

School of AI - Rasht Chapter

The Learning Path

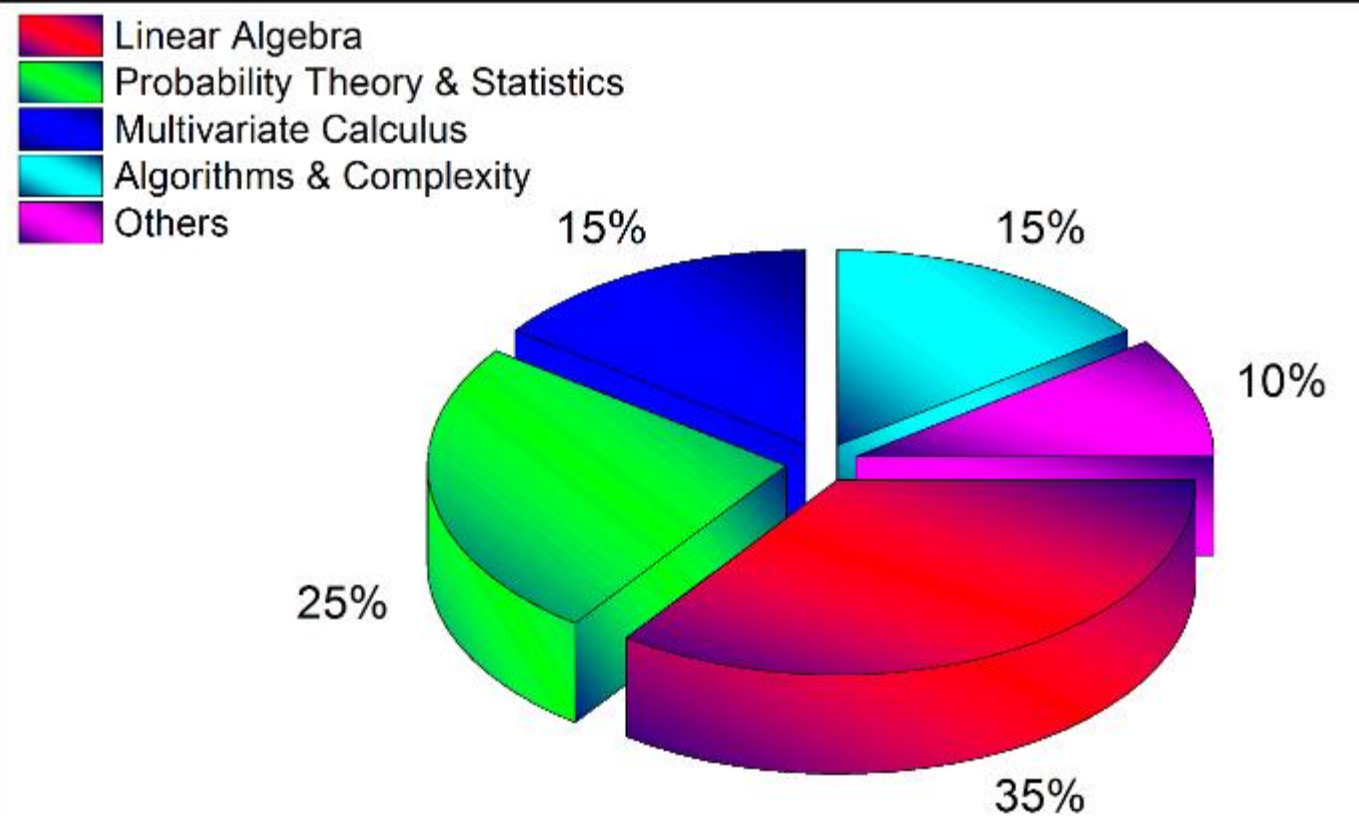
First Phase (Mostly Theory)

1. Linear Algebra
2. Calculus
3. Statistics
4. Algorithms

Second Phase (Mostly Practical)

5. Data Science & Python
6. Data Visualization
7. Machine Learning
8. Deep Learning





Importance of Maths Topics Needed For Machine Learning



Browse > Data Science > Machine Learning

This course is part of the **Mathematics for Machine Learning Specialization**

Mathematics for Machine Learning: Linear Algebra

★★★★★ 4.7 2,981 ratings • 531 reviews

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Imperial College
London



Course 1 of 1 in the
Mathematics for Machine Learning
Specialization



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Flexible deadlines
Reset deadlines in accordance to your
schedule.



