## Where to go for help

## Summary

Have you ever taken an online course, had a question, and didn’t know where to go for help? Did it make you lose your motivation to complete the course? Whether you are learning a new skill, or are an expert, we all learn from each other.

Join the IBM Data and AI Learning Community where you can Learn, Share, and Engage. This community is a place where you can participate in many various discussions that cover a wide spectrum of Data and AI related topics. If you have specific questions about content covered in this course, please be sure to add the tag "#course-question" to your post (*discussed in more detail in the step by step instructions to follow*). Please include the name of the course, and be as specific as you can.

The URL for the community:

## <https://ibm.biz/AILearningCommunity>

Please be respectful and follow the community guidelines as laid out here: <https://community.ibm.com/community/user/netiquette>

Community FAQ's can be found here: <https://community.ibm.com/community/user/participate/faq>The community is moderated, and failure to obey the rules may result in removal of your account and/or associated content.

## Objectives

Artificial Intelligence is not new, but it is new in a sense that it is easier than ever to get started using Machine Learning in business settings. In this module we will go over a quick introduction to AI and Machine Learning and we will visit a brief history of modern AI. We will also explore some of the current applications of AI and Machine Learning for you to think about how you want to leverage them in your day to day business practice or personal projects.

Learning Objectives:

* Become familiar with common Machine Learning vocabulary and the Machine Learning Workflow
* Become familiar with Modern AI applications, including Computer Vision and Natural Language Processing
* Become familiar with the chronology of Artificial Intelligence, including AI booms and AI winters
* Become familiar with the definitions of Artificial Intelligence, Machine Learning, and Deep Learning

## Course Prerequisites

**Basic Knowledge**

In order to be successful in this course, you will need a working knowledge of the following:

* Familiarity with programming on a Python development environment
* Familiarity with Jupyter notebooks
* Fundamental understanding of Calculus, Linear Algebra, Probability, and Statistics

**Computing Environment**

Throughout this course we will be providing Jupyter notebooks ([https://jupyter.org](https://jupyter.org/)) for you to download and run on your local computer. In some cases they will be in the form of a lab you will complete or as a follow-along notebook that you can complete with the video demo.

Introduction to Artificial Intelligence and machine learning

Ai breakthroughs:

* Image classification
  + Ex id if picture is dog or cat
  + Since 2015 computers are better than humans
* Machine translation
  + Ex. Translate from one language to another
  + As of 2016 ai techniques can achieve near-human performance

Ai is the new elctricity

About 100 years ago electrcicty transformed every major industry. Ai has advanced to the point where it has the power to transform every major sector in coming years.

2019 -> $40billion

2023 -> $100billion

Defintions:

Artificial intelligence – a program that can sense, reason, act, and adapt

Machine learning – algorithms whose performance improveas they are exposed to more data over time

Deep learning – subset of ml in which multlayered neural networks learn from vast amounts of data

Ai

* branch of computer science deal with the simulation of intelligent behavior in computers
* applied when a machine mimics cognitive functiosn that humans associate with other humans minds such as learning or problem solving

Machine Learning

* The study and construction of programs that are not explicitly programmed, but learn pattersn as they are exposed to more data over time
* These programs learn from repeatedly seeing data, rather than being explicitly programmed by humans
  + Ex. Emails are labeled as spam vs. Not spam
  + Machine learning program – the more emails the program sees the better it will be

Feature – attributes of the data

Target – column to be predicted

We can use features to predict the target

Supervised learning

* Datasets: has a target column
* Goal: make predictions
* Ex. Fraud detection

Unsupervised learning

* Does not have a target column
* Find structure in the data
* Ex. Customer segmentation

Machine learning example

* Suppose you want to id fradulent cc transactions
* You could define features to be:
  + Transaction time
  + Transaction amount
  + Transaction location
  + Category of purchase
* The algorithm could learn what feature combinations sugggest unusual activity.

Machine learning limitations

* Suppose you want to determin if an image is a dog or cat
* What features would you use?
* This is where deep learning can come in

Deep Learning

* Ml that incolves using very compllicated models called deep neural networks
* Models determine berst representation of original data; in classic machine learning, humans must do this.

