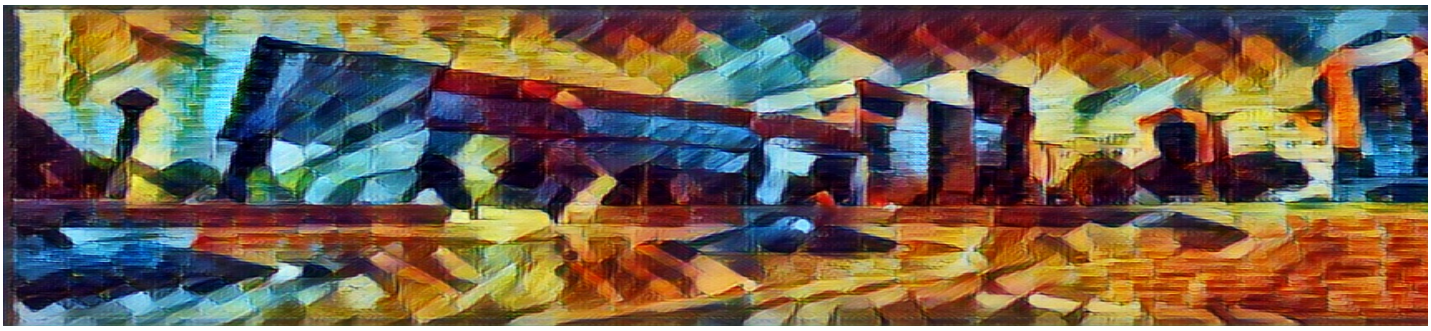
ECE ILLINOIS
Department of Electrical and Computer Engineering

CS446/ECE449: Machine Learning (Spring 2022)



Course Information

The goal of Machine Learning is to find structure in data. In this course we will cover three main areas, (1) discriminative models, (2) generative models, and (3) reinforcement learning models. In particular we will cover the following: linear regression, logistic regression, support vector machines, deep nets, structured methods, learning theory, kMeans, Gaussian mixtures, expectation maximization, VAEs, GANs, Markov decision processes, Q-learning and Reinforce.

Pre-requisites: Probability, linear algebra, and proficiency in Python.

Recommended Text: (1) Machine Learning: A Probabilistic Perspective by Kevin Murphy, (2) Deep Learning by Ian Goodfellow and Yoshua Bengio and Aaron Courville, (3) Pattern Recognition and Machine Learning by Christopher Bishop, (4) Graphical Models by Nir Friedman and Daphne Koller, (5) Reinforcement Learning by Richard Sutton and Andrew Barto, (6) Understanding Machine Learning by Shai Shalev-Shwartz and Shai Ben-David

Course Deliverables:
(1) Homework **due at noon, see below for dates (no late submission accepted)**
(2) Midterm
(3) Midterm 2

Grading:

3 credit: 60% homework (drop 1 homework), 20% midterm, 20% midterm 2
4 credit: 60% homework (drop 0 homework), 20% midterm, 20% midterm 2

Grading policy is subject to change.

TA/Office Hours:
Please see calendar on this [link]

Midterm 2: May 03 2022 during regular class time (attendance mandatory)

Instructor & TAs

Matus Telgarsky

Instructor
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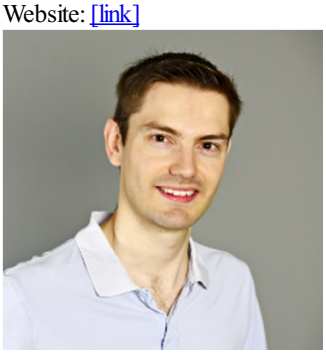

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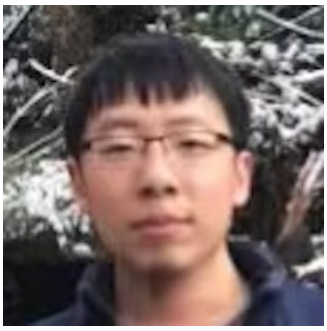

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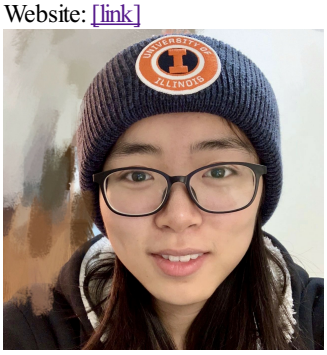

