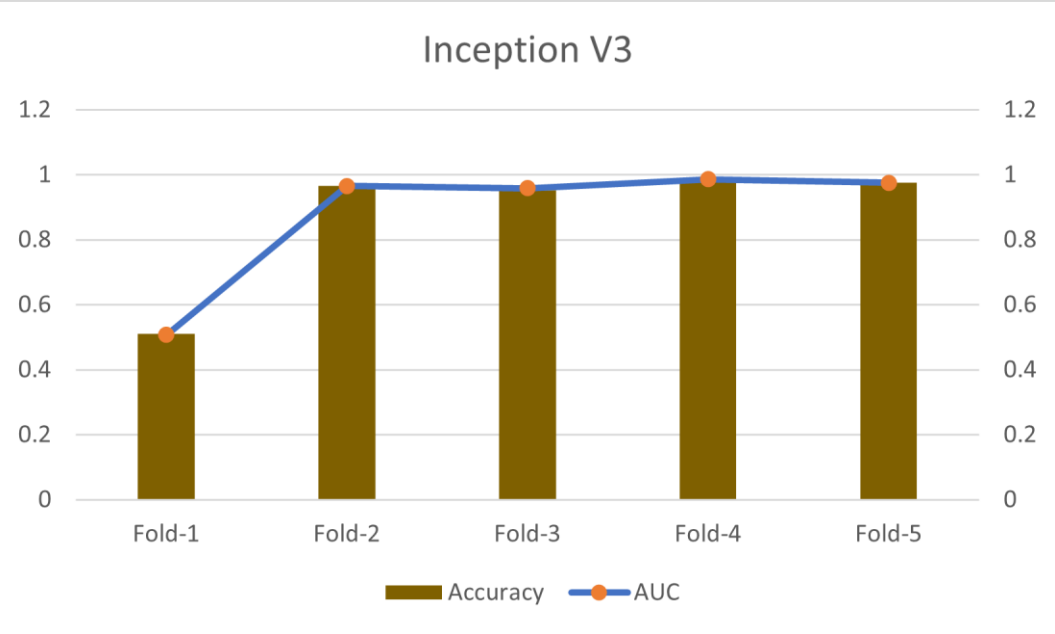
**U-net**

| Folds | **Accuracy** | **AUC** |
|---|---|---|
| Fold-1 | 0.6862 | 0.6862 |
| Fold-2 | 0.7207 | 0.7252 |
| Fold-3 | 0.687 | 0.718 |
| Fold-4 | 0.692 | 0.759 |
| Fold-5 | 0.7024 | 0.71 |
| Mean (μ) | 0.6977 | 0.7197 |
| σ | 0.0144 | 0.0264 |

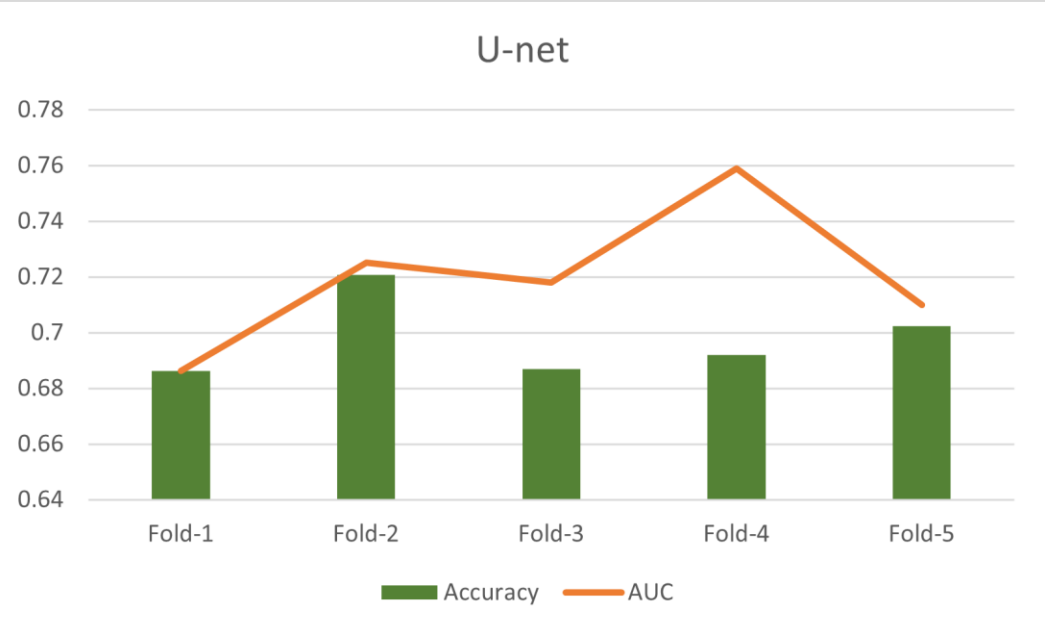
**Results**: Accuracy and AUC of Inception V3 and U-net

# Result Analysis

**Inception V3**




**U-net**



# Conclusions and Future Works

**Conclusion**

AI-driven tools must be integrated from the start of data collection, in collaboration with experts in the field.

The necessity of AI-driven tools for future Covid-19 epidemics has been discussed in this study.

**Future Works**

Our future plan is to work on the explainable artificial intelligence in CT scan images to screen Covid-19.

Also, we can use U-net for the purpose of lung segmentation for better visualization.

# Thank you