JFSA

Journal of Futuristic Sciences and Applications
Vol. 6(1), Jan-Jun 2023, pp. 1-10
doi: 10.51976/jfsa.612301
www.gla.ac.in/journals/jfsa

A Review of Computer Vision Techniques for Fighting Black Fungus

*Anurag Kumar**

ABSTRACT

This is obvious that no one wants to be associated with the Corona period. Consequently, this study has given the history of black fungus during the Corona period. Additionally, the reasons behind the proliferation of black fungus and the attention paid to its causes and preventions have been explained. In addition, he has studied black fungus and worked on it using contemporary tools like computers. Therefore, we describe in this study how and when to use image processing techniques and procedures to identify hazardous infection, to aid physicians in diagnostics and other activities. Therefore, the rationale for the use of CT-Scan and X-ray was explained, and a study was conducted to show how image enhancement aided at Corona times and how it may aid in the containment of epidemics such as black fungus. It is my hope that researchers working in this field will find a lot of use in this paper.

Keywords: *Black fungus; Computer vision; AI; Corona.*

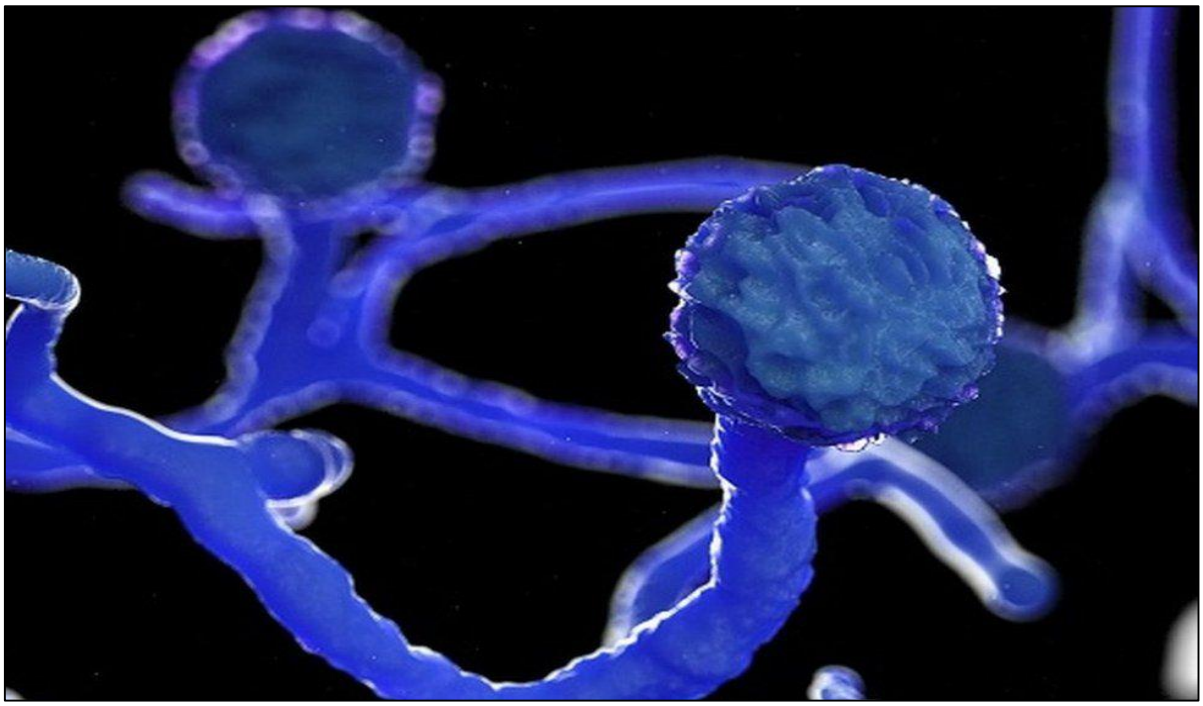
1.0 Introduction

The administration is actually grappling with the second wave of the Corona pandemic. The statistics on the number of diseases and deaths are released daily, and they are alarming. But in the midst of all of this, someone who is dealing with a lot of difficulties after COVID-19 is also having issues. [1]-[10]. Symptoms of viral illnesses include headaches, stinging in the eyes, hearing, and puffiness in the eyes. A black fungal infection is said to be the cause of everything (mucormycosis). In actuality, the air contains microscopic fungi known as mucormycitis. The medical word for this illness is mucormycosis. Figure 1 shows an illustration of mucormycosis. It was once called Zygomycosis. It's a fungal infection. The nose is usually where this disease starts. It subsequently extends to the eyes. Treatment is necessary as soon as the sickness spreads [11]. Iris paralysis can result from (mucormycosis). There is a greater likelihood of visual loss if the infection spreads over time. Mucormycosis poses a particular risk to diabetic Corona patients. Diabetes sufferers with Corona should stay away from it at all costs [12]. If the problem is handled in a timely manner, it can be lessened. Black fungus is a popular term used to describe mucormycosis. Twelve cases have previously been documented at Delhi's. These Corona patients had been diagnosed with mucormycosis [13]. It can spread to the brain if treatment is not received within 15 days. The most important thing in this situation is not to panic, but to remain conscious so that treatment may be given when it's needed [14].

