



Unsupervised Learning

1.0 Course Faculty Information

Prof. Dr. V. Saranya
Instructor
NSRIC Inc.,
London, Ontario, Canada

2.0 Course Information

Course Code and Title Month Year	NSRIC T0001: AI&ML July 2023
Class Days	Monday - Friday
Class Time	10:00 am – 11:00 am EST
Course Credit Hours	3
Class Location	NSRIC online platform
prerequisites and/or co-requisites	N/A
Level /A, E, H, I, K12, M, P, S, T, U, V, W	Foundational courses /I,P

Note: The below classification of courses is related any areas of knowledge:

A: Advanced level academic level courses; **E:** Executive courses; **H:** Higher-level courses (i.e., graduate courses); **I:** Intermediate courses (i.e., university preparatory courses – Grade XII+); **K12:** Foundational, and lower-level courses; **M:** Mid-level courses (i.e., undergraduate courses); **P:** Professional courses; **S:** Short/seminar courses; **T:** Training courses; **U:** Tutorial Courses; **V:** Vocational training courses; and **W:** Workshop courses.

3.0 Professor Information

Name	Dr.V.Saranya
Title	NSRIC
Contact Information	saranyapulse@gmail.com
Office Location	NSRIC online platform
Office Hours	10: 30 am – 11:30 am EST (Saturdays) by email appointment

Our Specializations:

1. **ADK:** to create different avenues and opportunities for the **Acquisition and Dissemination of Knowledge**.
2. **MKT:** to commercialize and market the NSRIC products through our **Marketing** team around the world.
3. **OE:** to offer different courses for Human Resource Development through the NSRIC **Online Education** platform.
4. **RID:** to conduct **Research, Innovation and Development** in the areas of your interest and expertise



NSRIC Inc.

Bringing people together through knowledge dissemination

Office of the CEO & President - Headquarters

4.0 Target Audiences

- Diploma and vocational training student
- University undergraduate level student
- Any student who is interested in Artificial Engineering and Machine Learning
- Students who want to know Basics of Artificial Engineering and Machine Learning offered by Dr. V. Saranya

5.0 Course Description

Unsupervised learning is a type of machine learning where the algorithm is trained on an unlabelled dataset, meaning that there is no output variable that is being predicted. Instead, the goal is to identify patterns, structures, and relationships within the data itself. Clustering is a common technique used in unsupervised learning, where the algorithm groups similar data points together based on their similarities in the input features. Other techniques include dimensionality reduction, anomaly detection, and association rule mining. In unsupervised learning, the dataset is not divided into training and test sets, and there is no ground truth to evaluate the performance of the algorithm. Instead, the quality of the results is often evaluated based on the coherence and consistency of the patterns and relationships discovered by the algorithm. Unsupervised learning has many practical applications, such as identifying customer segments, detecting anomalies in network traffic, and exploring complex datasets in scientific research. They should also be able to apply their knowledge to solve real-world problems using machine learning techniques by Prof. Saranya .V at NSRIC Platform to understand this course content.

6.0 Course Learning Outcomes

Upon successful completion of this course, students will be able to:

CLO1: Understand the basics of unsupervised learning, including clustering, dimensionality reduction, anomaly detection, and association rule mining.

CLO2: Choose appropriate unsupervised learning algorithms based on the characteristics of the dataset and the problem to be solved.

CLO3: Evaluate the performance of unsupervised learning algorithms using metrics such as coherence and consistency of the patterns and relationships discovered by the algorithm.

Our Specializations:

1. **ADK:** to create different avenues and opportunities for the **Acquisition and Dissemination of Knowledge**.
2. **MKT:** to commercialize and market the NSRIC products through our **Marketing** team around the world.
3. **OE:** to offer different courses for Human Resource Development through the NSRIC **Online Education** platform.
4. **RID:** to conduct **Research, Innovation and Development** in the areas of your interest and expertise



NSRIC Inc.

Bringing people together through knowledge dissemination

Office of the CEO & President - Headquarters

CLO4: Preprocess and prepare data for unsupervised learning algorithms, including techniques such as feature scaling, normalization, and handling missing data.

