Dayananda Sagar University

Innovation Campus,
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LESSON PLAN

Course Name: MACHINE LEARNING FOR HEALTHCARE

Course Code: 20AM47XX

Faculty Name: Prof. Pavithra A

Course Objectives: This Course will enable students to:

1. **Summarize** the different types of medical data and its Medical Standards, Challenges.
2. **Explain** the different techniques to handle the image and clinical data.
3. **Apply** Modelling techniques, Reinforcement Learning and Natural Language Processing for healthcare data.
4. **Utilize** the suitable Machine Learning and Deep Learning algorithms for various types of healthcare applications.
5. **Get the idea** to build a chatbot and develop a project using the appropriate case study in the healthcare.

Lecture	Topics Covered	Innovative Teaching Methods	Text & Reference
MODULE – I			
1	**Knowing Healthcare Industry:** Introduction to healthcare informatics,	• Power point presentation	T1
2	Introduction to Machine Learning and Deep Learning in Healthcare	• Power point presentation	T1
3	Medical Standards and Coding Types (ICD-11, ICD-10-CM, ICD-10-PCS, CPT and HCPCS Level II)	• Board Teaching • Power point presentation • Hands on	T1
4	Health Level Seven (HL7)	• Power point presentation	T1
5	Global Healthcare Challenges and Trends	• Power point presentation • Group Discussion	T1
6	Past-Present-Future of AI&ML in Healthcare	• Power point presentation • Group Discussion	T1

7	Electronic Medical Records (EMR), Electronic Health Records (EHR)	• Board Teaching • Power point presentation	T1
8	Dataflow of EHR, Difference between EHR and EMR.	• Power point presentation	T1
MODULE – II			
09	**Advanced Analytics in Health Care:** Overview of Clinical Data	• Board Teaching • Power point presentation	T1
10	Data Types	• Board Teaching • Power point presentation	T1
11	Data handling techniques – Imputation technique for handling missing data	• Board Teaching • Power point presentation	T1
12	Synthetic Minority Oversampling Technique for handling imbalanced data	• Board Teaching • Power point presentation	T1
13	Different types of Data Analysis techniques	• Board Teaching • Power point presentation	T1
14	Risk Stratification	• Board Teaching • Power point presentation	T1
15	Survival Modelling	• Board Teaching • Power point presentation	T1
16	Disease progression Modelling	• Power point presentation	T1
MODULE – III			
17	**Medical Image Diagnostics and its Preprocessing:** Biomedical Imaging Modalities	• Board Teaching • Power point	T2

		presentation	
18	Computed Tomography	• Power point presentation	T2
19	Magnetic Resonance Imaging	• Power point presentation	T2
20	Positron Emission Tomography	• Power point presentation	T2
21	Biomedical Signal: Electrocardiogram (ECG), Electroencephalogram (EEG), Segmentation	• Power point presentation	T1
22	Thresholding and Region based Segmentation	• Power point presentation	T1ss
23	Image Registration	• Power point presentation	T1
24	ML applications in medical Ology space (Cardiology, oncology)	• Board Teaching • Power point presentation • Group Discussion	T1
MODULE – IV			
25	**AI/ML and NLP for healthcare**: Automating clinical workflow	• Power point presentation	
26	Regulation of AI/ML	• Power point presentation	T2
27	Challenges in deploying ML model	• Power point presentation	T2
28	NLP for Healthcare	• Power point presentation	T2
29	Re-enforcement learning in healthcare applications,	• Board Teaching • Power point presentation • Hands on	T2
30	Re-enforcement learning in	• Board Teaching	T2

	healthcare applications	• Power point presentation • Hands on	
31	Wearable devices	• Board Teaching • Power point presentation	T2
32	Medical Bots	• Power point presentation	T2
MODULE – V			
33	A hospital consists of patients with heart diseases, their ECGs are stored in a repository. Based on the n ECG of a new patient, conclude whether patient has heart disease or not using an appropriate Deep Learning network, and so give suggestion for improve decision-making using an algorithm.	Discussion and Power point presentation Hands on	-
34	Autopsy study as a means of classifying cause of death.	Discussion and Power point presentation Hands on	-
35	Brain Tumor Segmentation in medical care.	Discussion and Power point presentation Hands on	-
36	Mini Project Applications of Machine learning models (Linear regression, SVM, Random Forest) and Deep learning models (CNN, RNN….) for healthcare area.	Discussion and Power point presentation by the students.	-
37	Mini Project Applications of Machine learning models (Linear regression, SVM, Random Forest) and Deep learning models (CNN, RNN….) for healthcare area.	Discussion and Power point presentation by the students.	-
38	Mini Project Applications of Machine learning models (Linear regression, SVM, Random Forest) and Deep learning models (CNN, RNN….) for healthcare area.	Discussion and Power point presentation by the students.	-

39	Mini Project Applications of Machine learning models (Linear regression, SVM, Random Forest) and Deep learning models (CNN, RNN….) for healthcare area.	Discussion and Power point presentation by the students.	-

Course Outcomes and CO-PO/PSO Mapping:

CO No.	Outcomes	Bloom's Taxonomy Level	POs / PSOs
CO1	**Explain** the different types of medical data and its Medical Standards, Challenges.	L2	PO1, PO2, PO9, PO10, PSO1, PSO2, PSO3
CO2	**Utilize** the appropriate techniques to handle the image and clinical data.	L3	PO1, PO2, PO5, PO9, PO10, PSO1, PSO2, PSO3
CO3	**Make use of the** Modelling techniques, Reinforcement Learning and Natural Language Processing for various healthcare applications	L3	PO1, PO2, PO5, PO9, PO10, PSO1, PSO2, PSO3
CO4	**Apply** the suitable Machine Learning and Deep Learning algorithms for various types of healthcare applications.	L3	PO1, PO2, PO5, PO9, PO10, PSO1, PSO2, PSO3
CO5	**Build** a chatbot and **develop** a project using the appropriate case study in the healthcare.	L5	PO1, PO2, PO3, PO5, PO9, PO10, PSO1, PSO2, PSO3

Strength of CO Mapping to PO/PSOs with Justification:

CO's	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PS
CO1	3	1	-	-	-	-	-	-	2	2	-	-	2	2	
CO2	3	2	-	-	1	-	-	-	2	2	-	-	2	2	
CO3	3	2	-	-	1	-	-	-	2	2	-	-	2	2	
CO4	3	2	-	-	1	-	-	-	2	2	-	-	2	2	
CO5	3	3	2	-	1	-	-	-	2	2	-	-	2	2	

CO-PO-PSO	JUSTIFICATION
CO1 → PO1(3)	Strongly mapped as students will be able to understand the basics of mathematics needed for machine learning in healthcare.
CO1 → PO2(1)	Slightly mapped as students will analyze the complex engineering problems using the basic mathematics
CO1->PO9(2)	Moderately mapped as students will be able to Function effectively as an individual and team.
CO1 → PO10(2)	Moderately mapped as students will be able to communicate and write effective reports and design documentation, make effective presentations.
CO2 → PO1(3)	Moderately mapped as students will be able to know about the basic knowledge about data collection.
CO2 → PO2(2)	Moderately mapped as students will analyze the complex engineering problems using the basic mathematics
CO2 → PO5(1)	Slightly mapped as students will be able to use modern tools to collect data
CO2 → PO9(2)	Moderately mapped as students will be able to Function effectively as an individual and team.
CO2 → PO10(2)	Moderately mapped as students will be able to communicate and write effective reports and design documentation, make effective presentations.
CO3→ PO1(3)	Strongly mapped as students will understand the basics of machine learning algorithms
CO3→ PO2(2)	Moderately mapped as students will be able to apply the knowledge gained to solve real time problems.
CO3→ PO5(1)	Slightly mapped as students will be able to use modern tools to collect data
CO3 → PO9(2)	Moderately mapped as students will be able to Function effectively as an individual and team.
CO3 → PO10(2)	Moderately mapped as students will be able to communicate and write effective reports and design documentation, make effective presentations.
CO4→ PO1(3)	Strongly mapped as students will be able to get the basic knowledge about developing data science applications.
CO4→ PO2(3)	Moderately mapped as students will be able to apply the knowledge gained to solve real time problems.
CO4→ PO5(1)	Slightly mapped as students will be able to use modern tools to collect data
CO4 → PO9(2)	Moderately mapped as students will be able to Function effectively as an individual and team.
CO4 → PO10(2)	Moderately mapped as students will be able to communicate and write effective reports and design documentation, make effective presentations.
CO5→ PO1(3)	Strongly mapped as students will be able to understand the basics of mathematics needed for machine learning in healthcare.
CO5→ PO2(3)	Strongly mapped as students will be able to apply the knowledge

	gained to solve real time problems.
CO5→ PO3(2)	Moderately mapped as students will be designing and developing solutions to engineering problems.
CO5→ PO5(1)	Slightly mapped as students will be able to use modern tools to collect data
CO5 → PO9(2)	Moderately mapped as students will be able to Function effectively as an individual and team.
CO5 → PO10(2)	Moderately mapped as students will be able to communicate and write effective reports and design documentation, make effective presentations.
CO1, CO2, CO3, CO4, CO5->PSO1(2)	Moderately mapped as students will apply basic concepts to solve real world problems
CO1, CO2, CO3, CO4, CO5->PSO1(2)	Moderately mapped as students will be able to apply the knowledge gained to solve real time problems.
CO1, CO2, CO3, CO4, CO5->PSO1(2)	Moderately mapped as students will be able to develop intelligent systems with the help of machine learning algorithms.

LIST OF ACTIVITIES (IF ANY):

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

LIST OF INNOVATIVE TEACHING METHODS:

a. Board Teaching

b. Power point presentations

c. Developing an expert mindset with real-time problem-solving

ASSESSMENT PROCESSES:

a. Provision for Two Internal assessments of 40 marks each of descriptive questions and reducing it to 40 marks.

b. Mini project-15 marks.

c. Quiz 05 marks.

ASSESSMENT PLAN:

Course Outcomes	Internal Test-I addresses (Cognitive Level)	Internal Test-II addresses (Cognitive Level)	Mini Project (Cognitive Level)
CO1	**Understanding**	--	**Applying**
CO2	**Applying**	--	**Applying**
CO3	--	**Applying**	**Applying**
CO4	--	**Applying**	**Applying**

CO5			**Applying**

TEXT BOOKS:	
1.	SumeetDua, U. RajendraAcharya, PrernaDua , Machine Learning in Healthcare nformatics,Intelligent Systems Reference Library 56, Springer Nature 2014.
2.	Sergio Consoli, Diego ReforgiatoRecupero, Milan Petkovic, Data Science for Healthcare Methodologies and Applications, 2019 Edition.

REFERENCES:	
1	Thomas M. Deserno, Fundamentals of Bio-Medical Image processing, Biological and Medical Physics, Biomedical Engineering, Springer, ISBN 978-3-642-15816-2, 2011

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-dat

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