**Assistant Professor, Computer Science & Engineering, I.E.T, Bundelkhand University, Jhansi, Uttar Pradesh, India (E-mail: researchworkhub@gmail.com)*

Journal of Futuristic Sciences and Applications, Volume 6, Issue 1, Jan-Jun 2023
Doi: 10.51976/jfsa.612301

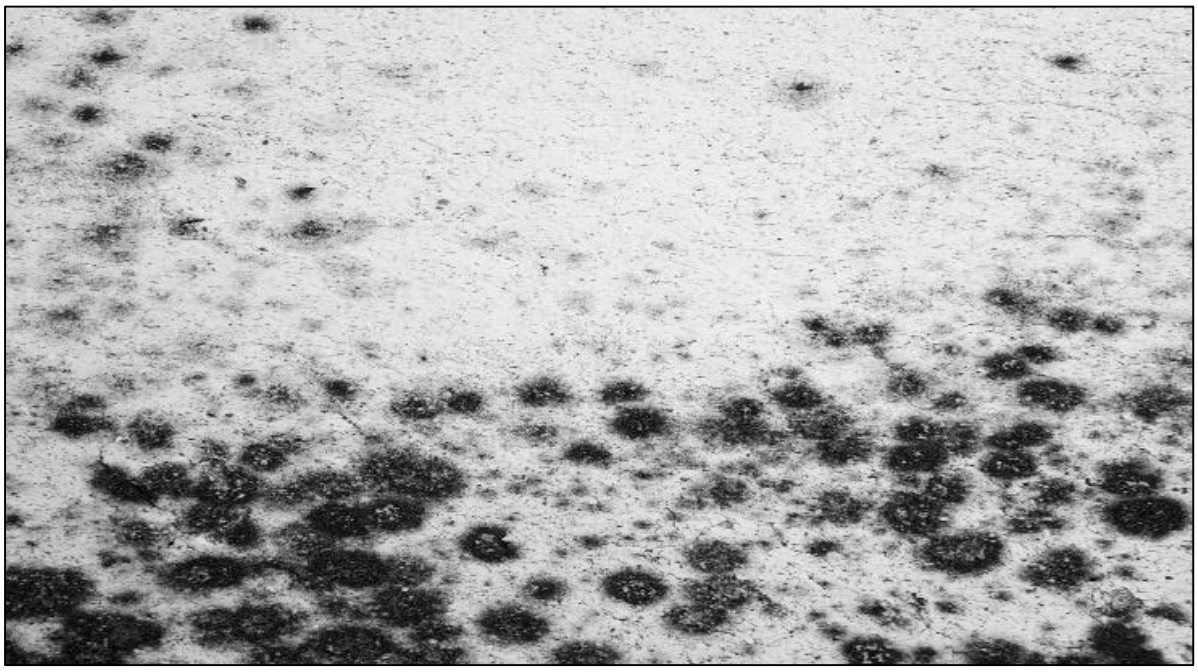
Figure 1: Structure of Black Fungus



2.0 Black Fungus

Black fungus was once a rare and deadly disease that only affected a small number of people. These days, the emergence of black fungus is getting worse. Thousands of people who have healed from Covid have been plagued with mucormycosis [15] [16].

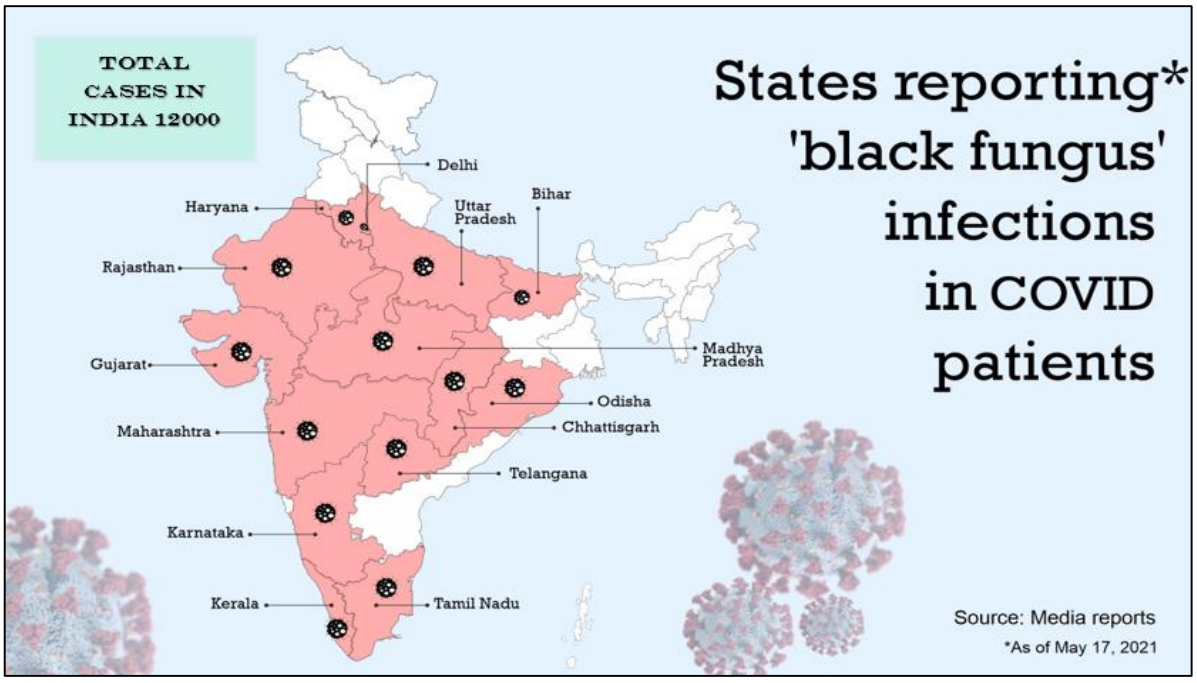
Figure 2: Large Sight Image of Spots in Mucormycosis



Black fungus cases are on the rise in India, which has raised concerns. This has resulted in numerous deaths in different parts of the nation. Following Covid, a black fungus invaded him and caused a large number of deaths. In Delhi alone, there have been over 700 cases reported, and over 90 people have passed away as a result. A black patch brought on by a black fungus is seen in Figure 2.