Beginner Level



**Approx. 21 hours to
complete**
Suggested: 5 weeks of study, 2-5
hours/week



English
Subtitles: English

Linear algebra explained in four pages

Excerpt from the [\[NO BULLSHIT GUIDE TO LINEAR ALGEBRA\]](#) by Ivan Savov

Abstract—This document will review the fundamental ideas of linear algebra. We will learn about matrices, matrix operations, linear transformations and discuss both the theoretical and computational aspects of linear algebra. The tools of linear algebra open the gateway to the study of more advanced mathematics. A lot of *knowledge buzz* awaits you if you choose to follow the path of *understanding*, instead of trying to memorize a bunch of formulas.

I. INTRODUCTION

Linear algebra is the math of vectors and matrices. Let n be a positive integer and let \mathbb{R} denote the set of real numbers, then \mathbb{R}^n is the set of all n -tuples of real numbers. A vector $\vec{v} \in \mathbb{R}^n$ is an n -tuple of real numbers. The notation “ $\in S$ ” is read “element of S .” For example, consider a vector that has three components:

$$\vec{v} = (v_1, v_2, v_3) \in (\mathbb{R}, \mathbb{R}, \mathbb{R}) \equiv \mathbb{R}^3.$$

A matrix $A \in \mathbb{R}^{m \times n}$ is a rectangular array of real numbers with m rows and n columns. For example, a 3×2 matrix looks like this:

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} \in \begin{bmatrix} \mathbb{R} & \mathbb{R} \\ \mathbb{R} & \mathbb{R} \\ \mathbb{R} & \mathbb{R} \end{bmatrix} \equiv \mathbb{R}^{3 \times 2}.$$

The purpose of this document is to introduce you to the mathematical operations that we can perform on vectors and matrices and to give you a

B. Matrix operations

We denote by A the matrix as a whole and refer to its entries as a_{ij} . The mathematical operations defined for matrices are the following:

- addition (denoted $+$)

$$C = A + B \quad \Leftrightarrow \quad c_{ij} = a_{ij} + b_{ij}.$$

- subtraction (the inverse of addition)
- matrix product. The product of matrices $A \in \mathbb{R}^{m \times n}$ and $B \in \mathbb{R}^{n \times \ell}$ is another matrix $C \in \mathbb{R}^{m \times \ell}$ given by the formula

$$C = AB \quad \Leftrightarrow \quad c_{ij} = \sum_{k=1}^n a_{ik} b_{kj},$$

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} = \begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} & a_{11}b_{12} + a_{12}b_{22} \\ a_{21}b_{11} + a_{22}b_{21} & a_{21}b_{12} + a_{22}b_{22} \\ a_{31}b_{11} + a_{32}b_{21} & a_{31}b_{12} + a_{32}b_{22} \end{bmatrix}$$

- matrix inverse (denoted A^{-1})
- matrix transpose (denoted T):

$$\begin{bmatrix} \alpha_1 & \alpha_2 & \alpha_3 \\ \beta_1 & \beta_2 & \beta_3 \end{bmatrix}^T = \begin{bmatrix} \alpha_1 & \beta_1 \\ \alpha_2 & \beta_2 \\ \alpha_3 & \beta_3 \end{bmatrix}.$$





Overview

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Linear Algebra Review



Andrew Ng

This optional module provides a refresher on linear algebra concepts. Basic understanding of linear algebra is necessary for the rest of the course, especially as we begin to cover models with multiple variables.

Linear Algebra Review

- ✓ **Video:** Matrices and Vectors 8 min
- ✓ **Reading:** Matrices and Vectors 2 min
- ✓ **Video:** Addition and Scalar Multiplication 6 min
- ✓ **Reading:** Addition and Scalar Multiplication 3 min
- ✓ **Video:** Matrix Vector Multiplication 13 min
- ✓ **Reading:** Matrix Vector Multiplication 2 min
- ✓ **Video:** Matrix Matrix Multiplication 11 min
- ✓ **Reading:** Matrix Matrix Multiplication 2 min



This course is part of the **Mathematics for Machine Learning Specialization**

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Mathematics for Machine Learning: Multivariate Calculus

★★★★★ 4.7 1,648 ratings • 243 reviews

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Mathematics for Machine Learning
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Beginner Level



**Approx. 21 hours to
complete**

Suggested: 6 weeks of study, 2-5
hours/week



English
Subtitles: English, Greek, Spanish

Calculus Cheat Sheet

Derivatives

Definition and Notation

If $y = f(x)$ then the derivative is defined to be $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$.

