CHANDIGARH UNIVERSITY
Discover. Learn. Empower.

APEX INSTITUTE OF TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

MACHINE LEARNING (21CSH-286)

Faculty: Prof. (Dr.) Vineet Mehan (E13038)

Lecture - 3

Applications of Machine Learning

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1

DBMS: Course Objectives

COURSE OBJECTIVES

The Course aims to:

1. Understand and apply various data handling and visualization techniques.
2. Understand about some basic learning algorithms and techniques and their applications, as well as general questions related to analysing and handling large data sets.
3. To develop skills of supervised and unsupervised learning techniques and implementation of these to solve real life problems.
4. To develop basic knowledge on the machine techniques to build an intellectual machine for making decisions behalf of humans.
5. To develop skills for selecting suitable model parameters and apply them for designing optimized machine learning applications.

2

COURSE OUTCOMES

On completion of this course, the students shall be able to:-

CO1	Understand machine learning techniques and computing environment that are suitable for the applications under consideration.

3

Unit-1 Syllabus

Unit-1	Introduction to Machine Learning
Introduction to Machine Learning	Definition of Machine Learning, Working principles of Machine Learning; Classification of Machine Learning algorithms: Supervised Learning, Unsupervised Learning, Reinforcement Learning, Semi-Supervised Learning; Applications of Machine Learning.
Data Pre-Processing and Feature Extraction	Data Sourcing and Cleaning, Handling Missing data, Encoding Categorical data, Feature Scaling, Handling Time Series data; Feature Selection techniques, Data Transformation, Normalization, Dimensionality reduction
Data Visualization	Data Frame Basics, Different types of analysis, Different types of plots, Plotting fundamentals using Matplotlib, Plotting Data Distributions using Seaborn.

4

SUGGESTIVE READINGS

- **TEXT BOOKS:**
- There is no single textbook covering the material presented in this course. Here is a list of books recommended for further reading in connection with the material presented:
- **T1:** Tom.M.Mitchell, "Machine Learning, McGraw Hill International Edition".
- **T2:** Ethern Alpaydin," Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India, 2005".
- **T3:** Andreas C. Miller, Sarah Guido, Introduction to Machine Learning with Python, O'REILLY (2001).

- **REFERENCE BOOKS:**
- **R1** Sebastian Raschka, Vahid Mirjalili, Python Machine Learning, (2014)
- **R2** Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification, Wiley, 2nd Edition".
- **R3** Christopher Bishop, "Pattern Recognition and Machine Learning, illustrated Edition, Springer, 2006".

5

Applications of Machine Learning

1. Virtual Personal Assistant
2. Image Recognition
3. Traffic Prediction
4. Product Recommendations
5. Self-driving Cars
6. Email Spam and Malware Filtering
7. Online Fraud Detection
8. Stock Market trading
9. Medical Diagnosis
10. Automatic Language Translation

1. Virtual Personal Assistant

a) Google Assistant

b) Alexa (Amazon)

c) Cortana (Microsoft)

d) Siri (Apple)

a) Google Assistant

- To make phone calls
- To send text messages
- Need to change your Google Maps destination while you're driving?
- Say "OK Google, give me directions to the closest gas station" while your phone is locked, and Google Assistant will open Maps and find the best route.

a) Google Assistant

- Use Your Favorite Apps With Your Voice
- Google Assistant is compatible with many apps.
- eBay, Walmart, PayPal, Instagram, and Spotify are just some of the apps that Google Assistant can control.
- Google is encouraging all developers to design their apps to be compatible with Assistant.

a) Google Assistant

- Google Assistant can read an article to you
- Your hands and eyes can be free to make coffee in the morning while you catch up on the news at the same time.
- Is your phone missing again?
- Say "Hey Google, find my phone" from another voice enabled device connected to your account, and Google Assistant will sound your phone, providing it's turned on and has an internet connection.

b) Alexa (Amazon)

- 1. LISTEN TO ALMOST ANY SONG, ON DEMAND Alexa works with almost all the most popular music streaming services. ...
- 2. GET THE DAILY NEWS AND WEATHER ...
- 3. LISTEN TO YOUR FAVORITE BOOKS ...
- 4. SET YOUR SMART THERMOSTAT (Manage Home Temperature)
- 5. CONTROL OTHER SMART HOME GADGETS, INCLUDING YOUR LIGHTS ...

c) Cortana (Microsoft)

- Cortana is Microsoft's intelligent personal assistant.
- It is included in Windows 10.
- To use Cortana simply type a question in the search box in the Taskbar.
- Activating Cortana: If Cortana isn't active, you can turn it on by typing "Cortana" in the Taskbar search.

d) Siri

- Virtual assistant by Apple.
- Siri is a virtual assistant that is part of Apple Inc.'s iOS, iPadOS, watchOS, macOS, tvOS, and audioOS operating systems.
- E.g.
- Hey Siri, text Sakshi, "I'm on my way"
- Hey Siri, where did I park my car?
- Hey Siri, call Geetika
- Hey Siri, start a 30-minute outdoor run
- Hey Siri, set an alarm for 8 AM

1. Virtual Personal Assistant

- Google assistant, Alexa , Cortana, and Siri are using speech recognition technology to follow the voice instructions.
- Speech recognition is a process of converting voice instructions into text.
- These assistants can help us in various ways just by our voice instructions such as Play music, call someone, Open an email, Scheduling an appointment, etc.

