

## Course Title: Machine Learning Course Code: DSU07320

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## Learning Resources:

1. Geron, A. (2017). Hands-On Machine Learning with Scikit-Learn & Tensorflow O'Reilly Media, Inc. *O'Reilly Media, Inc, 1005, 564.*
2. Russell, R. (2020). *Machine Learning: Step-by-Step Guide To Implement Machine Learning Algorithms with Python.* (Knxb)
3. Marsland, S. (2011). *Machine learning: an algorithmic perspective.* Chapman and Hall/CRC.

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## Method of Assessment:

- Test 10%
- Assignment 10%
- Practicals 20%
- S/Exam (Practical +theory) 60%

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## Introduction to Machine Learning

### What is Machine Learning?

- ❖ Machine Learning is the field of study that gives computers the **ability to learn** without being explicitly programmed.
- ❖ Just like human being, ML enables computers learn how to do a given task without being programmed to do so.

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- ❖ Machine learning is a subset of AI that deals with the development of algorithms and models that enable computers to learn from data and make predictions or decisions without being explicitly programmed.
- ❖ ML focuses on learning from data

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- ❖ *Say you need the computer that can tell the difference between **picture of a dog** and a **picture of a cat**, you could begin by feeding its images and telling it this is a dog and that is a cat.*

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### Examples of Machine Learning Programs

- Spam filter (Detect unsolicited, unwanted and [virus](#)-infected emails and prevent those messages from getting to a user's inbox)



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- Image recognition  
(like plate number recognition, facial recognition!)
- Text to speech/speech to text



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- Google search (results based on your personal interests)
- Viewing recommendations/recommending next video to watch
- Find ONE more ML programs

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### Why Use Machine Learning?

Consider how you would write a spam filter using traditional programming techniques

1. First you would look at what spam typically looks like. You might notice that some words or phrases (such as “4U,” “credit card,” “free,” and “amazing”) tend to come up a lot in the subject.

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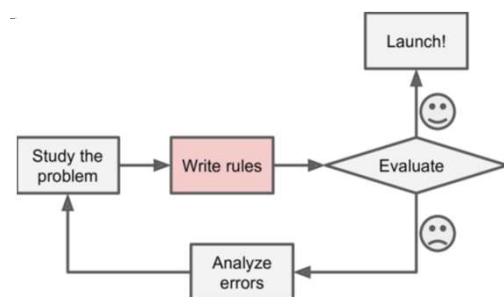
2. You would write a **detection algorithm** for each of the patterns that you noticed, and your program would flag emails as spam if a number of these patterns are detected.
3. You would test your program, and repeat steps 1 and 2 until it is good enough.

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### The traditional approach

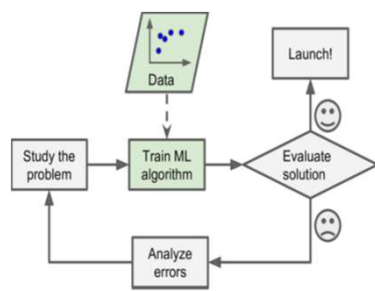


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## Machine Learning approach



❖ In contrast, a **spam filter based** on Machine Learning techniques automatically learns which words and phrases are **good predictors** of spam by detecting unusually frequent patterns of words in the **spam examples** compared to the **ham examples**

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## ML approach offers;

- ❖ Shorter program ( the traditional requires many long lists of rules)
- ❖ Easier maintenance of the program,
- ❖ More accurate
- ❖ Flexible

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## Flexibility in ML

- ❖ Example, if spammers notice that all their emails containing “4U” are blocked, they might start writing “For U” instead. A spam filter using traditional programming techniques would need to be updated to flag “For U” emails. If spammers keep working around your spam filter, you will need to keep writing new rules forever.
- ❖ In contrast, a spam filter based on ML techniques automatically notices that “For U” has become unusually frequent in spam flagged by users, and it starts flagging them without your intervention.

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## When should you use machine learning?

- ❖ When you have a problem that requires many long lists of rules to find the solution.
- ❖ Very complex problems (or have no known algorithm) for which there is no solution with a traditional approach.
- ❖ Non-stable environments’: machine-learning software can adapt to new data.

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