

| <b>MACHINE LEARNING FOR HEALTHCARE</b><br>[As per Choice Based Credit System (CBCS) scheme]  |                               |
|--|-------------------------------|
| SEMESTER – VII   |                               |
| <b>Subject Code</b> : 20AM47XX   | <b>Credits</b> : 03           |
| <b>Hours / Week</b> : 03 Hours   | <b>Total Hours</b> : 39 Hours |
| <b>L-T-P-S</b> : 3-0-0-0   |                               |
| <b><u>Course Learning Objectives:</u></b><br>This course will enable students to: <ol style="list-style-type: none"> <li>1. <b>Summarize</b> the different types of medical data and its Medical Standards, Challenges.</li> <li>2. <b>Explain</b> the different techniques to handle the image and clinical data.</li> <li>3. <b>Apply</b> Modelling techniques, Reinforcement Learning and Natural Language Processing for healthcare data.</li> <li>4. <b>Utilize</b> the suitable Machine Learning and Deep Learning algorithms for various types of healthcare applications.</li> <li>5. <b>Get the idea</b> to build a chatbot and develop a project using the appropriate case study in the healthcare.</li> </ol>  |                               |
| <b>Teaching-Learning Process (General Instructions)</b><br>These are sample new pedagogical methods that teachers can use to accelerate the attainment of the various course outcomes. <ol style="list-style-type: none"> <li>1. <b>Lecture method</b> means it includes not only the traditional lecture method but a different type of teaching method that may be adopted to develop the course outcomes.</li> <li>2. <b>Interactive Teaching: Adopt Active learning</b> that includes brainstorming, discussing, group work, focused listening, formulating questions, note-taking, annotating, and roleplaying.</li> <li>3. Show <b>Video/animation</b> films to explain the functioning of various concepts.</li> <li>4. Encourage <b>Collaborative</b> (Group Learning) Learning in the class.</li> <li>5. Discuss how every <b>concept can be applied to the real world</b> - and when that's possible, it helps improve the student's understanding.</li> </ol> |                               |
| <b>UNIT – I</b>  | <b>08 Hours</b>               |
| Knowing Healthcare Industry: Introduction to healthcare informatics, Introduction to Machine Learning and Deep Learning in Healthcare, Medical Standards and Coding Types, Health Level Seven (HL7); Global Healthcare Challenges and Trends; Past-Present-Future of AI&ML in Healthcare, Electronic Medical Records (EMR), Electronic Health Records (EHR) - Dataflow of EHR, Difference between EHR and EMR.   |                               |
| <b>UNIT – II</b>   | <b>08 Hours</b>               |
| Advanced Analytics in Health Care: Overview of Clinical Data, Data Types; Data handling techniques – Imputation technique for handling missing data; Synthetic Minority Oversampling Technique for handling imbalanced data, Different types of Data Analysis techniques, Risk Stratification; Survival Modelling; Disease progression Modelling.  |                               |
| <b>UNIT – III</b>  | <b>08 Hours</b>               |

|   |                 |
|---|-----------------|
| Medical Image Diagnostics and its Preprocessing: Biomedical Imaging Modalities - Computed Tomography, Magnetic Resonance Imaging, Positron Emission Tomography; Biomedical Signal: Electrocardiogram (ECG), Electroencephalogram (EEG), Segmentation – Thresholding and Region based Segmentation, Image Registration; ML applications in medical Ology space (Cardiology, oncology).   |                 |
| <b>UNIT – IV</b>  | <b>08 Hours</b> |
| AI/ML and NLP for healthcare: Automating clinical workflow, Regulation of AI/ML, Challenges in deploying ML model, NLP for Healthcare, Re-enforcement learning in healthcare applications, Wearable devices and Medical Bots.   |                 |
| <b>UNIT – V</b>   | <b>07 Hours</b> |
| Applications of Machine learning models (Linear regression, SVM, Random Forest) and Deeplearning models (CNN, RNN....) for the Healthcare area (Case study)   |                 |
| <b>Course Outcomes:</b><br>At the end of the course the student will be able to: <ol style="list-style-type: none"> <li><b>1. Explain</b> the different types of medical data and its Medical Standards, Challenges.</li> <li><b>2. Utilize</b> the appropriate techniques to handle the image and clinical data.</li> <li><b>3. Make use of the</b> Modelling techniques, Reinforcement Learning and Natural Language Processing for various healthcare applications</li> <li><b>4. Apply</b> the suitable Machine Learning and Deep Learning algorithms for various typesof healthcare applications.</li> <li><b>5. Build</b> a chatbot and develop a project using the appropriate case study in thehealthcare.</li> </ol> |                 |

