**The Statistics Track**

**(AMS website:** [**http://www.ams.sunysb.edu/**](http://www.ams.sunysb.edu/)**)**

1. **Our faculty** (in alphabetical order): **(\*Email is a good way to reach us\*)**

Core faculty

Professor Hongshik Ahn ([Hongshik.Ahn@stonybrook.edu](mailto:Hongshik.Ahn@stonybrook.edu)), math tower P-137

Professor Pei-fen Kuan ([Peifen.Kuan@stonybrook.edu](mailto:Peifen.Kuan@stonybrook.edu)), math tower 1-113

Professor Jian Li ([jian.li.3@stonybrook.edu](mailto:jian.li.3@stonybrook.edu)), math tower 1-106

Professor Yi Liu ([yi.liu.4@stonybrook.edu](mailto:yi.liu.4@stonybrook.edu)), math tower 1-103

Professor Song Wu ([Song.Wu@stonybrook.edu](mailto:Song.Wu@stonybrook.edu)), math tower 1-114

Professor Haipeng Xing ([Haipeng.Xing@stonybrook.edu](mailto:Haipeng.Xing@stonybrook.edu)), math tower 1-102

Professor Wei Zhu ([Wei.Zhu@stonybrook.edu](mailto:Wei.Zhu@stonybrook.edu)), math tower P-138

Affiliated faculty from the Department of Preventive Medicine

Professor Jie Yang ([Jie.Yang@stonybrook.edu](mailto:Jie.Yang@stonybrook.edu))

***Other affiliated faculty:*** <http://www.stonybrook.edu/commcms/ams/people/affiliatedfaculty.php>

1. **Masters course requirement (10 courses <30-credit>, no thesis):**

Required Courses for M.S. Degree in Statistics Track  
[AMS **507** Introduction to Probability](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams507.php) (Fall) [AMS **510** Analytical Methods for Applied Mathematics and Statistics](http://www.ams.sunysb.edu/graduate/grad/AMS510Webpage.html) (Fall)  
[AMS **570** Mathematical Statistics I](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams570) (Spring)  
[AMS **572** Data Analysis](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams572) (Fall)  
[AMS **573** Design and Analysis of Categorical Data](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams573) (Spring)  
[AMS **578** Regression](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams578) (Spring)  
\* AMS **580** [Statistical](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams580) Learning (Spring) or AMS **586** [Time](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams586) Series Analysis (Fall)  
[AMS **597**](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams597.php) Statistical Computing (Spring)

Plus, two electives chosen from other graduate courses in the department or (with approval) graduate statistics courses in other departments.Some popular choices:

[AMS **595** Fundamentals of Computing](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams595) (Fall)

[AMS **511** Foundation of Quantitative Finance](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams511)(Fall)

[AMS **516** Statistical Methods in Finance](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams516)(Fall)

[AMS **520** Machine Learning in Quantitative Finance](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams520) (Fall)

[AMS **530** Principles in Parallel Computing](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams530)(Fall)

[AMS **562** Introduction to Scientific Programming in C++](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams562) (Fall)

[AMS **598**](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams598.php) Big Data Analysis (Fall)

[AMS **560** Big Data Systems](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams560) (Fall)

[AMS **580** Statistical Learning](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams580) (Spring, if not chosen as a core course)

[AMS **586** Time Series Analysis](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams586) (Fall, if not chosen as a core course)  
[AMS **550** Stochastic Models](http://www.stonybrook.edu/commcms/ams/graduate/_courses/ams550)(Spring)

\* Please also note three new machine learning courses (AMS 691.02, 03, 04) available for Fall at the end of this document, and also at the following website: <https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams691.php>

\*You will notice we have more electives in Fall than Spring because most of you will graduate in 3 semesters (Fall, Spring, Fall). Once you have taken all core courses and fulfilled the 30-credit required for the MS degree, you must graduate. Typically, each student should take 3~4 courses (9~12 -credits) per semester.

1. **Recommended course schedule**

**For our master’s students in statistics, we recommend the following schedule (\*our doctoral students can follow the same schedule for the first 3 semesters) (**[**https://www.stonybrook.edu/commcms/ams/graduate/sched.php**](https://www.stonybrook.edu/commcms/ams/graduate/sched.php)**):**

1. Year 1, Fall semester: **AMS 507, AMS 510, AMS 572, AMS 595** (\*Those who have already learned Python which is taught in AMS 595, can register for AMS 562 instead to learn C++.) (\*Some of our doctoral students who serve as TA must register for an English course [OAE] – you can take AMS 595 the next Fall semester, or alternatively, take AMS 561, nearly identical to 595, in Spring.)

