Yale CS AI/ML Overview

Fall 2023, Spring 2024

General AI & ML

CPSC 170
AI for Future Presidents
Spring 2024

CPSC 370/570
Artifical Intelligence (AI)
Fall 2023

CPSC 474
Comp. Intell. for Games
Fall 2023, Spring 2024


Tesca Fitzgerald


Brian Scassellati


James Glenn

Machine Learning

CPSC 381/581
Machine Learning (ML)
Spring 2024

CPSC 486/586
Probabilistic ML
Spring 2024

CPSC 482
Topics in Applied ML
Spring 2024

CPSC 443
Optimal Transport
Fall 2023


Andre Wibisono


David Van Dijk


Smita Krishnaswamy


Alex Wong

Machine Perception

CPSC 475
Computational Vision
Fall 2023

CPSC 476/576
Adv. Computational Vision
Spring 2024

CPSC 480/580
Computer Vision
Fall 2023


Steve Zucker


Alex Wong

Natural Language Processing

CPSC 477/577
Natural Language Processing
Springl 2024

CPSC 488/588
AI Foundational Models
Fall 2023


Arman Cohen

Deep Learning

CPSC 487/587
Deep Learning Systems Eng.
Spring 2024

CPSC 452/552
Deep Learning Theory & App.
Spring 2024

CPSC 471/571
Trustworthy Deep Learning
Spring 2024


Smita Krishnaswamy


Arman Cohen


Rex Ying

Graphs

CPSC 482/583
Deep Learning on Graph Data
Fall 2023


Rex Ying

Applications towards Robotics

CPSC 489/589
Robot Learning
Spring 2024

CPSC 484/584
Introduction to HCI
Spring 2024

CPSC 459/559
Building Interactive Machines
Fall 2023

CPSC 472/572
Intelligent Robotics
Fall 2023

CPSC 587
3D Spatial Modeling
Spring 2024


Tesca Fitzgerald


Marynel Vazquez


Brian Scassellati


Danny Rakita

Notes:
CPSC 453/553 Unsupervised Learning for Big Data is typically offered in the Fall, but will resume in the following years.

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Courses aim to provide an introduction to Artificial Intelligence (AI)

Topics are relevant for developing intelligent agents and lay the foundation for more advanced topics i.e. machine learning, deep learning, robotics

Notes:
CPSC 170 is designed for non-majors.
CPSC 474 covers topics related to developing intelligent agents for games; whereas, CPSC 370 goes over a more general, but technical survey of AI.
CPSC 370 is equivalent to 470, but requires CPSC 223 as a prerequisite and will become the prerequisite for almost all of our more advanced AI courses.

Machine Learning

CPSC 381/581
Machine Learning (ML)
Spring 2024

CPSC 486/586
Probabilistic ML
Spring 2024

CPSC 482
Topics in Applied ML
Spring 2024

CPSC 443/543
Optimal Transport
Fall 2023


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Alex Wong

Courses aim to provide an provide theoretical foundations and practical applications of machine learning (ML)

Materials in these courses are often discussed and used in more specialized topics i.e. computer vision, natural language processing, graphs, deep learning, robotics

Notes:
CPSC 486 covers a probabilistic view of ML via Bayesian inference and algorithms for posterior approximations (e.g. variational inference and MCMC).
CPSC 443 covers the theory of optimal transport which is used across machine learning, including deep learning.

Deep Learning

CPSC 487/587
Deep Learning Systems Eng.
Spring 2024

CPSC 452/552
Deep Learning Theory & App.
Spring 2024

CPSC 471/571
Trustworthy Deep Learning
Spring 2024


Smita Krishnaswamy


Arman Cohen


Rex Ying

Courses aim to provide an provide theoretical foundations and practical applications of deep learning

Materials in these courses are catered towards understanding deep neural networks including modern day techniques on designing, training, applying, and analyzing them

Machine Perception

CPSC 475/575
Computational Vision
Fall 2023

CPSC 476/576
Adv. Computational Vision
Spring 2024

CPSC 480/580
Computer Vision
Fall 2023

Steve Zucker

Alex Wong

Graphs

CPSC 482/582
Deep Learning on Graph Data
Fall 2023

Rex Ying

Courses aim to provide an provide theoretical foundations and practical applications of machine learning and deep learning involving different aspects of intelligence. Course topics include methods to study different type of data modalities, to extract information from them, and to understand the physical world through them

- Machine Perception: visual data
- Natural Language Processing: text data
- Graphs: graph-structured data

Notes:
CPSC 475 and 476 computer vision from a biological vision perspective and have a significant neuroscience component; whereas, CPSC 480 takes a classical vision and machine learning approach.