If $y = f(x)$ then all of the following are
equivalent notations for the derivative.

$$f'(x) = y' = \frac{df}{dx} = \frac{dy}{dx} = \frac{d}{dx}(f(x)) = Df(x)$$

If $y = f(x)$ all of the following are equivalent
notations for derivative evaluated at $x = a$.

$$f'(a) = y'|_{x=a} = \left. \frac{df}{dx} \right|_{x=a} = \left. \frac{dy}{dx} \right|_{x=a} = Df(a)$$

Interpretation of the Derivative

If $y = f(x)$ then,

1. $m = f'(a)$ is the slope of the tangent
line to $y = f(x)$ at $x = a$ and the
equation of the tangent line at $x = a$ is
given by $y = f(a) + f'(a)(x - a)$.

2. $f'(a)$ is the instantaneous rate of
change of $f(x)$ at $x = a$.
3. If $f(x)$ is the position of an object at
time x then $f'(a)$ is the velocity of
the object at $x = a$.



Stanford
University

Overview

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Parameter Learning

- ✓ **Video:** Gradient Descent 11 min
- ✓ **Reading:** Gradient Descent 3 min
- ✓ **Video:** Gradient Descent Intuition 11 min
- ✓ **Reading:** Gradient Descent Intuition 3 min
- ✓ **Video:** Gradient Descent For Linear Regression 10 min
- ✓ **Reading:** Gradient Descent For Linear Regression 6 min





Probability - The Science of Uncertainty and Data

Build foundational knowledge of data science with this introduction to probabilistic models, including random processes and the basic elements of statistical inference — *Course 1 of 4 in the MITx MicroMasters program in Statistics and Data Science.*



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- ☐ I would like to receive email from MITx and learn about other offerings related to Probability - The Science of Uncertainty and Data.

This course is part of a
MicroMasters® Program

🕒 Length:	16 Weeks
🕒 Effort:	10–14 hours per week
💰 Price:	FREE Add a Verified Certificate for 300 USD
🏛️ Institution	MITx
🎓 Subject:	Data Analysis & Statistics
⚙️ Level:	Advanced
🗣️ Language:	English
📄 Video Transcript:	English

Introduction to Probability

SECOND EDITION

Dimitri P. Bertsekas and John N. Tsitsiklis

Massachusetts Institute of Technology

Selected Summary Material – All Rights Reserved



[Browse](#) > [Computer Science](#) > [Algorithms](#)

Algorithms, Part I

★★★★★ 4.9 5,157 ratings • 1,078 reviews

Enroll for Free

Starts Jul 20

397,648 already enrolled!

[Browse](#) > [Computer Science](#) > [Algorithms](#)

Algorithms, Part II

★★★★★ 5.0 793 ratings • 127 reviews

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95,668 already enrolled!

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Flexible deadlines

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Intermediate Level



Approx. 32 hours to complete

Suggested: 6 weeks of study, 6–10 hours per week.



English

Subtitles: English, Korean



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Intermediate Level



Approx. 34 hours to complete

Suggested: 6 weeks of study, 6–10 hours per week.



English

Subtitles: English, Korean

Browse > Data Science > Data Analysis

This course is part of the **Applied Data Science with Python Specialization**

Introduction to Data Science in Python

★★★★★ 4.5 11,184 ratings • 2,614 reviews

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Course 1 of 1 in the
Applied Data Science with Python
Specialization



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Intermediate Level



**Approx. 18 hours to
complete**
Suggested: 7 hours/week

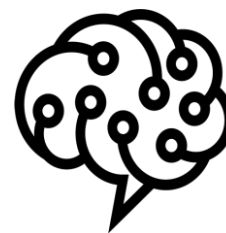


English
Subtitles: Chinese (Traditional),
Portuguese (Brazilian),
Vietnamese, Korean, English,
Hebrew

	Brand	Product
0	Pepsi	Diet Pepsi 12oz.
1	Coke	Coke lemon Flavor 16oz.
2	Nike	Nike cool running shoes
3	Pepsi	Pepsi 16oz

`np.mean` calculates in the column
direction when we set `axis = 1`

0	4	8	→ 4.
12	16	20	→ 16.