Mucormycosis, which has just recently afflicted a small number of patients. One in a million people were afflicted by this illness. However, among corona patients, this infection has spread quickly in the previous several days [17]. Oftentimes, we ignore common symptoms that turn out to be the precursor of a serious illness. If you cure yourself as soon as you notice these symptoms, you can prevent fungus. There aren't many medications available right now to treat this fungus [18]. Put another way, it poses a same risk to cancer. Despite a 66% increase in the number of cases. Let us inform you that the majority of people in India are victims of black fungus [19]. Physicians think that people are ignoring symptoms of black fungal infections. If the signs and symptoms are identified early on, black fungus can be prevented. The doctor advises diabetics who are recuperating from COVID-19 to exercise special caution at this time. since 99 percent of these people have black fungal infection. Three to five cases arrive each month. One case per day is the result of this [20].

Figure 3: State wise Overall Media Report Cases [27]



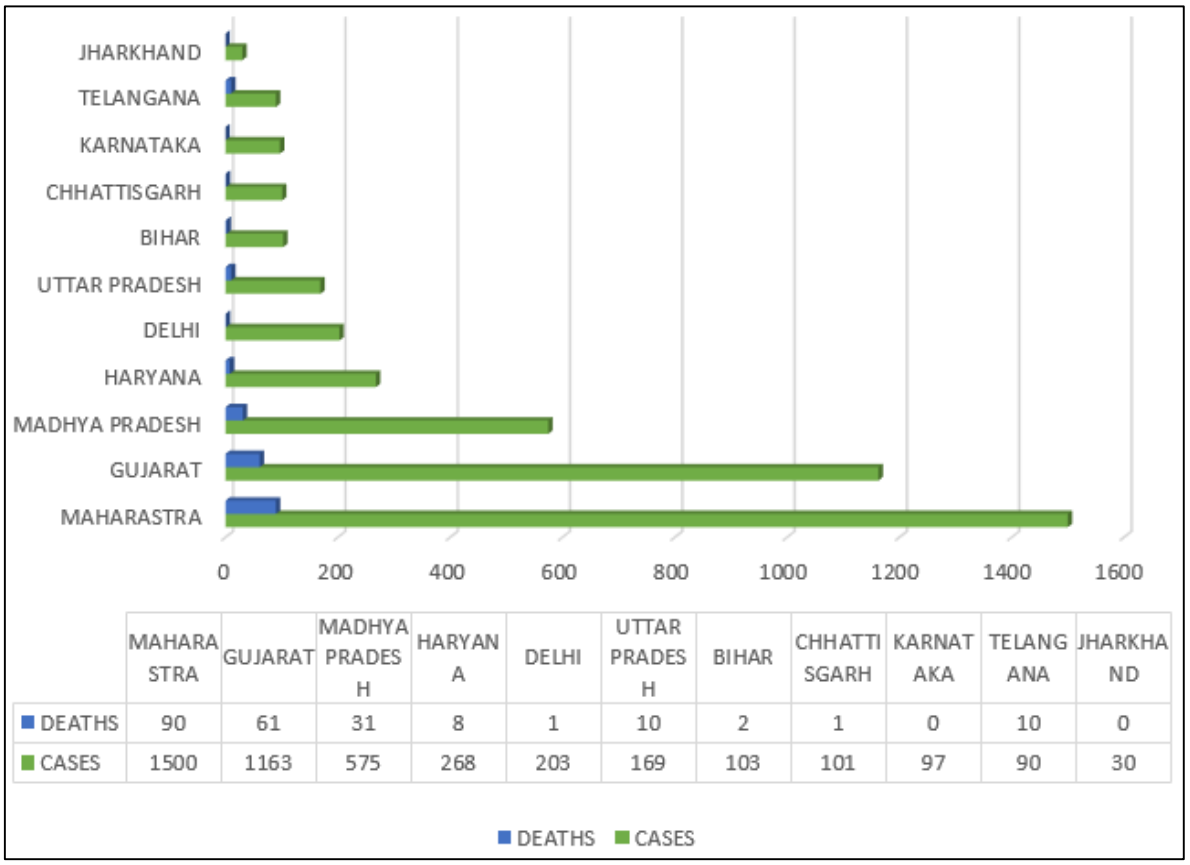
In reality, black fungus infection affects only those with weakened immune systems. Previously, this condition was more prevalent in chemotherapy, uncontrolled diabetes, those undergoing any type of transplant, and the elderly. Mucormycetes is a fungus that causes this sickness. This fungus enters the body through the nose [7]. This fungus is usually found in the air and enters the nose via the breath. Infection happens frequently when this fungus comes into contact with cut or burned areas of the body. That is, while the nose is the most common entry point, it can assault any area of the body. It is such a deadly virus that almost half of the victims die. There have even been situations where patients' eyes had to be removed to save them [21]-[25]. Diabetics are the most commonly affected by black fungus. In such a case, people must exercise extreme caution and

Journal of Futuristic Sciences and Applications, Volume 6, Issue 1, Jan-Jun 2023
Doi: 10.51976/jfsa.612301

monitor their blood sugar levels on a frequent basis. Although black fungus is most likely to harm the oral cavity or brain.

