

# What is Machine Learning?

# What is Machine Learning & AI?

...and why is it important?

# AI: Hype or Reality?

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*AI is one of the most important things humanity is working on. It is more profound than electricity or fire.*

Sundar Pichai, Google's CEO





**Human Intelligence**



**Artificial Intelligence**



## Human Intelligence

- Solve problems
- Achieve goals
- Analyze & reason
- Communicate, collaborate & influence
- Consciousness, Emotions, Intuition, Imagination



## Artificial Intelligence



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## Artificial Intelligence

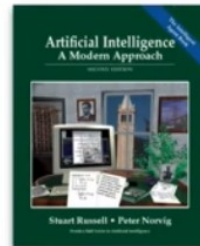
The ability for machines to simulate & enhance (human) intelligence

# AI Definition: Academic

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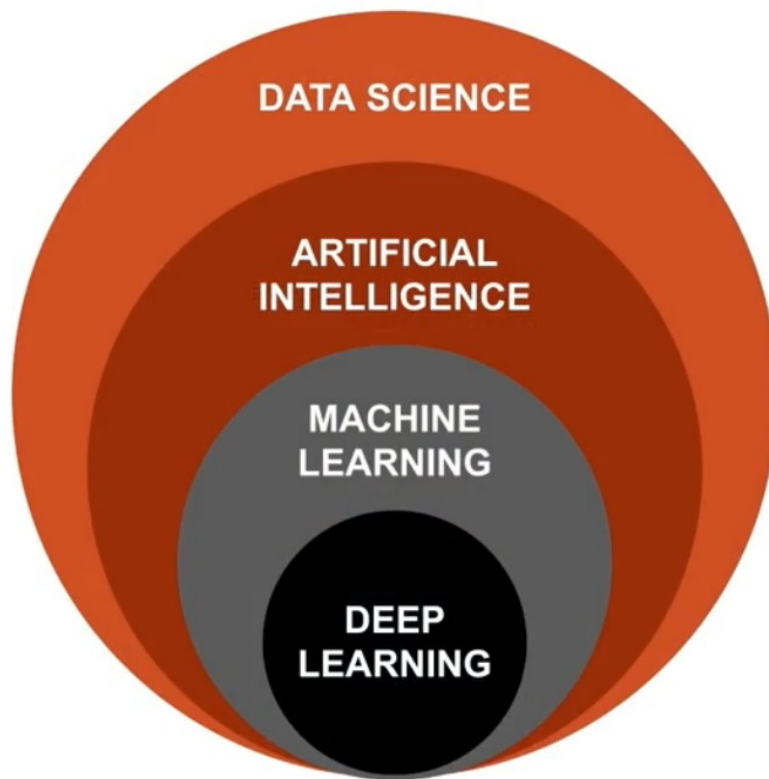
*The designing and building of intelligent agents that receive precepts from the environment and take actions that affect that environment*

Stuart Russell & Peter Norvig,  
AI Professors



# Machine Learning (ML) is a subfield of AI

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# AI is **not new**, it's been around for a loong time

## Mathematical Statistics



## Artificial Intelligence



## Machine Learning

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### A Bayesian Approach to Filtering Junk E-Mail

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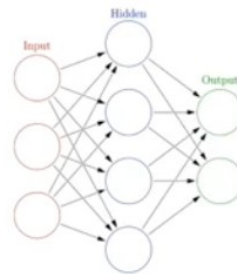
#### Abstract

In addressing the growing problem of junk e-mail on the Internet, we examine methods for the automated categorization of e-mail to eliminate non-solicited messages from a user's mail stream. By casting this problem in a Bayesian framework, we are able to model the probabilistic nature of e-mail in conjunction with a series of differential classification rules to produce filters which are especially appropriate for the nature of this task. While this may appear, at first, to be a straightforward task, classification, we show that by considering domain-specific features of this problem in addition to the raw text of e-mail messages, we can produce much more accurate filters. Finally, we show the efficacy of such filters in a real world usage scenario, arguing that this technology is mature enough for deployment.

contains offensive material (such as graphic pornography), there is often a higher cost to users of actually viewing this mail than simply the time to sort out the junk. Lastly, junk mail not only wastes user time, but can also quickly fill up the server storage space, especially at large sites with thousands of users who may all be getting duplicate copies of the same junk mail.

As a result of this growing problem, automated methods for filtering such junk from legitimate e-mail are becoming necessary. Indeed, many commercial products are now available which allow users to hand-craft a set of signal rules to filter junk mail. This solution, however, is problematic at best. First, systems that require users to hand-build a rule set to detect junk assume that their users are savvy enough to be able to construct robust rules. Moreover, as the nature of junk mail becomes more subtle, these rules sets must be

## Deep Learning



1700's

1950's

1960's

1970's

1980's

1990's

2000's

2010's

Today

Future

1943 – The first ANN

1969 – Backpropagation

1955 – Official term and academic recognition

1985 – Rediscovery of Backprop

1958 – Rosenblatt's Perceptron

1996 – Chess victories – defeating the world champion

2012 – AlexNet wins ImageNet

2013 - Today: Deep Learning is applied almost everywhere!