Natural Language Processing

CPSC 477/577
Natural Language Processing
Springl 2024

CPSC 488/588
AI Foundational Models
Fall 2023

Arman Cohen

Applications towards Robotics

CPSC 489/589
Robot Learning
Spring 2024

CPSC 484/584
Introduction to HCI
Spring 2024

CPSC 459/559
Building Interactive Machines
Fall 2023

CPSC 484/584
Introduction to HCI
Spring 2024

CPSC 459/559
Building Interactive Machines
Fall 2023


Tesca Fitzgerald


Marynel Vazquez

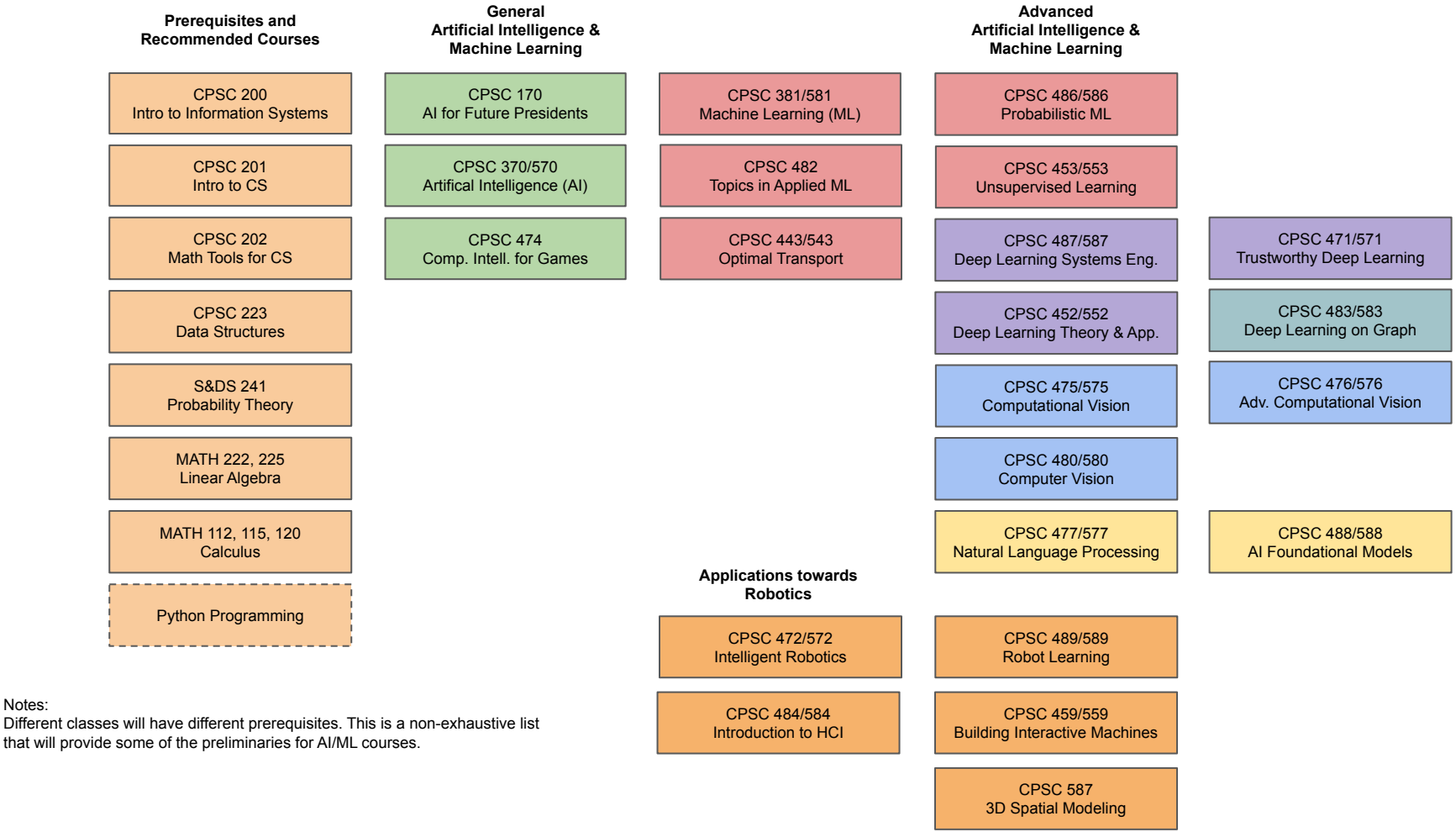

Brian Scassellati


Danny Rakita

Courses will focus on various aspects of robotics. Topics in artificial intelligence and machine learning, including machine vision, natural language processing, graphs, deep learning, etc., will be applied within this context to enable robots to interact with the physical world

Applications include:

- Scene understanding (vision)
- Grounding (language)
- Relationships (graphs)


Prerequisites and Recommended Courses
CPSC 200 Intro to Information Systems
CPSC 201 Intro to CS
CPSC 202 Math Tools for CS
CPSC 223 Data Structures
S&DS 241 Probability Theory
MATH 222, 225 Linear Algebra
MATH 112, 115, 120 Calculus
Python Programming
General Artificial Intelligence & Machine Learning
CPSC 170 AI for Future Presidents
CPSC 370/570 Artifical Intelligence (AI)
CPSC 474 Comp. Intell. for Games
CPSC 381/581 Machine Learning (ML)
CPSC 482 Topics in Applied ML
CPSC 443/543 Optimal Transport
Advanced Artificial Intelligence & Machine Learning
CPSC 486/586 Probabilistic ML
CPSC 453/553 Unsupervised Learning
CPSC 487/587 Deep Learning Systems Eng.
CPSC 452/552 Deep Learning Theory & App.
CPSC 475/575 Computational Vision
CPSC 480/580 Computer Vision
CPSC 477/577 Natural Language Processing
CPSC 471/571 Trustworthy Deep Learning
CPSC 483/583 Deep Learning on Graph
CPSC 476/576 Adv. Computational Vision
CPSC 488/588 AI Foundational Models
Applications towards Robotics
CPSC 472/572 Intelligent Robotics
CPSC 484/584 Introduction to HCI
CPSC 489/589 Robot Learning
CPSC 459/559 Building Interactive Machines
CPSC 587 3D Spatial Modeling
Notes:
Different classes will have different prerequisites. This is a non-exhaustive list that will provide some of the preliminaries for AI/ML courses.
AI/ML Material Progression