Only a few patients returned for treatment after being discharged from LNJP Hospital; the others were referred from elsewhere. Figure 4 depicts the number of illnesses and deaths reported by the top 11 states. Although doctors utilise an injection called Liposomal Amphoteresirin B to treat this ailment, the Government of India has granted licences to five more companies to manufacture it in order to encourage its production [26].

Figure 4: Highest Ranking States Which is Affected by Disease [14]



	MAHARASTRA	GUJARAT	MADHYA PRADESH	HARYANA	DELHI	UTTAR PRADESH	BIHAR	CHHATTISGARH	KARNATAKA	TELANGANA	JHARKHAND
DEATHS	90	61	31	8	1	10	2	1	0	10	0
CASES	1500	1163	575	268	203	169	103	101	97	90	30

3.0 Vision - based Approaches for Fungal Identification

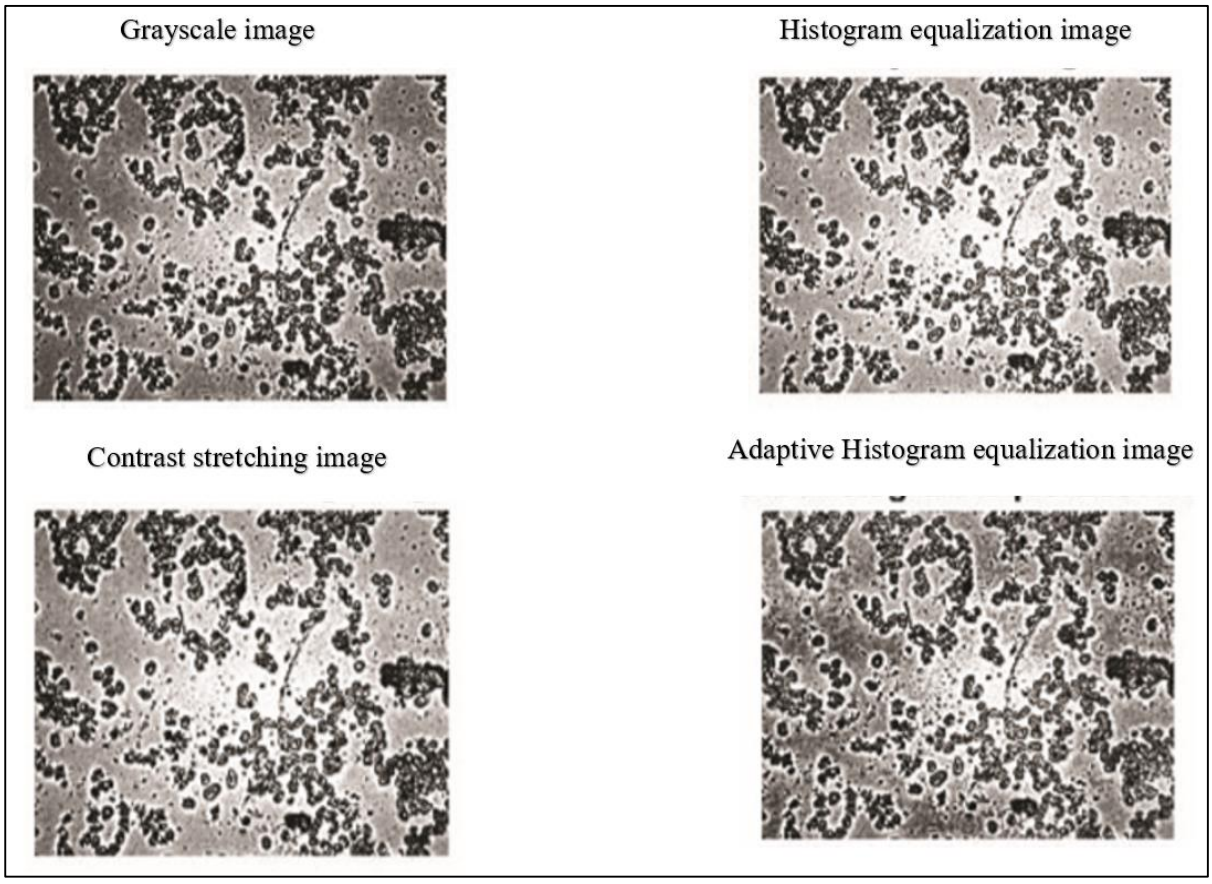
Artificial Intelligence (AI) is a technological system that uses software to create the ability to think, understand, act, and react like a human. It was able to artificially understand, interpret, and acquire. Robots are integrated with artificial intelligence, even if humans do not consider them to be artificial intelligence [27, 29, 31]. Applying AI to the public health sector would be a great way to solve the labour crisis and raise the standard of care [19]. It is generally challenging to identify any kind of fungus. Nonetheless, scientists have found a number of methods that let us recognise fungus in objects or people. But each of these tactics—including hog feature pay and SIFT (scale invariant feature transform) based algorithms—takes a lot of time, money, and effort to find.

