

Introduction to Machine Learning

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Welcome to machine learning course, in the era of machine learning!

What is Machine Learning (ML)?

- **Automated learning from data without being explicitly programmed**
- Extracting structure in data
- Could use labeled data instead of pre-specified rules
- Examples: Spam detection, Fraud detection
Image tagging (annotation)

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Why study machine learning?

- Data is available in huge quantities. Machines are powerful. Time to extract information!
- Beautiful and **young** field. You could be influential!!
Many machine learning methods work, but little is known about reasons. Many open problems.
- Cool and useful real world applications: Machine translation, speech recognition, question answering, image recognition, weather prediction, friend suggestion, product recommendation, Handwriting recognition, information retrieval, etc
- **Scientific impact:** Bioinformatics: cancer studies
- **Technological impact:** e.g. Self driving cars

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Why study machine learning?

- Great job market for both ML practitioners and researchers.
Eg: Look around in Bay Area!

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Salary Estimate

\$90,000+ (1087)

\$105,000+ (920)

\$120,000+ (663)

\$125,000+ (520)

\$140,000+ (242)

Job Type

[Full-time \(1106\)](#)

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Understanding of fundamental computer vision algorithms and approaches, with a focus on machine learning. Perform state-of-the-art research into deep learning...

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Principal Data Scientist

Walmart eCommerce - ★★★★★ 25 reviews - Sunnyvale, CA

Expertise in large scale machine learning with a broad understanding of supervised and unsupervised learning methods....

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Sr Python Data Engineer

Elevano - San Francisco, CA

\$130,000 - \$200,000 a year

NPL or Machine Learning exposure is a huge plus. Our Client is looking to hire a Senior Python Data Engineer....

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ML is used in other tasks and fields!

Introduction to machine learning could be easy if you know how to start! :-)

Undergrad is a great time to start a long deep journey to ML!

Build your background and seem smart! Empower yourselves!

- Mathematical skills

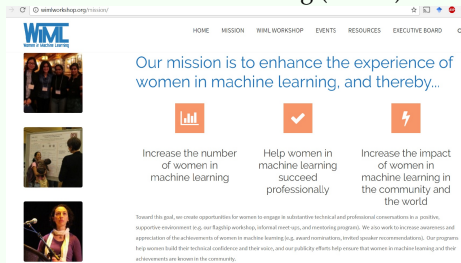
- Multivariate calculus, analysis, functional analysis
- Linear algebra
- Convex optimization, numerical optimization, mathematical programming
- Probability, statistics
- Scientific computing, numerical analysis
- Game theory
- etc

- Computer science and programming skills

- Correct and fast programming
- Efficient codes: analysis of algorithms
- Getting comfortable with tools, parallelization frameworks: MapReduce

More about machine learning

- Statistical vs computational approach
- Recent trend: deep learning!
- Several great online courses, lecture notes, video lectures, tutorials available. **Use them!**
- Several tools and specific languages available: TensorFlow, Julia, Weka, R, Matlab ...
- Women in Machine Learning (WiML)



- Related fields: Natural language processing, Computer vision, Social network analysis, Bioinformatics, ...
- Conferences: NIPS, ICML, COLT, AAI, IJCAI, ICLR, KDD, ...
(Many recent sessions video recorded and are available)

Learning tasks

- Supervised learning Learn a model from labeled data, use the learned model to predict for new unseen data



- Unsupervised learning: Capture structure and regularities in data
No labels
Find meaningful categories, find anomalies, ...

How to predict a person's wage at age 45 based on his/her characteristics at age 25?

- What features?
- Input? Type?
- Target (output)? Type?

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Think together

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