CIS 678 Machine Learning

Introduction to ML

Week 1 Plan

- **Get to know each other (networking)**
- Set up our course objective, guidelines, and evaluation procedure.
- Introduction to ML
- Set up our programming development environment(s), more specifically,
  - Google Colab(oratory) on your Google drive,
  - HPC cluster account (introduction)
- Basics of Math, Statistics, and Probability (Part 1)

ML introduction

What *is* Machine Learning?

Machine Learning (ML) is when a computer learns patterns from data and improves its performance **without being explicitly programmed** for every task.

What *is NOT* Machine Learning?

These are programs that follow **explicit instructions** or rules written by a human, without adapting or learning from data.

ML introduction

What *is* Machine Learning?

Machine Learning (ML) is when a computer learns patterns from data and improves its performance **without being explicitly programmed** for every task.

What *is NOT* Machine Learning?

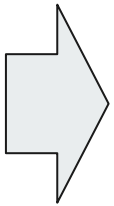
These are programs that follow **explicit instructions** or rules written by a human, without adapting or learning from data.

ML introduction

What *is NOT* Machine Learning?

These are programs that follow **explicit instructions** or rules written by a human, without adapting or learning from data.

Example Applications



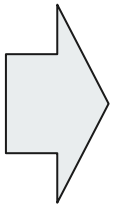
1. **Calculator App:**
   - Follows strict math rules coded by a programmer.
   - It doesn't "learn" how to calculate—it just executes instructions.
1. Digital Alarm Clock:
   - Goes off at a set time programmed by the user.
   - No learning—just performs based on what you set.
1. Static Website:
   - Displays fixed content to all users.
   - Doesn't adapt or learn from user behavior.
1. Microwave Oven Timer:
   - Follows direct input commands (e.g., heat for 2 minutes).
   - Doesn't learn what type of food you usually heat or adjust automatically.

ML introduction

What *is NOT* Machine Learning?

These are programs that follow **explicit instructions** or rules written by a human, without adapting or learning from data.

Example Applications



1. Calculator App:
   - Follows strict math rules coded by a programmer.
   - It doesn't "learn" how to calculate—it just executes instructions.

1. **Digital Alarm Clock:**
   - Goes off at a set time programmed by the user.
   - No learning—just performs based on what you set.

1. Static Website:
   - Displays fixed content to all users.
   - Doesn't adapt or learn from user behavior.

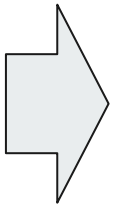
1. Microwave Oven Timer:
   - Follows direct input commands (e.g., heat for 2 minutes).
   - Doesn't learn what type of food you usually heat or adjust automatically.

ML introduction

What *is NOT* Machine Learning?

These are programs that follow **explicit instructions** or rules written by a human, without adapting or learning from data.

Example Applications



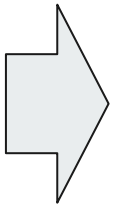
1. Calculator App:
   - Follows strict math rules coded by a programmer.
   - It doesn't "learn" how to calculate—it just executes instructions.
1. Digital Alarm Clock:
   - Goes off at a set time programmed by the user.
   - No learning—just performs based on what you set.
1. **Static Website:**
   - Displays fixed content to all users.
   - Doesn't adapt or learn from user behavior.
1. Microwave Oven Timer:
   - Follows direct input commands (e.g., heat for 2 minutes).
   - Doesn't learn what type of food you usually heat or adjust automatically.

ML introduction

What *is NOT* Machine Learning?

These are programs that follow **explicit instructions** or rules written by a human, without adapting or learning from data.

Example Applications



1. Calculator App:
   - Follows strict math rules coded by a programmer.
   - It doesn't "learn" how to calculate—it just executes instructions.
1. Digital Alarm Clock:
   - Goes off at a set time programmed by the user.
   - No learning—just performs based on what you set.
1. Static Website:
   - Displays fixed content to all users.
   - Doesn't adapt or learn from user behavior.
1. **Microwave Oven Timer:**
   - Follows direct input commands (e.g., heat for 2 minutes).
   - Doesn't learn what type of food you usually heat or adjust automatically.

ML introduction

What *is* Machine Learning?

Machine Learning (ML) is when a computer learns patterns from data and improves its performance **without being explicitly programmed** for every task.

Example Applications

1. **Email Spam Filter:**
   - Learns from thousands of emails labeled "spam" or "not spam."
   - Over time, it gets better at predicting which emails are spam—even if it's never seen that exact message before.
2. Netflix Recommendations:
   - Learns fro… …atched.
   - Suggests ne… …tterns in viewing behavior.
3. Voice Assistants (e.g.…
   - Learn your …
   - Understand… …better the more you use them.

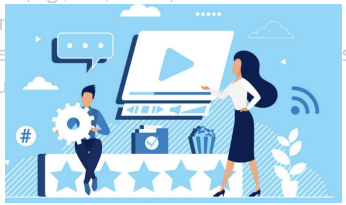
ML introduction

What *is* Machine Learning?

Machine Learning (ML) is when a computer learns patterns from data and improves its performance **without being explicitly programmed** for every task.

Example Applications

1. Email Spam Filter:
   - Learns from thousands of emails labeled "spam" or "not spam."
   - Over time, it gets better at predicting which emails are spam—even if it's never seen that exact message before.
2. **Netflix Recommendations:**
   - Learns from what you and others have watched.
   - Suggests new movies/shows based on patterns in viewing behavior.
3. Voice Assistants (e.g., Siri, Alexa):
   - Learn
   - Unde s better the more you u



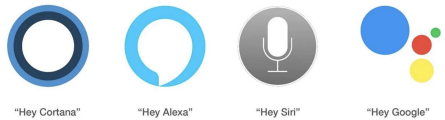
ML introduction

What *is* Machine Learning?

Machine Learning (ML) is when a computer learns patterns from data and improves its performance **without being explicitly programmed** for every task.

Example Applications

1. Email Spam Filter:
   - m" or "not
   - mails are age before.
2. Netflix R
   - Learns from what you and others have watched.
   - Suggests new movies/shows based on patterns in viewing behavior.
3. **Voice Assistants (e.g., Siri, Alexa):**
   - Learn your speech patterns.
   - Understand different accents or phrases better the more you use them.



ML introduction

What *is* Machine Learning?

Machine Learning (ML) is when a computer learns patterns from data and improves its performance **without being explicitly programmed** for every task.

Example Applications

4. **Self-Driving Cars:**
    - Learn to detect pedestrians, read signs, and respond to traffic using data from cameras, radar, etc.

5. Conversational Age
    - Learns fr
    - Improve

ML introduction

What *is* Machine Learning?

Machine Learning (ML) is when a computer learns patterns from data and improves its performance **without being explicitly programmed** for every task.

Example Applications

4. Self-Driving Cars:
    - Learn to detect pedestrians, read signs, and respond to traffic using data from cameras, radar, etc.

5. **Conversational Agent (ChatGPT)**
    - Learns from massive text data
    - Improves using human feedback.

Let's Check with our Understanding!

Q. What was the average daytime temperature in Grand Rapids in August 2024?

Is it a ML problem?

Let's Check with our Understanding!

Q. What was the average daytime temperature in Grand Rapids in August 2024?

Clue: This information is already known.

Is it a ML problem?

Let's Check with our Understanding!

Q. What will be the average daytime temperature in Grand Rapids in August 2026?

Is it a ML problem?

Let's Check with our Understanding!

Q. What will be the average daytime temperature in Grand Rapids in August 2026?

Clue: This information is unknown and involves uncertainty.

Is it a ML problem?

QA