But in the modern world, everything is clear-cut and easy to understand.

3.1 Pre-processing

Smoothing the image is highly demanded at the first pre-processing step since the image's quality affects the outcome as well. Therefore, image smoothing can be accomplished by using the 2D Gaussian Filter [28]. Next comes image enhancement, where the entire extent of the fungus in the photograph is brought to light. Some methods for improving fungal images are shown in Figure 5, including [30]

Figure 5: Enhancement Images of Pre-processing [11]



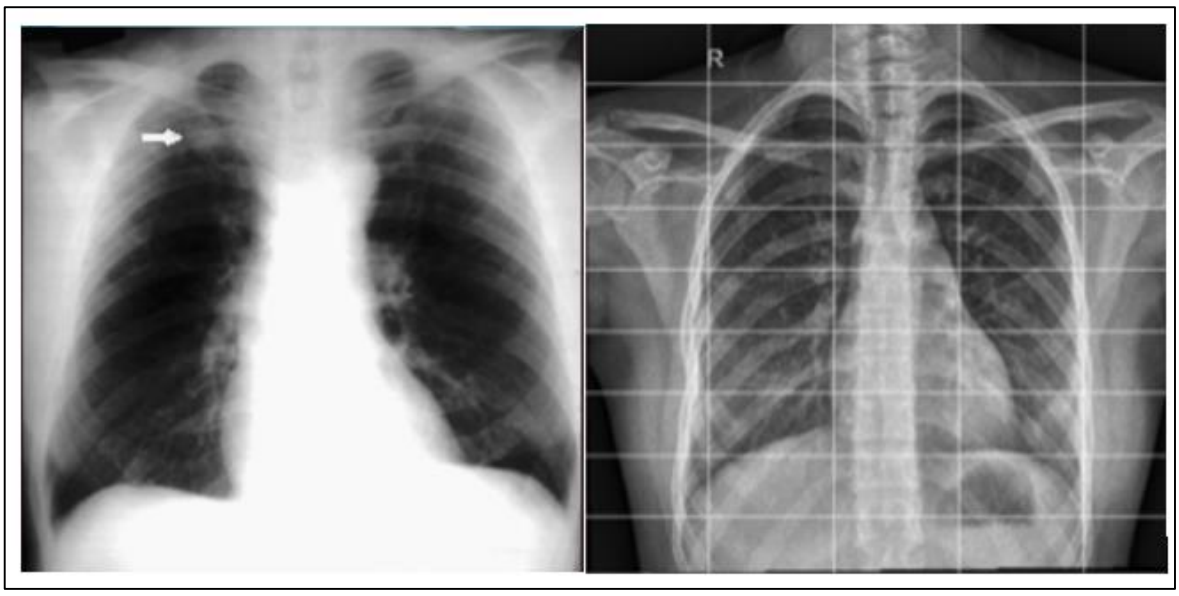
3.1.1 Chest X-Ray

Up to five minutes ago, the patient's status as Covid-19 positive can be ascertained with the Nashik-based ESDS AA+ Covid-19 Testing Solution. The verification process is fully contactless. Health professionals can use this method by simply taking a chest X-ray, uploading the image or film to their online browser, and then clicking the submit button [31]. It will decide whether or not the patient has COVID-19 once you hit the submit button. Its accuracy percentage is 98 percent. Because of this, it can also be applied to stop Aspergillosis and Black, White, and Yellow fungal outbreaks. But this hasn't been demonstrated yet [10]. Because calcium absorbs a large amount of radiation, bones appear white in X-rays because various tissues absorb different amounts of radiation [12]. An X-ray of a human lung in normal condition and an X-ray of a lung damaged by the Black fungus are displayed in Figures 6(a) and (b). An X-ray of a healthy human lung and an X-ray of lungs infected with the Aspergillosis fungus are displayed in Figure 7(a) and (b).

Journal of Futuristic Sciences and Applications, Volume 6, Issue 1, Jan-Jun 2023
Doi: 10.51976/jfsa.612301

Figure 6: (a) Common Person Lungs X-ray
(b) X-ray of a Lung Tissues Afflicted by the Black Fungi [8]

Figure 7: (a) Common Person Lungs X-Ray
(b) X-ray of a Lung Tissues Afflicted by the Aspergillosis Fungus



3.1.2 CT-Scan

Computerized Tomography Scan is shortened to CT scan. Tomography is the technique of dissecting an object into minute pieces in order to understand it. During the Covid technique, physicians employ HRCT Chest, which stands for presented in three-dimensional pictures. Lung infection is therefore identified early. Despite this, doctors advise against doing CT scans in the absence of symptoms or without a doctor's approval. In fact, it is imperative that one give their health

extra attention right now [16, 21]. Because of the sheer number of victims in this wave, everyday people have several difficulties during the entire treatment process. In the meanwhile, corona and fungus are frequently examined with CT scans.

