Artificial Intelligence Corroborates COVID-19 treatment by Chloroquine, Remdesivir, Favipiravir and Umifenovir.

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Deep Learning – it is the artificial intelligence (AI) that powers today's self driving cars, chatbots, personal assistants (such as Alexa, Cortana, Siri etc.), facial recognition in social media and law enforcement agencies. The collaboration between Prof. Angshul Majumdar of IIIT Delhi and Prof. Emilie Chouzenoux of INRIA, Saclay, Paris, harnesses the power of deep learning to screen drugs that have the potential to treat COVID-19 infections. "This is the first of a kind AI powered study for antiviral selection", says Prof. Majumdar.

In scientific literature this is called 'drug repositioning'. Current approaches are based on rudimentary models like network diffusion, similarity matching, matrix factorization, classification etc. In contrast, our approach (DeepVir), integrates the power of deep representation learning with biological insights via graphical regularization. Furthermore, Prof. Chouzenoux boosted DeepVir with a state-of-the-art optimization approach based on hybrid proximal alternating minimization (HyPALM); in short "it is Deep Learning on steroids" – she explains.

Our deep learning AI model, DeepVir, selects Chloroquine, Remdesivir, Umifenovir, Favipiravir and Ribavarin. All of them are undergoing clinical trials for treating COVID-19 infections in multiple centers around the globe.

The use of chloroquine and hydroxychloroquine for COVID-19, both as a prophyalactic and as a treatment, is common knowledge today. Major pharma companies (Zydus Cadilla, Cipla, Jubilant) in India have already launched Remdesivir for treating COVID-19 infections. The Russian drug Umifenovir has received DGCI nod for phase III trials in the country a while back. Several big Pharma companies (starting with Glenmark followed by Lupin, Sun etc) have launched the Japanese drug Favipiravir for treating novel coronavirus infections. The LANCET reported positive effects of Ribavarin (an antiviral for Hep-C) in a cocktail therapy in treating COVID-19 infections. Prof. Majumdar, who has been leading the study from the Indian side says, "the power of DeepVir lies in the uncanny accuracy with which it can select clinically relevant drugs."

The database of viruses and antivirals is curated from https://www.drugbank.ca/ . Dr. Aanchal Mongia, who just finished her PhD, says, "since the goal is to combat novel coronavirus infections, we prune the dataset to include only RNA viruses." Dr. Mongia looked at two different types of meta information for viruses and antivirals. She considered the genomic structure of the virus and the symptoms they cause in human beings; regarding the antivirals she looked at their chemical structure and mechanism of action.

The aforesaid meta information along with known associations between viruses and antiviruses are fed into the graphical deep learning model - DeepVir. Miss Stuti Jain, MTech student at IIIT Delhi helped Dr. Mongia in the experiments.

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