Classic machine learning

* Feature detection – are defined by us – step1: determine featueres
* Ml classifier algo – step 2 feed them through model
* Output

Deep learning combines seteps 1 and 2 and returns an output

History of ai

Ai has experience severl hype cycles where it has oscillated gbetween periods of excitement and disappointment

Starts with early algorithms in 1950, ai winter late 60s-70s, 80s expert systems and rule based systems, ai winter late 1980-1990s,

Late 90s –2000s – speech recognition, ml,

Today – deep learning, img classification and language translation

1950: alan turing developed the turing test, to test a machines ability to exhibit intelligent behavior

1956 – ai was accepted as a field at the dartmouth conference

1957 – frank rosenblatt invented the perceptron algorithm. This was precursor to modern neural networks

1959: arthur samuel published an algo for a checkers program using ml

The first “ai winter”

1966 – ALPAC committee evaluated ai techniques for machine translation and determined there was little yied from the investment

1969 – marvin minsky published a book on the limitations of the perceptron algo wthich slowed research in neural networks

1973- the lighhill repor highlights ai failure to live up to promises

The two reporst led to cuts in gov funding

1980s ai boom

Expert systems – systems with programmed rules designed to mimic human experts

* Ran on mainframe computers with specialized programming langues (e.g.LISP)
* WERE THE FFIRST WIDELY-USED AI TECH WITH 2/3 OF FORTUN 500 COMPANIES USING THEM AT THEIR PEAK

1986 THE BACKPROGAGATION ALGO IS ABLE TO TRAIN MULT-LAYER PERCEPTRONS LEADING TO NEW SUCCESSESS AND INTEREST IN NEURAL NETWORK RESEARCH.

AI WINTER 80-90

EXPERT SYSTEMS PROGRESS ON SOLVING BUS. PROBLEMS SLOWED.

Expert systems began to be melded into software suites of genreal bus apps. (sap, oracle) that could run on pcs instead of mainframes

Neural networks didn’t scale to large problems.

Interest in ai in business declined.

90-2000 ml

Ai solutions had successes in speech recognition, medical diagnosis, robotics, and many other areas.

Ai algos were integrated into larger systems and became useful throughout industry.

Deep blue chess system beat world chess champion kasparov

Googles search engine laucnhed using ai tech.

2006 geoffrey hinton publishes a paper on unsupervised pre-training that allowed deeper neural networks to be trained

Neural networks are rebranmded as deep learning

2009 imagenet database of human-tagged images is presented at th scpr confrerence

Algos compete on severl visual recognition taskes at the first imagenet competition.

2012-?

2012 – deep learning beat previous benchmark on the imagenet competition called alex net

2013 – deep learning is used to understand conceptual meaning of workds

2014 – similar breathroughs appeard in language tranlation

These have led to advancements in web search, document search, document summarization and machine translation.

2014 – standfor team creates computer vision algo that can describe photos.

2015- deep learning platform tensoflow iss developed

2016 – deepminds alphago, beats go master

2018 – waymo launches commercial self-driving car servic e in subs of phoneix

2019-Ibm project debater is able to have a full debate with rebuttal with champsionship human debater

Machine Learning consists in programming computers to learn from real-time human interactions.

False

MODERN AI

2012-

Computer vision – self drivingt cars and object detection, heaklrcare and improved diagnosis

natural language - communication and language translation

How is this era of ai different

* Bigger data sets
* Faster computers
* Neural nets

Cutting edge results in a variet of fileds from the above 3

Transformative changes’

* Health
  + Enhanced diagnostics
  + Drug discovery
  + Patient care
  + Research
  + Sensory aids
* Industrial
  + Factory automation
  + Predcitive maintenance
  + Precision agriculture
  + Field automation
* Finanace
  + Algorithmic trading
  + Fraud detection
  + Research
  + Personal finance
  + Risk mitigation
* Energy
  + Oil and gas exploration
  + Smart grid
  + Operational improvement
  + Conservation
* Governmen
  + Defense
  + Data insights
  + Saffety and security
  + Engagement
  + Smarter cities
* Transport
  + Autonomous cars
  + Automated trucking
  + Aerospace
  + Shipping
  + Search and rescue
* More
  + Advertising
  + Education
  + Gaming
  + Professional and it services
  + Telco / media
  + Sports