Figure 8: (a) Common Person Lungs CT-Scan [21]
(b) CT-Scan of a Lung Tissues Afflicted by the Aspergillosis Fungus [7]

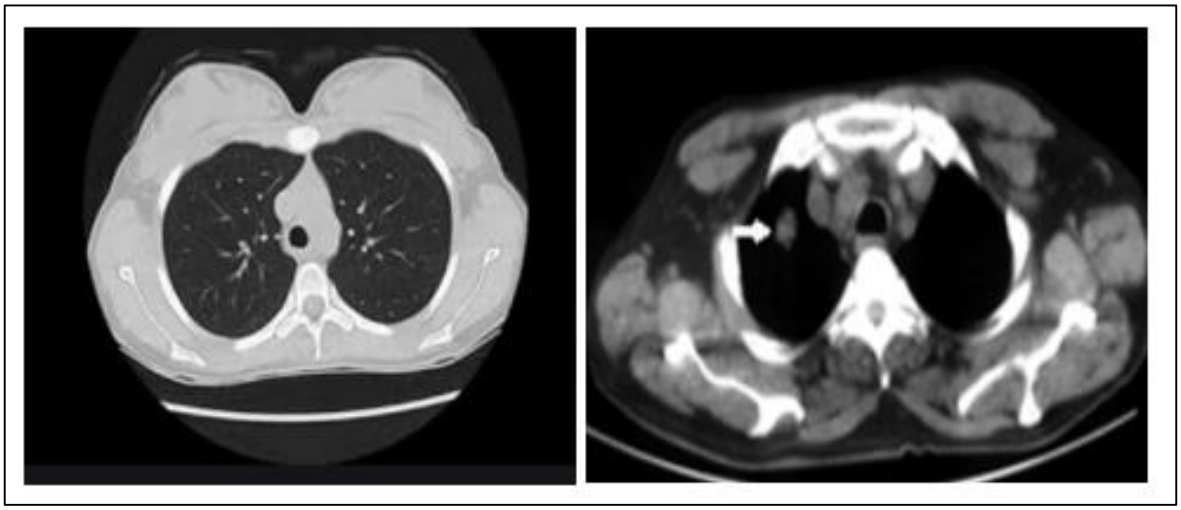
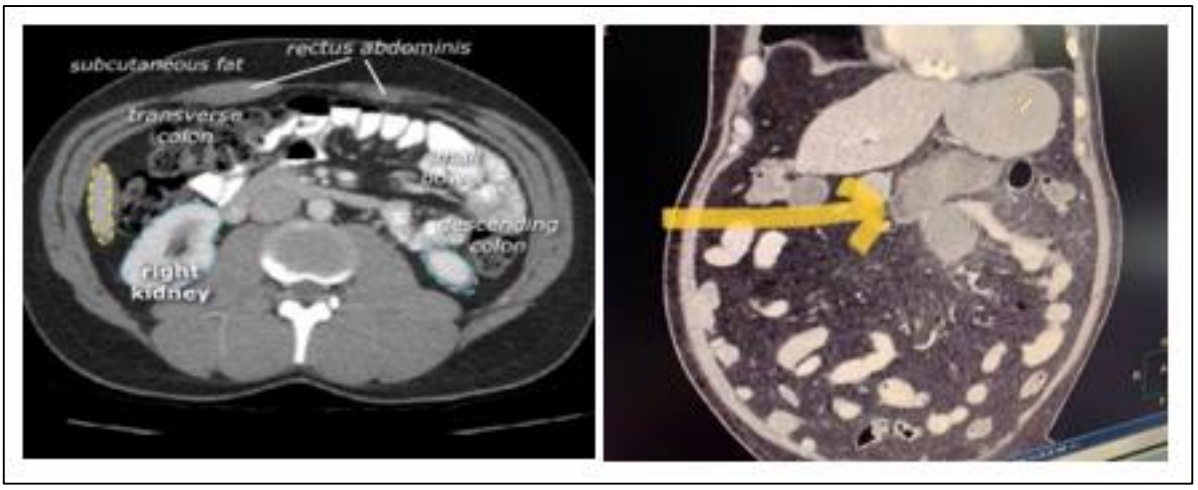


Figure 9: (a) Common Person Intestine CT-Scan [21]
(b) CT-Scan of a Lung Tissues Afflicted by the Mucormycosis [16]



3.1.3 DBN

A deep belief network approach has been proposed in deep learning theory to capture the deep features of imaging spectrum image data [3]. A deep belief network will be constructed from a set of RBM, and a greedy technique will be used to train the model's parameters layer by layer [3]. One can employ DL approaches to find treatments for black fungus. The connected weight vector makes use of the manifolds neural network layers [5]. DL is used in a wide range of applications, such as voice search, object identification, and computer vision [4]. AI approaches have been used to generate it [31]. Based on research on the AI diagnosis of COVID-19, Table 1 was created. We can

Journal of Futuristic Sciences and Applications, Volume 6, Issue 1, Jan-Jun 2023
Doi: 10.51976/jfsa.612301

see from this that multiple researchers used a variety of approaches to study. Nonetheless, considering that the subjects in this study are Covid patients, it is possible to conclude that the use of AI has greatly raised the accuracy rate [6]. Currently, no research of this kind has been done on any kind of fungus, which may present a great chance in the future.

At the 27th meeting of the government, the UN Health Minister reported 5424 instances of black fungus in 18 states as of May 21, 2021, as illustrated by a pie chart in Figure 10. Fifty-five percent of the 4556 individuals diagnosed with corona also had diabetes.

