**Sardar Patel Institute of Technology**

**(Autonomous Institute Affiliated to University of Mumbai)**

**Computer Science and Engineering department**

**A.Y. 2024-25**

**REPORT GUEST LECTURE TOC**

**Course: Theory of Computation**

**Sem V, T. Y. B.Tech CSE**

**Title of the Guest Lecture:** *Applications of Theory of Computation in AI for Healthcare*

**Date:** 10th September 2025

**Day :** Wednesday

**Time:** 9:00 AM – 10:00 AM

**Venue:** Room 008

**Mode :** Offline

**Resource Person:** Dr. Guy Brown, Professor of Computer Science, University of Sheffield (UK)

**Organizers :** Prof. Nikahat Mulla(Assistant Prof. CSE Department)

## 1. Introduction & Objectives :

A guest lecture on **"Applications of Theory of Computation in AI for Healthcare"** was conducted for the students and faculty members of the Computer Science and Engineering Department. The session was delivered by **Dr. Guy Brown**, who explained how the theoretical concepts of computation form the foundation of modern Artificial Intelligence systems used in healthcare.

The lecture emphasized that concepts such as finite automata, Turing machines, formal languages, algorithms, and computational complexity are essential for designing intelligent systems capable of processing medical data efficiently and reliably.

### Objectives:

The major objectives of the guest lecture were:

- To understand the relevance of Theory of Computation in Artificial Intelligence.
- To explore the role of computational models in healthcare applications.
- To discuss AI-based healthcare systems from a computational perspective.
- To introduce students to research opportunities combining TOC and AI.

## 2. Details of the Lecture

Mr. Guy Brown began by revisiting the importance of **Theory of Computation** in Computer Science. He explained how computational models, particularly **Turing Machines**, provide the theoretical basis for solving complex problems and understanding the limits of computation.

The lecture demonstrated how these concepts extend to AI applications in healthcare. Efficient algorithms and complexity analysis help process large medical datasets, while computational models support intelligent decision-making in disease diagnosis, medical imaging, patient monitoring, and clinical data analysis.

Topics discussed during the session included:

- Turing Machines and computational models.
- Computational complexity and algorithm efficiency.
- AI applications in disease diagnosis and medical imaging.
- Processing electronic health records using intelligent systems.
- Challenges in building reliable and scalable AI-based healthcare solutions.

The lecture concluded with an interactive question-and-answer session, where students discussed the practical significance of computational theory in developing healthcare technologies.

## 3. Outcomes of the Lecture

The guest lecture enabled students to:

- Understand the role of Theory of Computation in Artificial Intelligence.
- Appreciate the significance of Turing Machines and computational models in solving real-world problems.
- Learn how computational complexity influences AI-based healthcare systems.
- Explore practical applications of theoretical computer science in medical technologies.

## 4. Photographs



## 5. Conclusion

The guest lecture on **"Applications of Theory of Computation in AI for Healthcare"** delivered by **Dr. Guy Brown** successfully demonstrated how the principles of Theory of Computation serve as the foundation for intelligent healthcare systems. By relating concepts such as Turing Machines, algorithms, and computational complexity to real-world AI applications, the session helped students bridge the gap between theory and practice while encouraging them to explore emerging research areas in computational intelligence and healthcare.