# What is different this time? - **4 key enablers**

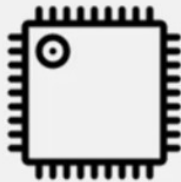
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1



Data availability

2



Computational  
power

3



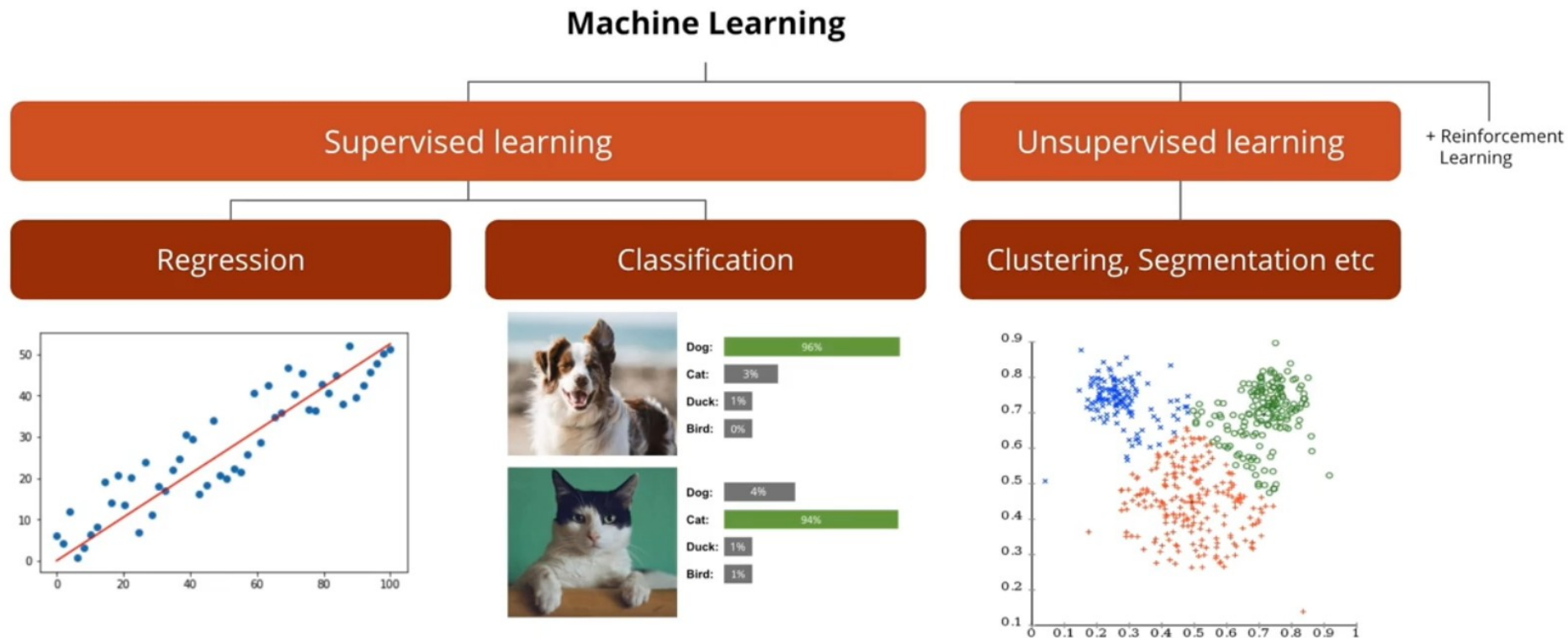
Algorithm  
advancements

4



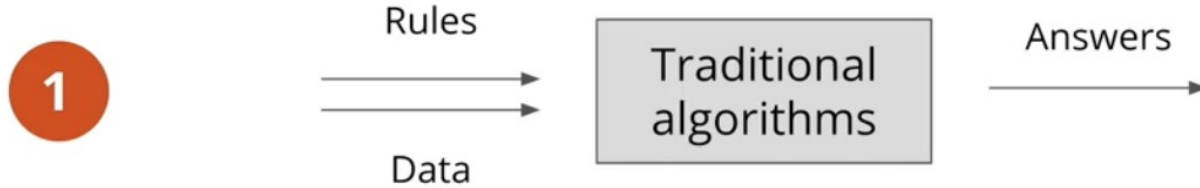
Broad public  
interest

# The Categories of Machine Learning



# Traditional algorithms rely on rules defined by humans

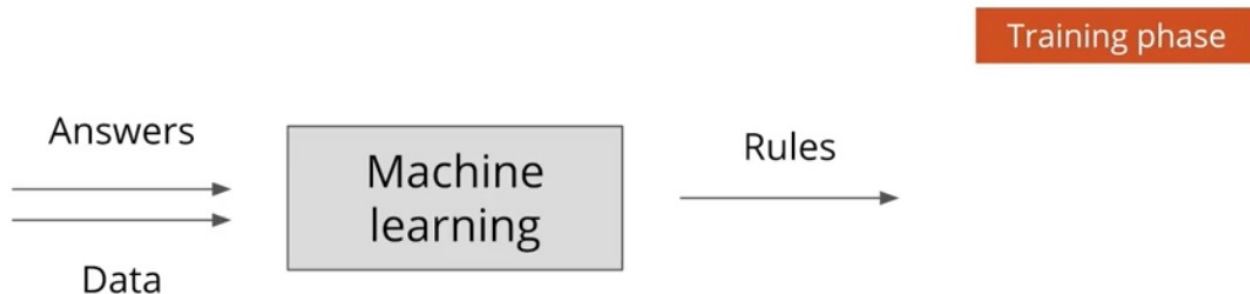
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# Machine learning algorithms extract rules from data

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2



Obrigado!