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IIT-M and CMC Vellore build AI tools for early kidney disease detection

03 September 2026 | News

New technologies aim to help doctors diagnose kidney conditions faster



Researchers from Indian Institute of Technology Madras (IIT-M) and Christian Medical College (CMC), Vellore, have developed a set of Artificial Intelligence (AI)-based tools designed to assist in the early detection and assessment of kidney diseases, which affect millions of people worldwide.

The team has developed three technologies that complement each other-

1. A machine learning model that uses clinical and laboratory information to predict the risk of chronic kidney disease (CKD).
2. A deep learning system that automatically analyzes CT scans and classifies them into four categories: normal kidney, kidney cyst, kidney stone, and kidney tumour.
3. A 3D imaging platformthat recreates kidneys from CT scans to precisely assess tumour volume and the percentage of kidney involvement.

These tools can enable earlier diagnosis, which could help slow the disease process and reduce the need for expensive interventions like dialysis.

The CT image classifier has been trained with over 12,000 images and can distinguish healthy kidneys from cysts, stones and tumors. The 3D imaging framework developed using open-source software provides an inexpensive and repeatable method for measuring tumor burden, which can provide valuable information to help guide treatment decisions.

The CKD prediction model was implemented in a user-friendly prototype interface to facilitate future clinical translation. The team also worked on making it more accurate and more easily understood by the doctors who are using it to make their predictions.

The team intends to test the models with more patient information sets to validate them and establish stronger partnerships with health care institutions for deployment in the real world. The researchers are also exploring the long-term integration of these AI technologies with minimally invasive wearable sensing systems and Digital Twin platforms to enable personalised kidney health monitoring