Browse > Data Science > Data Analysis

This course is part of the **Applied Data Science with Python Specialization**

Applied Plotting, Charting & Data Representation in Python

★★★★★ 4.5 2,921 ratings • 485 reviews

Go To Course

Already enrolled

71,909 already enrolled!

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Course 2 of 5 in the
Applied Data Science with Python
Specialization



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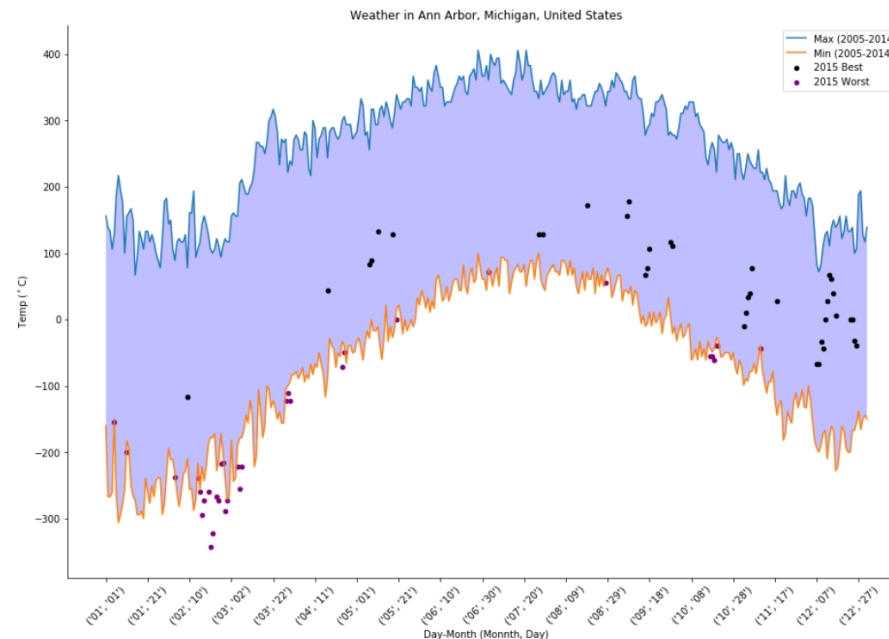
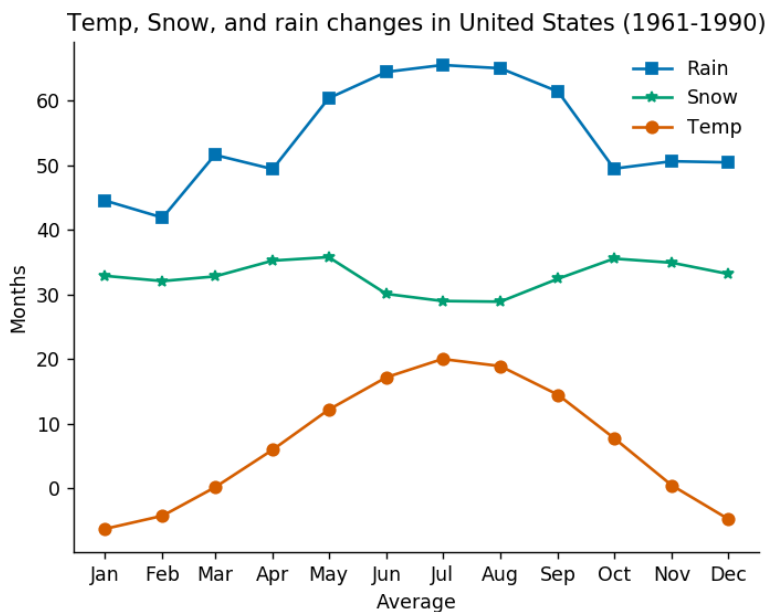
Intermediate Level



**Approx. 18 hours to
complete**
Suggested: 6 hours/week



English
Subtitles: English, Korean



Browse > Data Science > Machine Learning

Machine Learning

★★★★★ 4.9 107,127 ratings • 26,502 reviews

Go To Course

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2,415,276 already enrolled!

