In this issue

Research Performance of IITs

Starting with IIT Kharagpur in 1951, the number of IITs in India grew slowly in the initial phase and, in fifty years, there were six of them. But in the first two decades of this century, the expansion was rapid. There are 23 IITs now.

In a General Article on **page 923** in this issue, researchers from the South Asian University, New Delhi, and the Banaras Hindu University assess the research performance of 16 IITs, excluding the 7 that were set up recently. They used 25 years data of research publications – nearly 80,000 – from the IITs – to compare the research productivity, identify the most cited papers as well as the disciplinary research strengths of different IITs.

A comparison with top performing world institutions shows that even the best performing IITs have a lot to do before they catch up with the top ranking institutions in the world. Identifying the factors that contribute to the variations in research productivity will help foster and strengthen the weaker IITs.

Detect Buildings in Satellite Imagery

Cognitive tasks and subtasks

Human beings can easily detect buildings in satellite imagery. But, can machines? If so, unauthorized building activity can be identified more easily and prevented, preventing the need for later demolition.

To design a system to automatically detect buildings in satellite imagery, researchers at the IIT Roorkee, analysed the cognitive tasks involved and extracted the procedural and conceptual knowledge used by the analysts while performing the task.

The researchers tested the system using 14 images with resolutions of 0.60 and 1 m. The system could detect buildings in all cases. But it could not clearly detect the boundaries of the buildings.

With a little more tweaking and a little more machine learning, perhaps the system delineated in the Research Communication on **page 1038** can be deployed for administrative purposes.

Predicting Traffic

Given the rapid expansion of digital services, it is not inconceivable now to put a system in place for predicting traffic conditions, allowing commuters to take informed decisions about travel plans. We just need sensors on roads to get an estimate of the density of traffic. And, given this data, compute a prediction using available learning machines.

In theory, it is easy. But what kind of sensors should we use? Which machine learning techniques?

Researchers at the IIT Madras, examine four different sensors and three different machine learning techniques to compare and contrast their relative accuracies for predicting traffic.

Entrepreneurs who want to do one-upmanship over traffic on Google Maps now need to set up sensors and enlarge the dataset for further learning by machines. An app that predicts traffic will help in the deployment of traffic personnel. But first go to the Research Article on **page 954**.

Sharing Space with *Sher*

Conservation without conflict

In the southwest of Saurashtra, Gujarat, the region around the two hill systems, Gir and Girnar, encompasses large tracts of dry deciduous and thorny forest with patches of savannah-type vegetation. This, till recently, was the only ecological niche in the world for *Panthera leopersica*, the Asiatic lion.

In 1965, when the Girnar Wildlife Sanctuary was established, the Asiatic lion was on the verge of extinction. The area under protection increased in the following decades. So did the prey populations – spotted deer, blue bull, antelope, black buck, etc. Consequently, the population of the Asiatic lion also has increased to the extent that that they have started to disperse into surrounding regions.

Interestingly, the interplay of the local villagers and the lions is amicable. Though there are occasional attacks on domestic cattle, the lions keep at bay the populations of wild herbivores that damage crops. A General Article on **page 933** in this issue examines this success story in wildlife conservation.

Stealth Aircraft Design

Learning from barn owls

The barn owl is famous for its swift, silent flights at night. Large wings with comb-like serrations at the leading edge, the soft upper surface texture and fringes at the trailing edge of the wing – all these contribute to give the barn owl stealth.

The designers of stealth aircrafts can learn a lot from the barn owl's wing. Not merely to reduce noise in flight. But to even escape detection by radars, say engineers from the IIT Bombay.

Using computational studies, they show that detectability by radars can be reduced if we use the barn owl wing design in stealth aircrafts. See the Research Communication on **page 1020** for details.

Gastroretentive Drug Delivery

The oral intake of medicines goes through a variety of processes from disintegration to adjusting to the different pH values of the stomach and the rest of the intestinal tract to absorption, metabolism and excretion.

Gastroretentive drug delivery systems have great importance in chronotherapy and can effectively use in the efficacy of chronotherapeutic drug delivery. Drugs which are unstable in lower gastrointestinal tract and have solubility problems can be delivered efficiently using such techniques.

In a Review Article on **page 946** researchers at the SSDJ College of Pharmacy, Nashik, provide an overview of the state-of-art techniques of gastroretentive drug delivery systems.

K. P. Madhu
Science Writing Consultant
kp.madhu2000@gmail.com