

1.	Title of the Proposal	Deep Learning based imaging data analysis for the diagnosis of Covid-19 patients
2.	Detail of the principle investigator	Dr. Abhijit Bhattacharyya, Assistant Professor, E&CED, NIT Hamirpur Email : abhijit@nith.ac.in
3.	Category of the project	Data Analytics, AI to model epidemic patterns and disease dynamics
4.	Project overview	<p>The novel coronavirus disease (COVID-19) is a progressing pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The exponential increase of the COVID-19 infected people across the globe has become a serious cause of public health concern. Up to April 24, 2020, worldwide 2,709,408 confirmed cases of COVID-19 have been registered across 185 countries/regions causing total number of deaths of 190,861 persons (mortality rate of 7.04%) [1]. The World Health Organization (WHO) proclaimed the outbreak as Public Health Emergency of International Concern (PHEIC) on January 30, 2020 and declared it as a pandemic on March 11, 2020 [2, 3].</p> <p>Reverse Transcription-Polymerase Chain Reaction (RT-PCR) test has turned out as a gold standard for identifying COVID-19 patients [4]. However, the RT-PCR test becomes infeasible in the severely affected areas during early outbreak of the pandemic. In addition, the preparation of sample and poor quality control techniques lead to increase in false-negative rates [5].</p> <p>The imaging data acquired from chest X-Ray and thoracic CT facilitate the clinicians in the diagnosis of COVID-19 patients [6-7]. In India, the patients without clinical symptoms (coughing, sore throat, fever) were found positive for COVID-19 and subsequently admitted in the hospitals and isolated. Moreover, multiple tests need to be carried out for COVID-19 suspected patients due to the high false-positive rate of nucleic acid tests. Therefore, the imaging techniques can be effective tool in combating the transmission of the COVID-19 virus. However, medical imaging data, such as chest CT, has hundreds of slices, which make diagnosing a time consuming task for the specialists. In addition, COVID-19 manifests similar imaging data like other types of pneumonia. This requires long term experience for the radiologists in order to achieve high degree of accuracy.</p> <p>The recent advancement in deep learning has empowered the processing of medical images and also significantly contributed in the fight against COVID-19 [8]. In comparison to conventional imaging workflow that laboriously</p>

		<p>relies on the human efforts, the deep learning provides more efficient and speedy imaging decisions.</p> <p>Therefore, in this project, the focus is on the development of deep learning based early screening models in order to distinguish COVID-19 pneumonia from Influenza-A viral pneumonia and healthy cases.</p>
5.	Research objectives	<p>This project will use deep learning methods for the implementation of following objectives:</p> <p>i) Classification of COVID-19 from other pneumonia and healthy subjects using X-ray images.</p> <p>ii) Classification of COVID-19 from other pneumonia and healthy subjects using CT images.</p> <p>iii) Severity assessment of COVID-19 using X-ray and CT images.</p> <p>iv) Assessment of progression of COVID-19 patients using X-Ray and CT images.</p>
6.	Expected outcome	Software for rapid screening of COVID-19 patients using X-Ray and CT-images. The identification of COVID-19 patients can be performed in no time once input images are available.
7.	Funding requirement	Rs. 100000/-
8.	Expected timeline	6 months

References:

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2. WHO. (2020, 30 January, 2020). Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV).

3. WHO. (2020). WHO Director-General's opening remarks at the media briefing on COVID-19.

4. T. Ai, Z. Yang, H. Hou, C. Zhan, C. Chen, W. Lv, et al., "Correlation of Chest CT and RT-PCR Testing in Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases," *Radiology*, p. 200642, 2020.
5. T. Liang, *Handbook of COVID-19 prevention and treatment*, 2020.
6. J. P. Kanne, "Chest CT findings in 2019 novel coronavirus (2019-nCoV) infections from Wuhan, China: key points for the radiologist," *Radiology*, p. 200241, 2020.
7. I. D. Apostolopoulos and T. Bessiana, "Covid-19: Automatic detection from X-Ray images utilizing transfer Learning with convolutional neural networks," arXiv:2003.11617, 2020.
8. L. A. Bullock Joseph, Pham Katherine Hoffmann, Lam Cynthia, Luengo-Oroz Miguel A., "Mapping the landscape of artificial intelligence applications against COVID-19," arXiv:2003.11336, 2020.