Figure 10: Total Cases versus Patients which has Covid Data

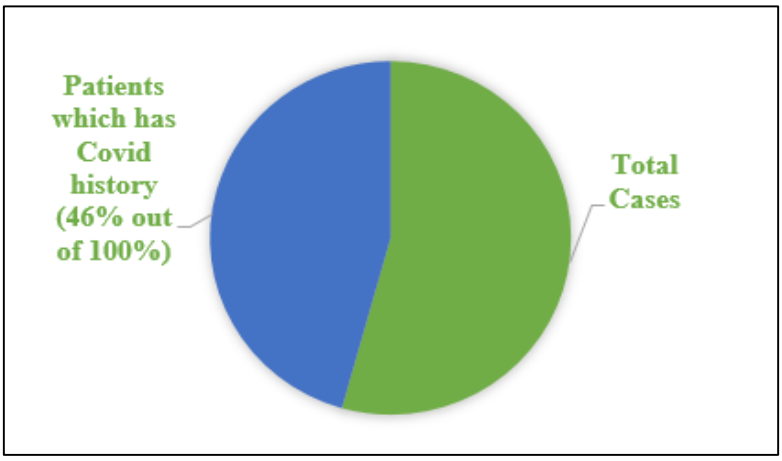
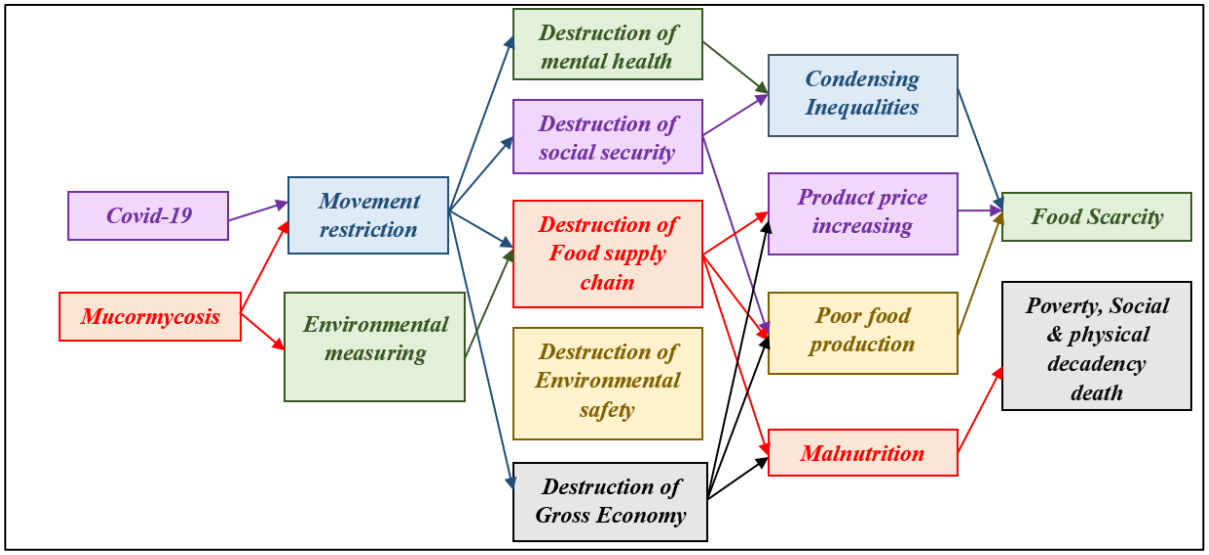


Figure 11: Future Challenges of Computer Vision for Covid-19 and Mucormycosis



4.0 Conclusion

This research has provided a full account of the black fungi, indicating that this epidemic is quite lethal and usually strikes people with compromised immune systems. Around the same time, it was shown that fungi could be identified in an organism by utilising computer image processing

techniques. It could therefore be applied fast in testing and counselling. This investigation also revealed that black fungi are more dangerous than other types of fungi, and that individuals who contract them are either immunocompromised or diabetics.

References

[1] Achanta, R., Shaji, A., Smith, K., Lucchi, A., Fua, P., & Süsstrunk, S. (2012). SLIC superpixels compared to state-of-the-art superpixel methods. *IEEE Transactions on Pattern Analysis and Machine Intelligence, 34*(11), 2274-2282.

[2] Acharjya, P. P., Das, R., & Ghoshal, D. (2012). Study and comparison of different edge detectors for image segmentation. *Global Journal of Computer Science and Technology.*

[3] Abbas, A., Abdelsamea, M.M. & Gaber, M.M. (2020) Classification of COVID-19 in chest X-ray images using DeTraC deep convolutional neural network. *arXiv preprint arXiv:2003.13815*

[4] After black fungus and white fungus, another fungal infection aspergillosis, hits India. [online]. Available: https://www.dnaindia.com/india/report-after-black-fungus-and-white-fungus-another-fungal-infection-aspergillosis-hits-india-2892150

[5] After Black, White Or Yellow Fungus – Aspergillosis Is The New Fungal Infection Reported In Covid-19 Patients In India. [online]. Available: https://thenationalbulletin.in/after-black-white-or-yellow-fungus-ndash-aspergillosis-is-the-new-fungal-infection-reported-in-covid-19-patients-in-india

[6] AI Helps Doctors Diagnose the Coronavirus. (n.d.) [Online]. Available: https://news.developer.nvidia. com/ai-helps-doctors-diagnose-thecoronavirus/

[7] Ai, T., Yang, Z., Hou, H., Zhan, C., Chen, C., Lv, W., Tao, Q., Sun, Z., & Xia, L. (2020). Correlation of chest CT and RT-PCR testing in coronavirus disease 2019 (COVID-19) in China: A report of 1014 cases. *Radiology, 26*, 200642

[8] Al-antari, M.A., Al-masni, M.A., Choi, M.T., Han, S.M. & Kim, T.S. (2018) A fully integrated computer-aided diagnosis system for digital X-ray mammograms via deep learning detection, segmentation, and classification. *Int J Med Inform, 117*, 44–54

[9] Angelini, E., & Shah, A. (2021). Using artificial intelligence in fungal lung disease: CPA CT Imaging as an Example. *Mycopathologia,* 1-5.