| Table: Mapping Levels of COs to POs / PSOs |                        |                  |        |  |            |                          |                                |        |           |               |                    |                                |                                    |  |  |
|--|------------------------|------------------|--------|--|------------|--------------------------|--------------------------------|--------|-----------|---------------|--------------------|--------------------------------|------------------------------------|--|--|
| COs  | Program Outcomes (POs) |                  |        |  |            |                          |                                |        |           |               |                    |                                | PSOs                               |  |  |
|  | 1                      | 2                | 3      | 4  | 5          | 6                        | 7                              | 8      | 9         | 10            | 11                 | 12                             | 1                                  | 2  | 3  |
|  | Engineering knowledge  | Problem analysis | Design | Conduct investigations of complex problems | tool usage | The engineer and society | Environment and sustainability | Ethics | team work | Communication | Life-long learning | Project management and finance | Apply the principal concepts of AI | Apply the knowledge gained pertaining to data storage, data processing and data security | develop, and test principles of AI concepts on Intelligent Systems |
| CO1  | 2                      | 1                | -      | -  | -          | -                        | -                              | -      | 2         | 2             | -                  | -                              | 2                                  | 2  | 2  |
| CO2  | 3                      | 2                | -      | -  | 1          | -                        | -                              | -      | 2         | 2             | -                  | -                              | 2                                  | 2  | 2  |
| CO3  | 3                      | 2                | -      | -  | 1          | -                        | -                              | -      | 2         | 2             | -                  | -                              | 2                                  | 2  | 2  |
| CO4  | 3                      | 2                | -      | -  | 1          | -                        | -                              | -      | 2         | 2             | -                  | -                              | 2                                  | 2  | 2  |
| CO5  | 3                      | 3                | 2      | -  | 1          | -                        | -                              | -      | 2         | 2             | -                  | -                              | 2                                  | 2  | 2  |

|                              |   |   |   |   |                             |   |   |   |   |                      |   |   |   |   |   |
|------------------------------|---|---|---|---|-----------------------------|---|---|---|---|----------------------|---|---|---|---|---|
| C05                          | 3 | 3 | 2 | - | 1                           | - | - | - | 2 | 2                    | - | - | 2 | 2 | 2 |
| <b>3: Substantial (High)</b> |   |   |   |   | <b>2: Moderate (Medium)</b> |   |   |   |   | <b>1: Poor (Low)</b> |   |   |   |   |   |

#### **TEXT BOOKS:**

1. SumeetDua, U. RajendraAcharya, PrernaDua , Machine Learning in Healthcare Informatics, Intelligent Systems Reference Library 56, Springer Nature 2014.
2. Sergio Consoli, Diego ReforgiatoRecupero, Milan Petkovic, Data Science for Healthcare Methodologies and Applications.

#### **REFERENCE BOOKS:**

1. Thomas M. Deserno, Fundamentals of Bio-Medical Image processing, Biological and Medical Physics, Biomedical Engineering, Springer, ISBN 978-3-642-15816-2, 2011.
2. Silberschatz, Korth and Sudharshan: "Database System Concepts", Seventh Edition, McGrawHill, 2019.
3. C.J. Date, A. Kannan, S. Swamynatham: "An Introduction to Database Systems", Eight Edition, Pearson Education, 2012.

#### **E-Resources:**

1. <https://stellar.mit.edu/S/course/HST/sp19/HST.956/>
2. <https://www.coursera.org/learn/fundamental-machine-learning-healthcare>.
3. <https://www.coursera.org/learn/introduction-clinical-data>

#### **Activity Based Learning (Suggested Activities in Class)**

1. Group discussion on different Health Care Problems.
2. Collaborative Activity is minor project development with a team of 4 students.

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