

# The Machine Learning Track

The Machine Learning Track is intended for students who wish to develop their knowledge of machine learning techniques and applications. Machine learning is a rapidly expanding field with many applications in diverse areas such as bioinformatics, fraud detection, intelligent systems, perception, finance, information retrieval, and other areas.

## SUMMARY OF REQUIREMENTS

Machine Learning track students must complete a total of 30 points and must maintain at least 2.7 overall GPA in order to be eligible for the MS degree in Computer Science.

1. Machine Learning track requires:- [Breadth courses](#)
  - Required Track courses (6pts)
  - Track Electives (6pts)
  - General Electives (6pts)
2. Students must take at least 6 points of technical courses at the 6000-level overall. One of the Track Electives courses has to be a 3pt 6000-level course from the Track Electives list.
3. If the number of points used to fulfill the above requirements is less than 30, then General Elective graduate courses at 4000-level or above must be taken so that the total number of credits taken is 30.
4. Students using previous courses to fulfill track requirements may complete the 30 graduate points by expanding their electives selected from (a) the list of required track courses; (b) the list of Track Elective courses; or (c) other graduate courses.

Please use the [Degree Progress Check](#) to keep track of your requirements.

## 1. BREADTH REQUIREMENT

Visit the [breadth requirement page](#) for more information.

## 2. REQUIRED TRACK COURSES

Students are required to complete 2 of the following courses. Students who have taken equivalent courses in the past and received grades of at least a B may apply for waivers and take other CS courses instead.

Course ID	Title
COMS W4252	Introduction to Computational Learning Theory
COMS W4771 or COMS W4721*	Machine Learning/Machine Learning for Data Science
COMS W4772	Advanced Machine Learning
COMS/STAT G6509/6701	Foundations of Graphical Models (This course is an advanced course, but MS students may register for it with instructor approval)

\* Due to significant overlap, students can receive credits for only one of these courses (either COMS W4771 Machine Learning or COMS W4721 Machine Learning for Data Science).

### 3. ELECTIVE TRACK COURSES

Students are required to take 2 courses from the following list, at least one of which must be a 6000-level course. Other courses on this list may be used as General Electives or to replace required track courses when the student has received a waiver.

Course ID	Title
COMS W4111	Introduction to Databases
COMS W4252	Introduction to Computational Learning Theory
CSOR W4246	Algorithms for Data Science
COMS W4705	Intro to Natural Language Processing
COMS W4731	Computer Vision
COMS W4733	Computational Aspects of Robotics
COMS W4737	Biometrics
COMS W4761	Computational Genomics
COMS W4771 or COMS W4721*	Machine Learning/Machine Learning for Data Science
COMS W4772	Advanced Machine Learning
COMS W4776	Machine Learning for Data Science
<a href="#">COMS W4995</a>	Visit the <a href="#">topics courses page</a> to see which COMS 4995 courses apply to this track.
COMS E6111	Advanced Database Systems
COMS E6232	Analysis of Algorithms II
COMS E6253	Advanced Topics in Computational Learning Theory
COMS E6717 (ELEN E6717)	Information Theory
COMS E6735	Visual Databases
COMS E6737	Biometrics

COMS E6901	Projects in Computer Science
COMS E6998	Visit the <a href="#">topics courses page</a> to see which COMS 6998 courses apply to this track.
CSEE E6892	Bayesian Models in Machine Learning
CSEE E6898	Large-Scale Machine Learning
CSEE E6898	Sparse Signal Modeling
APMA E4990	Modeling Social Data
BINF G4006	Translational Bioinformatics
EEBM E6040	Neural Networks and Deep Learning
EECS E6870	Speech Recognition
EECS E6893	Big Data Analytics
EECS E6895	Topic Adv Big Data Analytics
EECS E6894	Deep Learning for Computer Vision and Natural Language Processing
IEOR E6613	Optimization I
IEOR E8100	Optimization Methods in Machine Learning
IEOR E8100	Big Data & Machine Learning
MECS E6615	Advanced Robotic Manipulation
SIEO 4150/STAT 4001 or STAT W4201/4291/5291	Probability and Statistics/Advanced Data Analysis
STAT W4240*	Data Mining
STAT W4249	Applied Data Science
STAT G4400/4241/5241*	Statistical Machine Learning
STAT W4640/4224/5224	Bayesian Statistics
STAT W4700	Probability and Statistics
STAT G6101	Statistical Modeling and Data Analysis I

STAT G6104	Computational Statistics
STAT GR8101	Topics in Applied Statistics: Applied Causality

\*Due to a significant overlap in course material, students in the Machine Learning track can only take 1 of the following courses – ELEN 4903, IEOR 4525, STAT 4240, STAT 4400/4241/5241 – as a track elective or a general elective.

## 4. GENERAL ELECTIVES

Students are required to complete at least 6 additional graduate points at, or above, the 4000 level; at least 3 of these points must be CS, the other 3 points may be non-CS/non-technical course approved by the track advisor. Candidates who wish to take a non-CS/non-Technical course should complete a [non-tech approval form](#), get the advisor's approval, and submit it to CS Student Services. At most 3 points overall of the 30 graduate points required for the MS degree may be non-CS/non-technical.

## 5. TRACK PLANNING

Please visit [the Directory of Classes](#) to get the updated course listings. Please also note that not all courses are offered every semester, or even every year. A few courses are offered only once every two or three years or even less frequently. For more information, please see the SEAS Bulletin [CS course-offering schedule](#) (This schedule can change due to unforeseeable circumstances; thus, it should only be used as a reference).

Please note that some Data Science Institute courses such as COMS W4121 (Computer Systems for Data Science) do not count towards the CS MS degree. If you have any questions, please contact your advisor or the CS Student Services.

As of Spring 15, **STAT W4252 Introduction to Data Science** is no longer an approved track elective course.

### **\*\* Known Non-Tech Course\*\***

CSOR E4995 Financial Software Systems

## 6. TRACK ADVISORS

Please direct all questions concerning the Machine Learning track to Prof. [David Blei](#), Prof. [Daniel Hsu](#), and Prof. [Tony Jebara](#).

## 7. GRADUATION

Candidates preparing for graduation should submit a completed [application for degree](#) to the Registrar's Office and submit a [track graduation form](#) to CS Student Services.