7.0 How the course supports the attainment of the student outcomes

Student Learning Outcomes (1-4)			
1	2	3	4
High	Moderate	Moderate	Moderate

8.0 Course Materials

Online course materials

- Online PowerPoint presentation slides in pdf form
- Audio/visual recording of lectures (Optional)
- Online tutorial and meeting with students upon request
- Assignments and quizzes in the MLS system in pdf form
- Reading materials if any in pdf form

Textbook and resources (If any)

- 1) Machine Learning For Dummies, 2nd Edition. John Paul Mueller, Luca Massaron. ISBN: 978-1-119-72401-8
- 2) Artificial Intelligence: A Modern Approach, 3rd Edition; Format, Cloth; ISBN-13: 9780136042594.

9.0 Academic Integrity

Students are encouraged to have a look at the NSRIC's statement of academic integrity at NSRIC website. It is noted that by signing this syllabus, you will acknowledge that you have understood that any detected plagiarism should be reported.

10. Assessment for Grade

This course contains assignment and quizzes for assessment. Student will receive a "Certificate of completion" after successful completion of the course.

Important Note:

Our Specializations:

1. **ADK:** to create different avenues and opportunities for the **Acquisition and Dissemination of Knowledge**.
2. **MKT:** to commercialize and market the NSRIC products through our **Marketing** team around the world.
3. **OE:** to offer different courses for Human Resource Development through the NSRIC **Online Education** platform.
4. **RID:** to conduct **Research, Innovation and Development** in the areas of your interest and expertise



NSRIC Inc.

Bringing people together through knowledge dissemination

Office of the CEO & President - Headquarters

- i) The below classified courses (i.e., academic courses) will only be evaluated based on the grade system shown in Table 2. A grade and certificate will be issued for the student(s) and participant(s).
A: Advanced level academic level courses; **H:** Higher-level courses (i.e., graduate courses); **I:** Intermediate courses (i.e., university preparatory courses – Grade XII+); **K12:** Foundational, and lower-level courses; **M:** Mid-level courses (i.e., undergraduate courses).
- ii) The below classified courses will **not** be evaluated based on the grade system shown in Table 2. A certificate will be issued for the student(s) and participant(s).
E: Executive courses; **P:** Professional courses; **S:** Short/seminar courses; **T:** Training courses; **U:** Tutorial Courses; **V:** Vocational training courses; and **W:** Workshop courses.

Participation/Engagement/Performance

Your participation in every aspect of the course is important for the learning process. Your engagement in every discussion in the course, due delivery of all assignments, quizzes, and research projects will be fruitful. These efforts from your side will reflect your performance in the course delivery and your commitments. This performance is the reflection of your dream grade!!

Assignments

You will be given **1 assignment** during the course delivery. The due dates for assignments are specified in the course content and schedule section. The assignments will be given time to time to solve/answer during the term. Assignments will be posted through NSRIC online platform at least one week before they are due. Due dates are given in course schedule (tentative schedule). However, in case of any special circumstance, the date will be posted beforehand or announced in class.

Quizzes

A Maximum of 2 quizzes (maximum of **Two MCQ @ five** minute) will be taken based on class lectures and performance. The quiz will be taken in the beginning of the lecture through NSRIC online platform. If you miss the quiz without any valid official excuse, you will receive **zero** for the non-attended quiz. If any student fails to attend the quiz, he/she must submit a valid reason to the instructor. In such case, he/she should appear another quiz or may be averaged on the quizzes that he/she attended. It will depend on the situation and instructor.

11.0 Advice and additional requirements

Our Specializations:

1. **ADK:** to create different avenues and opportunities for the **Acquisition and Dissemination of Knowledge**.
2. **MKT:** to commercialize and market the NSRIC products through our **Marketing** team around the world.
3. **OE:** to offer different courses for Human Resource Development through the NSRIC **Online Education** platform.
4. **RID:** to conduct **Research, Innovation and Development** in the areas of your interest and expertise



NSRIC Inc.