1. Virtual Personal Assistant

- These virtual assistants use machine learning algorithms as an important part.
- These assistant
  - Record our voice instructions
  - Send it over the server on a cloud,
  - And decode it

using ML algorithms and act accordingly.

2. Image Recognition

- Image recognition is one of the most common applications of machine learning.
- It is used to identify objects, persons, places, digital images, etc.
- The popular use case of image recognition and face detection is, Automatic friend tagging suggestion.

2. Image Recognition

- Facebook provides us a feature of auto friend tagging suggestion.
- Whenever we upload a photo with our Facebook friends, then we automatically get a tagging suggestion with name, and the technology behind this is machine learning's face detection and recognition algorithm.
- It is based on the Facebook project named "Deep Face," which is responsible for face recognition and person identification in the picture.

3. Traffic Prediction

- If we want to visit a new place, we take help of Google Maps, which shows us the correct path with the time to reach and shortest route.
- It predicts the Average time has taken on past days at the same time.
- Similarly shortest route is calculated by ML algorithms.

4. Product Recommendations

- Machine learning is widely used by various e-commerce and entertainment companies such as Amazon, Netflix, etc., for product recommendation to the user.
- Whenever we search for some product on Amazon, then we started getting an advertisement for the same product while internet surfing on the same browser and this is because of machine learning.
- Google understands the user interest using various machine learning algorithms and suggests the product as per customer interest.

4. Product Recommendations

- As similar, when we use Netflix, we find some recommendations for entertainment series, movies, etc., and this is also done with the help of machine learning.

5. Self-driving cars

- One of the most exciting applications of machine learning is self-driving cars.
- Machine learning plays a significant role in self-driving cars.
- Tesla, the most popular car manufacturing company is working on self-driving car.
- It is using unsupervised learning method to train the car models to detect people and objects while driving.

6. Email Spam and Malware Filtering

- Whenever we receive a new email, it is filtered automatically as important, normal, and spam.
- We always receive an important mail in our inbox with the important symbol and spam emails in our spam box, and the technology behind this is Machine learning.

6. Email Spam and Malware Filtering

- Below are some spam filters used by Gmail:
- Content Filter
- Header filter
- General blacklists filter
- Rules-based filters
- Permission filters

6. Email Spam and Malware Filtering

- Some machine learning algorithms such as
  - Multi-Layer Perceptron
  - Decision tree
  - Naïve Bayes classifier

are used for email spam filtering and malware detection.

7. Online Fraud Detection

- Machine learning is making our online transaction safe and secure by detecting fraud transaction.
- Whenever we perform some online transaction, there may be various ways that a fraudulent transaction can take place such as fake accounts, fake ids, and steal money in the middle of a transaction.
- So to detect this, Feed Forward Neural network helps us by checking whether it is a genuine transaction or a fraud transaction.

7. Online Fraud Detection

- For each genuine transaction, the output is converted into some hash values, and these values become the input for the next round.
- For each genuine transaction, there is a specific pattern which gets change for the fraud transaction hence, it detects it and makes our online transactions more secure.

8. Stock Market trading

- Machine learning is widely used in stock market trading.
- In the stock market, there is always a risk of up and downs in shares.
- So for this machine learning's long short term memory neural network is used for the prediction of stock market trends.

9. Medical Diagnosis

- In medical science, machine learning is used for diseases diagnoses.
- With this, medical technology is growing very fast and able to build 3D models that can predict the exact position of lesions in the brain.
- It helps in finding brain tumors and other brain-related diseases easily.

10. Automatic Language Translation

- Nowadays, if we visit a new place and we are not aware of the language then it is not a problem at all, as for this also machine learning helps us by converting the text into our known languages. Google's GNMT (Google Neural Machine Translation) provide this feature, which is a Neural Machine Learning that translates the text into our familiar language, and it called as automatic translation.
- The technology behind the automatic translation is a sequence to sequence learning algorithm, which is used with image recognition and translates the text from one language to another language.

Summary

- Introduction
- Types of Machine Learning
- Examples
- Machine Learning Process

Task

- Analyze the application of Machine learning in the areas of Medicine and Business. (BT-Level4)

REFERENCES

- https://www.javatpoint.com/machine-learning
- https://www.tutorialspoint.com/machine_learning/index.htm
- https://www.simplilearn.com/tutorials/machine-learning-tutorial/what-is-machine-learning?source=sl_frs_nav_playlist_video_clicked

THANK YOU

For queries
Email: vineet.e13038@cumail.in