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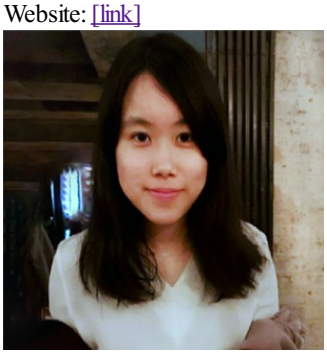

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Class Time & Location

Class Time: Tuesday, Thursday 12:30PM-1:45PM (hybrid/online; see campuswire for link)

Discussion & Homework submission

Campuswire: [link] (code in class email)
Gradescope: [link] (code: RWP5E2)

Material & Info

Material: [link]

Lectures

The syllabus is subject to change.

Event	Date	Description	Slides	Recording	Material	Format
Lecture 1	01/18/2022	Overview; start of linear regression	[Slides] [Slides Split] [Slides Annot]	[Rec]		online
Lecture 2	01/20/2022	Linear Regression	[Slides] [Slides Split] [Slides Annot]	[Rec]		online
Lecture 3	01/25/2022	Logistic Regression	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
Lecture 4	01/27/2022	Linear prediction: features, overfitting, and losses	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
Lecture 5	02/01/2022	Convex optimization	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
Lecture 6	02/03/2022	Support Vector Machines 1	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
Lecture 7	02/08/2022	Support Vector Machines 2	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
HW	02/08/2022	Homework 1 (due at noon)			[HW]	online
Lecture 8	02/10/2022	Deep Nets 1	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
Lecture 9	02/15/2022	Pytorch Tutorial	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
Lecture 10	02/17/2022	Deep Nets 2	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
Lecture 11	02/22/2022	Nearest Neighbors and decision trees	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
HW	02/22/2022	Homework 2 (due at noon)			[HW]	online
Lecture 12	02/24/2022	Ensemble methods	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
Lecture 13	03/01/2022	Learning theory	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
Lecture 14	03/03/2022	Review	[Slides] [Slides Split] [Slides Annot]	[Rec]		hybrid
HW	03/03/2022	Homework 3 (due at noon)			[HW]	online
Midterm	03/08/2022	Midterm				online
Lecture 15	03/10/2022	PCA	[Slides] [Slides Split] [Slides Annot]	[Rec]		online
Break	03/15/2022	Break				online
Break	03/17/2022	Break				online
Lecture 16	03/22/2022	k-Means	[Slides] [Slides Split] [Slides Annot]	[Rec]		online

Lecture 17	03/24/2022	Gaussian Mixture Models	[Slides] [Slides Split] [Slides Annot] [Rec]		online
Lecture 18	03/29/2022	Expectation Maximization	[Slides] [Slides Split] [Slides Annot] [Rec]		online
Lecture 19	03/31/2022	Variational Auto-Encoders	[Slides] [Slides Split] [Slides Annot] [Rec]		online
Lecture 20	04/05/2022	Generative Adversarial Nets	[Slides] [Slides Split] [Slides Annot] [Rec]		online
HW	04/05/2022	Homework 4 (due at noon)		[HW]	online
Lecture 21	04/07/2022	Autoregressive Methods	[Slides] [Slides Split] [Slides Annot] [Rec]		online
Lecture 22	04/12/2022	Transformers	[Slides] [Slides Split] [Slides Annot] [Rec]		online
HW	04/14/2022	Homework 5 (due at noon)		[HW]	online
Lecture 23	04/14/2022	Graph Neural Nets	[Slides] [Slides Split] [Slides Annot] [Rec]		online
Lecture 24	04/19/2022	MDP	[Slides] [Slides Split] [Slides Annot] [Rec]		online
Lecture 25	04/21/2022	Q-Learning	[Slides] [Slides Split] [Slides Annot] [Rec]		online
Lecture 26	04/26/2022	Actor-Critic & Policy Gradient	[Slides] [Slides Split] [Slides Annot] [Rec]		online
HW	04/26/2022	Homework 6 (due at noon)		[HW]	online
Lecture 27	04/28/2022	Review	[Slides] [Slides Split] [Slides Annot] [Rec]		online
Midterm 2	05/03/2022	Midterm 2			online