Applied Machine Learning

Syllabus and logistics

Siamak Ravanbakhsh

COMP 551 (winter 2020)
Sections

**Section one:** Tuesday & Thursday, 11:30 am - 12:55 pm  
Location: Strathcona Anatomy & Dentistry M-1  
Instructor: Reihaneh Rabbany <rrabba@cs.mcgill.ca>  
Office hours: Thursday, 1:30 pm - 2:30 pm @ MC 232  
Website: [http://www.reirab.com/comp55120.html](http://www.reirab.com/comp55120.html)

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**Section two:** Tuesday & Thursday, 4:30 pm - 5:30 pm  
Location: Maass Chemistry Building 10  
Instructor: Siamak Ravanbakhsh <siamak@cs.mcgill.ca>  
Office hours: Wednesdays 4:30 pm-5:30 pm, ENGMC 325  
# Teaching Assistants

<table>
<thead>
<tr>
<th>Name</th>
<th>Contact {@mail.mcgill.ca}</th>
<th>Office hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jin Dong</td>
<td>jin.dong</td>
<td>TBD</td>
</tr>
<tr>
<td>Yanlin Zhang</td>
<td>yanlin.zhang2</td>
<td>TBD</td>
</tr>
<tr>
<td>Haque Ishfaq</td>
<td>haque.ishfaq</td>
<td>TBD</td>
</tr>
<tr>
<td>Martin Klissarov</td>
<td>martin.klissarov</td>
<td>TBD</td>
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<tr>
<td>Kian Ahrabian</td>
<td>kian.ahrabian</td>
<td>TBD</td>
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<tr>
<td>Arnab Kumar Mondal</td>
<td>arnab.mondal</td>
<td>TBD</td>
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<tr>
<td>Samin Yeasar Arnob</td>
<td>samin.arnob</td>
<td>TBD</td>
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<tr>
<td>Tianzi Yang</td>
<td>tianzi.yang</td>
<td>TBD</td>
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<tr>
<td>Zhilong Chen</td>
<td>zhilong.chen</td>
<td>TBD</td>
</tr>
<tr>
<td>David Venuto</td>
<td>david.venuto</td>
<td>TBD</td>
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</tbody>
</table>
FAQ

- Will there be **recordings**? No, but you can refer to the slides and assigned readings.
- Will the **two sections** offer the same materials? That is the plan and assignments and mid-term will be jointly held, **but** the materials might or might not be covered in the same order, depth or pace.
About you!

399 registered mostly undergraduates year 3 most have CS or CE background
About me

Siamak Ravanbakhsh (pronounced almost like see-a-Mac)

- Assistant Professor in the School of Computer Science
- Canada CIFAR AI Chair and core member at Mila

research interest: representation learning

- what is the right representation for an AI agent?

background in two approaches to this problem

- using probabilistic graphical models

I also collaborate with physicists and cosmologists
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- what is the right representation for an AI agent?
- how do we learn quickly from data and perform inference

background in two approaches to this problem

- using probabilistic graphical models
- using invariances and symmetries

I also collaborate with physicists and cosmologists
# About them (TAs)

<table>
<thead>
<tr>
<th>Name</th>
<th>Specialization</th>
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</thead>
<tbody>
<tr>
<td>Jin Dong</td>
<td>graph representation and NLP at Mila</td>
</tr>
<tr>
<td>Yanlin Zhang</td>
<td>computational biology</td>
</tr>
<tr>
<td>Haque Ishfaq</td>
<td>RL theory and bandits</td>
</tr>
<tr>
<td>Martin Klissarov</td>
<td>RL</td>
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<tr>
<td>Kian Ahrabian</td>
<td>software engineering and machine learning</td>
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<td>Arnab Kumar Mondal</td>
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<td>Samin Yeasar Arnob</td>
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<tr>
<td>Tianzi Yang</td>
<td>DL on computer vision and network</td>
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<tr>
<td>Zhilong Chen</td>
<td>7</td>
</tr>
<tr>
<td>David Venuto</td>
<td>Deep RL at Mila</td>
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</tbody>
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About this course

Knowledge
Lectures
Weekly Quizzes
Midterm

Skills
Hands-on Tutorials [optional]
Mini-projects
About this course

complementary components

Understand the theory behind learning algorithms

Practice applying them in real-world
About this course
evaluation and grading

Weekly quizzes - 15% {online on Mondays}
Midterm examination - 35% {written}

Mini-projects - 50% {group assignments}
About this course

evaluation and grading

Weekly quizzes - **15%** {online on Mondays}
Midterm examination - **35%** {written}

**March 30th 18:05-20:55**

Let us know immediately if you cannot attend

Mini-projects - **50%** {group assignments}
Late submissions

- All due dates are **11:59 pm** in Montreal unless stated otherwise.
- **No make-up quizzes** will be given.
Prerequisites

- Python programming skills
- probability theory
- linear algebra
- calculus
# Tutorials

{tentative and subject to change, exact dates TBD}

<table>
<thead>
<tr>
<th></th>
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<th>Topic</th>
<th>URL</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>mid Jan.</td>
<td>Python</td>
<td><a href="https://www.python.org/">https://www.python.org/</a></td>
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<tr>
<td>2</td>
<td>end of Jan.</td>
<td>Scikit-learn</td>
<td><a href="https://scikit-learn.org/">https://scikit-learn.org/</a></td>
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<tr>
<td>3</td>
<td>end of Feb.</td>
<td>Pytorch</td>
<td><a href="https://pytorch.org/">https://pytorch.org/</a></td>
</tr>
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No plan on tutorials on math but please fill out this poll, to see if there is enough demand for organizing one.
Course outline

This is very likely going to change during the semester

Introduction
- Syllabus and Introduction
- K-Nearest Neighbours and Some Basic Concepts

Classic Supervised Learning
- Linear Regression
- Linear Classification
- Regularization, Bias-Variance
- Gradient Descent
- Support Vector Machines and Kernels
- Decision Trees
- Ensembles

Deep Learning
- Multilayer Perceptron
- Backpropagation
- Convolutional Neural Networks
- Recurrent Neural Networks

Unsupervised Learning
- Dimensionality Reduction
- Clustering

Bayesian Inference
- Bayesian Decision Theory
- Conjugate Priors
- Bayesian Linear Regression
Relevant Textbooks

No required textbook but slides will cover chapters from the following books, all available online, which can be used as reference materials.


[HTF] The Elements of Statistical Learning: Data Mining, Inference, and Prediction (2009) by Trevor Hastie, Robert Tibshirani and Jerome Friedman


[GBC] Deep Learning (2016) by Ian Goodfellow, Yoshua Bengio, and Aaron Courville
Two pointers

Course website

MyCourses

to check for announcements, form groups for projects, submit weekly quizzes, grades, discussions
https://mycourses2.mcgill.ca/d2l/home/432032