[10] Apostolopoulos, I.D. & Mpesiana, T.A. (2020). Covid-19: Automatic detection from X-ray images utilizing transfer learning with convolutional neural networks. *Australas Phys Eng Sci Med, 43*, 635–640

[11] Arrieta, A.B., Díaz-Rodríguez, N., Del Ser, J., Bennetot, A., Tabik, S. & Barbado, A. (2020) Explainable artificial intelligence (XAI): concepts, taxonomies, opportunities and challenges toward responsible AI. *Information Fusion, 58*, 82–115

[12] Asnaoui, K.E., Chawki, Y. & Idri, A. (2020) Automated Methods for Detection and Classification Pneumonia based on X-Ray Images Using Deep Learning. arXiv preprint arXiv:2003.14363

[13] Aspergillosis. [online]. Available: https://www.healthline.com/health/aspergillosis

[14] Black fungus treatment can be made 100 times cheaper from Rs 35,000 to Rs 350. [online]. Available: https://english.jagran.com/india/black-fungus-treatment-can-be-made-100-times-cheaper-from-rs-35000-to-rs-350-know-details-here-10027671

[15] Black fungus: Here is a list of states with highest number of mucormycosis cases. [online]. Available: https://www.hindustantimes.com/india-news/black-fungus-states-with-highest-number-of-mucormycosis-cases-101621559394002.html

Doi: 10.51976/jfsa.612301

[16] Barstugan, M., Ozkaya, U. & Ozturk, S. (2020). Coronavirus (COVID-19) classification using CT images by machine learning methods. arXiv preprint arXiv:2003.09424

[17] Bauriegel, E., Giebel, A., Geyer, M., Schmidt, U., & Herppich, W. B. (2011). Early detection of Fusarium infection in wheat using hyper-spectral imaging. *Computers and Electronics in Agriculture, 75*(2), 304-312.

[18] Blank, R., Vinayaka, P. P., Tahir, M. W., Yong, J., Vellekoop, M. J., & Lang, W. (2016). Comparison of several optical methods for an automated fungal spore sensor system concept. *IEEE Sensors Journal, 16*(14), 5596-5602.

[19] Cao, Y., Xu. Z., Feng, J., Jin, C., Han, X. & Wu. H. (2020) Longitudinal assessment of COVID-19 using a deep learning–based quantitative CT pipeline: illustration of two cases. *Radiol Cardiothorac Imaging, 2*, e200082

[20] Chen, T., & Chefd'Hotel, C. (2014, September). Deep learning based automatic immune cell detection for immunohistochemistry images. In International workshop on machine learning in medical imaging (pp. 17-24). Springer, Cham.

[21] Chen, R., Chen, J., & Meng, Q.T. (2020) Chest computed tomography images of early coronavirus disease (COVID-19). *Can J Anesth/J Can d'anesthésie, 11*, 1–2

[22] Chen, J., Wu, L., Zhang, J., Zhang, L., Gong, D., Zhao, Y., ... & Yu, H. (2020). Deep learning-based model for detecting 2019 novel coronavirus pneumonia on high-resolution computed tomography. *Scientific Reports, 10*(1), 1-11.

[23] Chen, E., Lerman, K., & Ferrara, E. (2020). Tracking social media discourse about the covid-19 pandemic: Development of a public coronavirus twitter data set. *JMIR Public Health and Surveillance, 6*(2), e19273.

[24] Cosic, I., Lazar, K., & Cosic, D. (2014). Prediction of Tubulin resonant frequencies using the Resonant Recognition Model (RRM). *IEEE Transactions on Nanobioscience, 14*(4), 491-496.

[25] Cortes, C., & Vapnik, V. (1995). Support-vector networks. Machine learning, 20(3), 273-297.

[26] COVID-19 and Black Fungus: What Is Mucormycosis? [online]. Available: https://science.thewire.in/the-sciences/covid-19-and-black-fungus-what-is-mucormycosis/

[27] Covid-19: All you need to know about 'yellow fungus'. [online]. Available: https://www.deccanherald.com/national/covid-19-all-you-need-to-know-about-yellow-fungus-989747.html

[28] COVID19 and Black Fungus: Everything you need to know about the rising mucormycosis infections in India. [online]. Available: https://en.gaonconnection.com/covid19-black-fungus-mucormycosis-infections-symptoms-treatement-icmr-india/

[29] COVID-19 India FAQs: What is White Fungus, Who It Can Infect, How It Can Be Treated and More. [online]. Available: https://weather.com/en-IN/india/coronavirus/news/2021-05-21-covid-19-india-faqs-what-is-white-fungus-who-it-can-infect-how-it

[30] Dai, X., Cheng, J., Gao, Y., Guo, S., Yang, X., Xu, X., & Cen, Y. (2020). Deep Belief Network for Feature Extraction of Urban Artificial Targets. *Mathematical Problems in Engineering.*

[31] Endres, I., & Hoiem, D. (2013). Category-independent object proposals with diverse ranking. *IEEE Transactions on Pattern Analysis and Machine Intelligence, 36*(2), 222-234.