



# E-NEWS LETTER

## Master of Computer Applications

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### LATEST UPDATES WORLD

#### **System detects errors when medication is self-administered**

*Wireless sensing technology could help improve patient's technique with inhalers and insulin pens.*



From swallowing pills to injecting insulin, patients frequently administer their own medication. But they don't always get it right. Improper adherence to doctors' orders is commonplace, accounting for thousands of deaths and billions of dollars in medical costs annually. MIT researchers have developed a system to reduce those numbers for some types of medications.

The new technology pairs wireless sensing with artificial intelligence to determine when a patient is using an insulin pen or inhaler, and flags potential errors in the patient's administration method. "Some past work reports that up to 70% of patients do not take their insulin as prescribed, and many patients do not use inhalers properly," says Dina Katabi, the Andrew and Erna Viteri Professor at MIT, whose research group has developed the new solution. The researchers say the system, which can be installed in a home, could alert patients and caregivers to medication errors and potentially reduce unnecessary hospital visits.

The research appears today in the journal *Nature Medicine*. The study's lead authors are Mingmin Zhao, a PhD student in MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL), and Kreshnik Hoti, a former visiting scientist at MIT and current faculty member at the University of Prishtina in Kosovo. Other co-authors include Hao Wang, a former CSAIL postdoc and current faculty member at Rutgers University, and Aniruddh Raghu, a CSAIL PhD student.

Some common drugs entail intricate delivery mechanisms. "For example, insulin pens require priming to make sure there are no air bubbles inside. And after injection, you have to hold for 10 seconds," says Zhao. "All those little steps are necessary to properly deliver the drug to its active site." Each step also presents opportunity for errors, especially when there's no pharmacist present to offer corrective tips. Patients might not even realize when they make a mistake — so Zhao's team designed an automated system that can.

Their system can be broken down into three broad steps. First, a sensor tracks a patient's movements within a 10-meter radius, using radio waves that reflect off their body. Next, artificial intelligence scours the reflected signals for signs of a patient self-administering an inhaler or insulin pen. Finally, the system alerts the patient or their health care provider when it detects an error in the patient's self-administration.

The researchers adapted their sensing method from a wireless technology they'd previously used to monitor people's sleeping positions. It starts with a wall-mounted device that emits very low-power radio waves. When someone moves, they modulate the signal and reflect it back to the device's sensor. Each unique movement yields a corresponding pattern of modulated radio waves that the device can decode. "One nice thing about this system is that it doesn't require the patient to wear any sensors," says Zhao. "It can even work through occlusions, similar to how you can access your Wi-Fi when you're in a different room from your router."

The new sensor sits in the background at home, like a Wi-Fi router, and uses artificial intelligence to interpret the modulated radio waves. The team developed a neural network to key in on patterns indicating the use of an inhaler or insulin pen. They trained the network to learn those patterns by performing example movements, some relevant (e.g. using an inhaler) and some not (e.g. eating). Through repetition and reinforcement, the network successfully detected 96 percent of insulin pen administrations and 99 percent of inhaler uses.

Once it mastered the art of detection, the network also proved useful for correction. Every proper medicine administration follows a similar

sequence — picking up the insulin pen, priming it, injecting, etc. So, the system can flag anomalies in any particular step. For example, the network can recognize if a patient holds down their insulin pen for five seconds instead of the prescribed 10 seconds. The system can then relay that information to the patient or directly to their doctor, so they can fix their technique.

“By breaking it down into these steps, we can not only see how frequently the patient is using their device, but also assess their administration technique to see how well they’re doing,” says Zhao.

The researchers say a key feature of their radio wave-based system is its noninvasiveness. “An alternative way to solve this problem is by installing cameras,” says Zhao. “But using a wireless signal is much less intrusive. It doesn’t show peoples’ appearance.”

He adds that their framework could be adapted to medications beyond inhalers and insulin pens — all it would take is retraining the neural network to recognize the appropriate sequence of movements. Zhao says that “with this type of sensing technology at home, we could detect issues early on, so the person can see a doctor before the problem is exacerbated.”

## **FACULTY CORNER**

### **Good Luck Students for your Exam**

*The biggest asset of student life is TIME. Spend it in good things & spend it wisely. I wish you good luck with your studies!*

*Studying in student life or Regretting in later life. Its time to decide which one you’d like. I hope you’re studying well. Have good luck!*

*Nobody can be 100% sure if he will pass or fail the exams. But hard work will increase the chances of doing well. Best of luck!*

*Your talent is not only for securing top positions in the exams. They’re for securing a bright future for you, your family and your country! Wish you all the best!*

*Great people did not just grow up and became greats. You need to foster honesty and excellence right from now to be one of them. May God bless you!*

**Vijay Kumar Dubey**

## **COLLEGE UPDATE**

**March 21, 2021**

### **49<sup>th</sup> Senior National Women’s Handball Championship**

49<sup>th</sup> Senior National Women’s Handball Championship was held on the main grounds of SRMSCET campus on 20th March, where students of SRMS Trust Institutions got the opportunity to witness the best players of the sport in the country.

**Shri Aditya Murti Sir**, Secretary, SRMS Trust, was one of the dignitaries present at the event, and inspired the gathering with his words. Teams from Indian Railways, Bihar, Uttar Pradesh, Delhi, Punjab, Haryana, Himachal Pradesh and Rajasthan participated in the quarter final and semi final rounds of the competition. Thrilling matches with strong competition and flawless sporting spirit turned out to be an inspiration for everyone.

The championship proceeded with the 1st Quarter [Indian Railways VS Bihar] , 2nd Quarter [Uttar Pradesh VS Delhi] , 3rd Quarter [Haryana VS Punjab] , 4th Quarter [Himachal Pradesh VS Rajasthan]. The Winning Teams in the respective quarter finals were Indian Railways, Uttar Pradesh, Haryana and Himachal Pradesh.

The 1st semi-final was played between Uttar Pradesh and Indian Railways in which the winning team was Indian Railways.

The second semi final was played between Haryana and Himachal Pradesh with the winning team being Himachal Pradesh.

The match for the third position took place between Delhi and Bihar in which the winning team was Delhi. The nerve racking championship ended by spreading the hues of power and positivity all over the participants. Indeed the event was a grand success.



## HOLI FESTIVAL

**March 10, 2021**

Gulaal, pichkaari, sweets and celebration-Holi is one of the biggest festivals and one we all look forward to. Be it kids or the adults, everyone looks forward to the Holi festivity-the festival of colours. Considered to be the second biggest festival after Diwali, this year, the festival will be celebrated on March 10, which is a Tuesday.



Holi is the time which ushers the welcoming of the spring season and ends the winter blues. Historically, it holds a lot of importance. From folklores to songs, you can find a lot of mentions of this festival. Many believe that the festival marks the celebration of good over evil. Holika Dahan, held a day before Holi resonates with the fact that evil cannot hold for a long time.

Largely celebrated in the northern part of the country, the festival of colours and love falls a day after the full moon. While a pious Holika bonfire is lit a day before the actual celebration, people come together to celebrate the victory of good over evil and splash colours of happiness around each other. No matter how you wish to celebrate, the feelings are all the same. Some splash around water pichkaaris, some use balloons, some use natural gulaal and flowers.

*Department of MCA wishes you a very happy and prosperous Holi.*