Bringing people together through knowledge dissemination

Office of the CEO & President - Headquarters

I advise you to:

- Please contact me if you need any help.
- Students are expected to attend all scheduled online lecture classes.
- Students are expected to study from the course materials and/or textbooks which will help to easily read and understand.
- Students are encouraged to write their own notes during lectures/presentations (pdf PowerPoint presentations, and additional materials if any).
- Students are encouraged to attend online platform classes on time because late-attende disrupts the flow of the class for both the instructor and the other students.

Additional information (During Online Course offering Period)

- The PowerPoint course materials, and video lectures will be available at the NSRIC Platform.
- There will be scheduled discussion/tutorial sessions on **every Monday** at the class scheduled time. All students must attend this session (Need student request).
- There will be an office hour for students on Monday from 10:30 am – 11:30 am, Toronto, Canada time. Students need to send an email request so that a zoom meeting can be arranged. In addition, any time student can set up an online appointment (i.e., phone, zoom, and/or other mode of communications) based on availability of the course instructor. However, student should send an email request for setting up this type of meeting.

12.0 Course Topics

1. Introduction to Artificial Intelligence (AI) and Machine Learning (ML)
2. Mathematics for Machine Learning
3. Supervised Learning
4. Unsupervised Learning
5. Deep Learning
6. Reinforcement Learning
7. Natural Language Processing (NLP)
8. AI Ethics and Bias
9. Case Studies and Real-World Applications

Our Specializations:

1. **ADK:** to create different avenues and opportunities for the **Acquisition and Dissemination of Knowledge**.
2. **MKT:** to commercialize and market the NSRIC products through our **Marketing** team around the world.
3. **OE:** to offer different courses for Human Resource Development through the NSRIC **Online Education** platform.
4. **RID:** to conduct **Research, Innovation and Development** in the areas of your interest and expertise



NSRIC Inc.

Bringing people together through knowledge dissemination

Office of the CEO & President - Headquarters

13.0 Course Contents and Schedule

Lec. No.	Module	Topics	Remarks
Unsupervised Learning			
1.	Introduction	Supervised Vs Unsupervised learning	
2.	Unsupervised Learning	Clustering in Machine Learning	
3.	Methods	Different Types of Clustering Algorithm	Quiz 1
4.	Methods	K means Clustering – Introduction	
5.	Methods	K-means++ Algorithm	Assignment
6.	Methods	Fuzzy Clustering	
7.	Methods	Dimensionality Reduction	
8.	Methods	Dimensionality Reduction	
9.	Methods	Feature Extraction	
10	Unsupervised Learning	Summery	Quiz 2

Prepared by Dr. V. Saranya, OE Division, NSRIC Inc., London, ON, Canada.

Course Descriptions

Unsupervised Learning is a type of machine learning in which an algorithm is trained on an unlabeled dataset. The algorithm learns to find patterns and structure in the input data without explicit knowledge of the output. In unsupervised learning, the algorithm is not provided with labeled data, but instead must discover relationships and groupings within the data on its own. The goal of unsupervised learning is to find hidden patterns or structure in the data, such as clusters or associations, that can be used to gain insights or make predictions about new, unseen data. Common examples of unsupervised learning include clustering, dimensionality reduction, and anomaly detection.

Our Specializations:

1. **ADK:** to create different avenues and opportunities for the **Acquisition and Dissemination of Knowledge**.
2. **MKT:** to commercialize and market the NSRIC products through our **Marketing** team around the world.
3. **OE:** to offer different courses for Human Resource Development through the NSRIC **Online Education** platform.
4. **RID:** to conduct **Research, Innovation and Development** in the areas of your interest and expertise



NSRIC Inc.

Bringing people together through knowledge dissemination

Office of the CEO & President - Headquarters

Captions: Unsupervised Learning, clustering, dimensionality reduction, and anomaly detection and hidden patterns or structure.

Requirements/Instructions

Students are advised to register all AI & ML modules courses for becoming the master in the subject area.



Our Specializations:

1. **ADK:** to create different avenues and opportunities for the **Acquisition and Dissemination of Knowledge**.
2. **MKT:** to commercialize and market the NSRIC products through our **Marketing** team around the world.
3. **OE:** to offer different courses for Human Resource Development through the NSRIC **Online Education** platform.
4. **RID:** to conduct **Research, Innovation and Development** in the areas of your interest and expertise