PRESS RELEASE

IIT Mandi researchers develop LakshmanRekha, an AI-driven Home Quarantine Management Application for COVID patients

This first-of-its-kind mobile application is capable of continuously monitoring and accurately detecting the identity of a quarantined person so that no patient can breach the assigned geo-fence

MANDI, 4ᵗʰ February 2021: Researchers at the Indian Institute of Technology Mandi have developed LakshmanRekha, an Artificial Intelligence - biometric driven Home Quarantine Management Application (HQMA) for COVID patients. The developed application uses a combination of biometric verification, geofencing, and artificial intelligence, to continuously monitor and accurately detect the identity of a home quarantined person. In addition to the quarantine management, this application can also serve as an unbreachable mobile phone platform for normal (non-COVID) mobile users, situations like under curfew, or any national emergency, for identifying the violators or lawbreakers.

The results of the research work that was funded by the Department of Science and Technology, have recently been published in the IEEE Consumer Electronics Magazine. The paper has been authored by the lead scientist on this research Dr. Aditya Nigam, Assistant Professor, School of Computing & Electrical Engineering, IIT Mandi, and Co-investigators on the study were Dr. Arnav Bhavsar, Associate Professors, School of Computing & Electrical Engineering, along with research scholars, Mr. Daksh Thapar and Mr. Piyush Goyal of IIT Mandi, with Dr. Gaurav Jaiswal from IIT Delhi and Dr. Kamlesh Tiwari and Mr. Rohit Bhardwaj of BITS Pilani, Rajasthan.

Speaking about the importance of LakshmanRekha, Dr. Aditya Nigam, Associate Professor, School of Computing & Electrical Engineering, IIT Mandi, said, *"We have developed a pilot version of LakshmanRekha mobile application and tested it over small datasets. The obtained results are very good and now we are working to add more functionality, scalability and usability to make it ready for deployment."*

Link to a working prototype of LakshmanRekha -

https://www.youtube.com/watch?v=LSDr9nytOG8&feature=emb_title

In existing quarantine management mobile applications, individuals under self-isolation are enforced to share their instantaneous position routinely via geofencing technology or they are required to upload a face selfie every hour or ten times a

day. But these geofencing applications fail to ensure the user identity throughout the time because individuals can leave cell phones in isolation zones and move in/out, leading to disobey the self-isolation rules. Similarly, the idea of uploading a face selfie every hour cannot ensure the patient's stay in a geofenced area as they can also try to fool the system by using a photo containing its registered face.

To mitigate these risks, LakshmanRekha matches the quarantine location of the individual with the location from where they have uploaded the biometric data. Along with this, using AI, the application continually computes an authentication score that can measure how certain it is, that the quarantined user is also the one using the mobile. If the application detects any action indicating that the user identity has been changed, it will directly notify the authorities for necessary action.

Considering the fact that we are still working on tracking the rapid spread of Coronavirus in society, it has become crucial to continuously monitor and track the movements of every person with symptoms, LakshmanRekha can play a key role in the home quarantine management system.

About IIT Mandi

Since the first batch of 97 students joined in July 2009, IIT Mandi has grown to currently host 125 faculty and 1,833 students who are enrolled in various programs of studies in undergraduate, postgraduate, and research programs, and 1516 alumni. IIT Mandi is a fully residential campus with 1.4 lakh sq. m. buildings completed. It has a guest house with 88 rooms, a 750-seater Auditorium, a campus school, a sports complex, and a hospital.

IIT Mandi has four Academic Schools and three major Research Centers. The Schools are School of Computing and Electrical Engineering, School of Basic Sciences, School of Engineering, and School of Humanities and Social Sciences. The Centers are Advanced Materials Research Centre (AMRC; set up with an investment of Rs. 60 crores), Centre for Design and Fabrication of Electrical Devices (C4DFED; has Rs. 50 crores worth of fabrication tools), and BioX Centre (has acquired research equipment worth Rs. 15 crores). In 2017, the Department of Biotechnology, Government of India, selected IIT Mandi to lead the prestigious Rs. 10 crore FarmerZone® Project.

To cater to the growing and changing needs of the Indian industry and the aspirations of students, IIT Mandi has introduced 7 B.Tech., 7 M.Tech., 5 M.Sc., 4 Ph.D., 1 I-Ph.D, and 1 M.A programs in the past 10 years. The unique, project-oriented B.Tech. the curriculum is centered around its 4-year long Design and Innovation stream. From August 2019, IIT Mandi started 3 new and unique B. Tech. programs in Data Science and Engineering, Engineering Physics, and Dual Degree in Bioengineering.

Since the inception of the Institute, IIT Mandi faculty have been involved in over 275 Research and Development (R&D) projects worth more than Rs. 120 crore. In the past 10 years, the Institute has signed a Memorandum of Understanding (MoU) with as many as 11 international and 12 national universities.

IIT Mandi Catalyst, the first Technology Business Incubator in Himachal Pradesh, has helped over 75 startups since 2017 and is changing both the industry profile and entrepreneurial mindset in the state. So far, Catalyst has secured external funding of Rs. 24 crores from various funding agencies. Enabling Women of Kamand Valley (EWOK) is another innovative program run by IIT Mandi, which focuses on imparting skills training to rural women to enable them to start village-scale businesses.

IIT Mandi has been ranked no. 31 in the Engineering Institutions Category in the India Rankings 2020 released by National Institutional Ranking Framework, Ministry of Education, Govt. of India. Apart from this IIT Mandi is the only second-generation IIT to be featured at rank no. 7 in the Atal Ranking of Institutions on Innovation Achievements, of the Innovation Cell, Ministry of Education, Govt. of India.

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