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Stanford



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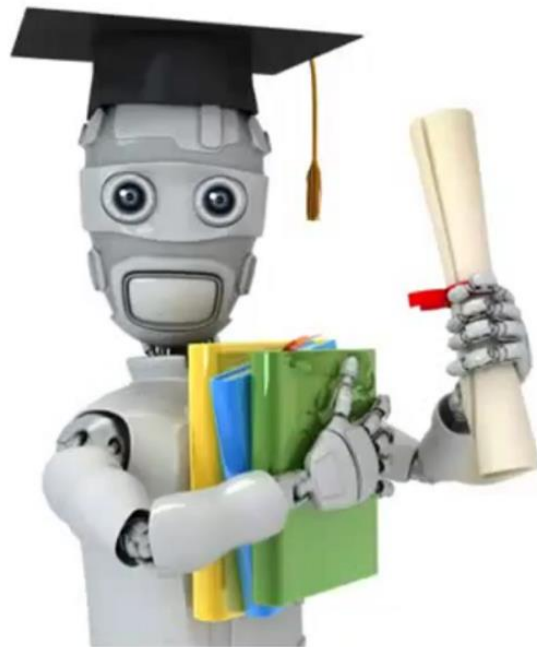


Approx. 55 hours to complete

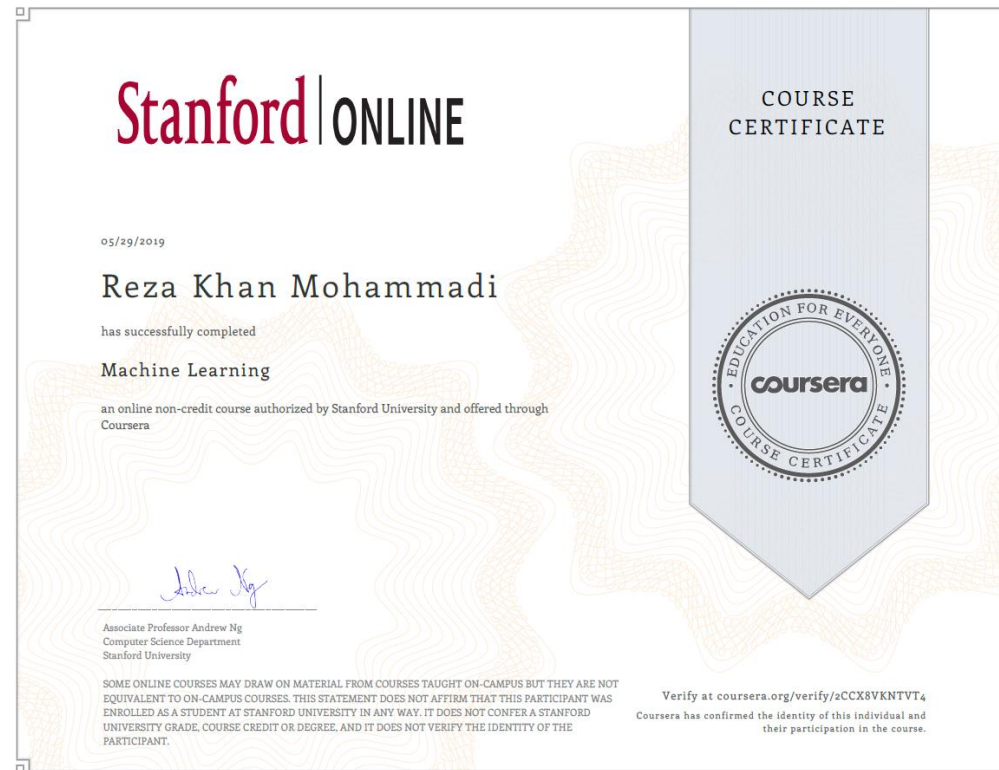


English

Subtitles: Chinese (Simplified), English, Hebrew, Spanish, Hindi, Japanese



Machine Learning



Browse > Data Science > Machine Learning

Deep Learning Specialization

Deep Learning Specialization. Master Deep Learning, and Break into AI

Enrolled

Already enrolled

225,231 already enrolled!

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Flexible Schedule

Set and maintain flexible deadlines.



Intermediate Level



Approx. 3 months to complete

Suggested 11 hours/week



English

Subtitles: English, Chinese (Traditional), Arabic, French, Ukrainian, Chinese (Simplified), Portuguese (Brazilian), Korean, Turkish, Japanese

To be filled, soon. 😊

