Deep 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

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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 (Courses 1-9) offered by Dr. V. Saranya

5.0 Course Description

Deep learning is a subfield of machine learning that uses neural networks with multiple layers to learn representations of data. The main advantage of deep learning is its ability to automatically learn hierarchical representations of data, enabling it to extract useful features from complex datasets. In deep learning, the neural network is composed of multiple layers, with each layer responsible for learning a specific set of features from the input data. These features are then used as input to the next layer, allowing the network to learn increasingly complex representations of the data. This process continues until the final layer of the network, which outputs the final predictions. Deep learning has achieved state-of-the-art performance in various tasks such as image recognition, speech recognition, natural language processing, and autonomous driving. Some popular deep learning architectures include convolutional neural networks (CNNs) for image processing, recurrent neural networks (RNNs) for sequential data processing, and transformers for natural language processing. 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 fundamentals of neural networks, including activation functions, loss functions, and optimization algorithms.

CLO2: Preprocess and prepare data for deep learning models, including techniques such as data augmentation, normalization, and handling missing data.

CLO3: Train and evaluate deep learning models for various tasks, such as image classification, object detection, speech recognition, and natural language processing.

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CLO4: Understand the principles and architecture of popular deep learning models such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), and transformers.

7.0 How the course supports the attainment of the student outcomes

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

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:

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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, your 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

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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-attendee 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 hours 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

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13.0 Course Contents and Schedule

Lec. No.	Module	Topics	Remarks
		Deep Learning	
1.	Introduction	Introduction to Deep Learning	
2.	Methods	Neural Networks	
3.	Methods	Backpropagation algorithm	Quiz 1
4.	Methods	Convolutional Neural Networks (CNNs)	
5.	Methods	Convolutional Neural Networks (CNNs)	Assignment
6.	Methods	Recurrent Neural Networks (RNNs)	
7.	Methods	Optimization Techniques	
8.	Methods	Deep Learning Frameworks	
9.	Methods	Applications of Deep Learning	
10	Deep Learning	Summery	Quiz 2

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

Course Descriptions

Deep Learning is a subfield of machine learning that uses neural networks with multiple layers to learn and extract features from data. Deep learning algorithms are capable of learning hierarchical representations of data, meaning that they can learn increasingly abstract and complex features from lower-level features. The use of deep neural networks allows for the creation of models that can perform a wide range of tasks, including image and speech recognition, natural language processing, and playing games. Deep Learning requires a large amount of data and computational resources, but has shown remarkable success in many applications and has become a key component in many modern artificial intelligence systems.

Captions: Deep learning, image and speech recognition, natural language processing, and playing games.

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