Applications

Ai omnipresence in transportation

Navigation

* Google and waze find the fastest route, by processing traffic data

Ride sharing’

* Uber and lyft predict real –time demand using ai techniques

Audience

* Facebook and twitter use ai to decide what content to present in their feeds to different audiences

Content

* Image recognition and sentiment analysis to ensure that content of the appropriate mood is being said

Natural language

* Language processing in phones and ocmputers

Object deetection

* Camers use object detection to determin whos in pctures

Deep learning prove to work for image classification

,models outperform humans on image classification

Object dection models out perform humans

Abandandoned baggege detection

MACHINE LEARNING WORKFLOW

Exmaples assume familiarity with

- python libraries (numpy, pandas) jupyter notebooks

- Basic statistics indcluding probability, caculating moments, bayes’ rule

Libraries:

* Numpy
* Pandas
* Natplotlib
* Seaborn
* Scikit-learn
* Tensorflow
* Keras

Problem statement – what problem are you trying to solve.

Data collection – what data do you need to solve it.

Data exploration and preprocessing – how should you clean your data so your model can use it.

Modeling – build a model to solve your problem?

Validation – did I solve the problem.

Decision making and deployment – communicate to stakeholders or put into production?

Vocab:

Target – category or value that we are trying to predict

Features: properties of the data used for prediction ( explanatory variables)

Examples – a single data point within the data (one row)

Label – the target value for a single data point

AI Winters happened mostly due to the lack of understanding behind the theory of neural networks

True

Most applications that use computer vision, use models that were trained using this discipline:

Deep learning

## End of module review: A Brief History of Modern AI and its Applications

### **Introduction to Artificial Intelligence and Machine Learning**

Artificial Intelligence is a branch of computer science dealing with the simulation of intelligent behavior in computers. Machines mimic cognitive functions such as learning and problem solving.

Machine learning is the study of programs that are not explicitly programmed, but instead these algorithms learn patterns from data.

Deep learning is a subset of machine learning in which multilayered neural networks learn from vast amounts of data.

### **History of AI**

AI has experienced cycles of AI winters and AI booms.

AI solutions include speech recognition, computer vision, assisted medical diagnosis, robotics, and others.

### **Modern AI**

Factors that have contributed to the current state of Machine Learning are: bigger data sets, faster computers, open source packages, and a wide range of neural network architectures.

### **Machine Learning Workflow**

The machine learning workflow consists of:

* Problem statement
* Data collection
* Data exploration and preprocessing
* Modeling
* Validation
* Decision Making and Deployment

This is a summary of the common taxonomy for data in open source packages for Machine Learning:

* target: category or value you are trying to predict
* features: explanatory variables used for prediction
* example: an observation or single data point within the data
* label: the value of the target for a single data point

### Question 1

Correct

1.00 points out of 1.00

Flag question

#### Question text

Assume you have a data set that summarizes a marketing campaign with information related to prospective customers. The data set contains 100 observations with several columns that summarize information about the prospective customer. It also has a column that flags whether the prospect responded or not.

In this example, "Yes" or "No" are the possible values of the:

Select one:

A.

label

Correct!

B.

features

C.

target

D.

example

#### Feedback

Your answer is correct.

The correct answer is: label

### Question 2

Correct

1.00 points out of 1.00

Flag question

#### Question text

Assume you have a data set that summarizes a marketing campaign with information related to prospective customers. The data set contains 100 observations with several columns that summarize information about the prospective customer. It also has a column that flags whether the prospect responded or not.

In this context, observation is a synonym of:

Select one:

A.

label

B.

features

C.

target

D.

example

Correct!

#### Feedback

Your answer is correct.

The correct answer is: example

### Question 3

Correct

1.00 points out of 1.00

Flag question

#### Question text

Assume you have a data set that summarizes a marketing campaign with information related to prospective customers. The data set contains 100 observations with several columns that summarize information about the prospective customer. It also has a column that flags whether the prospect responded or not.

A machine learning model that predicts response, is using the column Responded as a:

Select one:

A.

label

B.

features

C.

target

Correct!

D.

example

#### Feedback

Your answer is correct.

The correct answer is: target