**AMS 507 Introduction to Probability** [AMS 507 Webpage](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams507.php)  
91599 REC R01 RECW 7:00-7:55PM Loc: Lt. Engineering 102 Mode: IN PERSON Inst: Benjamin Hechtman  
91600 LEC 01 TUTH 2:30-3:50PM Loc: Humanities 1003 Mode: IN PERSON Inst: Eugene Feinberg

**AMS 510 Analytical Methods for AMS** [AMS 510 Webpage](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams510.php)  
Prerequisites:  A course in linear algebra and in multivariate calculus  
91602 REC R01 RECF 10:00-10:55AM Loc: Lt. Engineering 102 Mode: IN PERSON Inst: Xiaolin Li  
91601 LEC 01 TUTH 4:00-5:20PM Loc: Lt. Engineering 102 Mode: IN PERSON Inst: Xiaolin Li

**AMS 572 Data Analysis I**[AMS 572 Webpage](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams572.php)  
91490 LEC 02 TUTH 11:30AM-12:50PM Loc: Javits Lectr. 109 Mode: IN PERSON Inst: Pei-Fen Kuan

**AMS 595 Fundamentals of Computing** [AMS 595 Webpage](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams595.php)  
Anti-requisite: [AMS 561](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams561.php)  
91593 LEC 01 TUTH 7:00-8:20PM Loc: ESS 069 Mode: IN PERSON Inst: Wenhan Gao / Abdul Rahimyar

\*\* Those who consider themselves already have a solid background in statistics (for example, one can consider taking **AMS 586 Time Series Analsysi** (Prof Zhu) or AMS 691.02, 03 04. Please be sure to consult with the instructors for the courses you wish to take first, sending them your CV/transcripts, so that they can decide whether you are ready.

**AMS 586 Time Series** [AMS 586 Webpage](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams586.php)  
Prerequisites:  [AMS 570](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams570.php) or [AMS 572](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams572.php)  
92086 LEC 01 TUTH 8:30-9:50AM Loc: Harriman 115 Mode: IN PERSON Inst: Wei Zhu  
92144 LEC 30 TUTH 8:30-9:50 AM Loc SYNCHRONOUS Mode: ONLINE Inst: Wei Zhu

\*\* Those of our master’s and doctoral students who are interested in our sister-track of Quantitative Finance (QF), can also consider taking **AMS 511** Foundation of Quantitative Finance.

**AMS 511 Foundations of Quantitative Finance** [AMS 511 Webpage](https://www.stonybrook.edu/commcms/ams/graduate/_courses/ams511.php)  
90781 LEC 01 W 2:30-5:20PM Loc: SYNCHRONOUS Mode: ONLINE Inst: Robert Frey

|  |  |  |  |
| --- | --- | --- | --- |
| **TOEFL iBT**  **Speak** | **IELTS**  **Speak** | **Course Requirement** | **Result** |
| 23-30 | 7 or Higher | none | Eligible to TA |
| 21-22 | 6.5 | OAE 594 | Eligible to TA |
| 18-20 | 6 | OAE 592 | Eligible to run recitation & lab sessions/grade |
| 15-17 | 5-5.5 | OAE 590 | Not eligible to TA |

**\* All graduate students are expected to maintain a B or better grade average. Otherwise one cannot graduate. \***

1. Year 1, Spring semester: **AMS 570, AMS 573, AMS 578, AMS 597** (\*Note: If you are an international master’s student who wishes to study for 4 semesters instead of 3 semesters – you will need to hold a core course till the last Spring semester – so instead of that core course, you must choose a different 3-credit course, for example, AMS 562, to reach a 4-course full-time schedule).
2. Year 2, Fall semester: **AMS 586**, AMS 560, AMS 598, AMS 595 (\*for those who did not take it in the first fall), or other related courses such as a machine learning/AI course (AMS 691.02, 03, 04) **(\*\*\*Note you can graduate with your MS degree at the end of this semester for you have already taken at least 10 courses including all the core courses)**
3. \*\* Year 2, Spring semester: **the AMS core course** (for example **AMS 597** that you have not taken yet), **AMS 580**, AMS 550 (or other elective courses of interest).

**\* The general advice is to take 3~4 courses/semester.**

1. **Advanced Graduate Certificate in Data Science:**

Data science has been gaining increasing job market in the recent years – especially with the advent of advanced computers and the internet. “Data Scientist” has been voted the top 3 most satisfying job, seven years (2016 ~ 2022) in a row, by glassdoor.com. Computer programming and data analysis are the two main pillars of data science. Aside from our rigorous data analysis training, we have also strengthened your programming training with many programming and algorithm classes. The following courses are the subset that we hope you can all master:

AMS 595 Fundamentals of Computing (matlab, Python, C++) – everyone should take this if one is not a master of the materials yet

AMS 580 Statistical Learning – introduction to common statistical learning and machine learning procedures, and how to run them in R (mainly R, some Python)

AMS 597 Statistical Computing (R, and a bit Perl) – this is also a core course in statistics

AMS 598 Big Data Analysis -- application of the supercomputing for statistical data analyses, particularly on big data (R & Python)

AMS 530 Principles in Parallel Computing – this course is also closely related to big data analysis, AMS 598. (C/C++/Python; JAVA also allowed; teach C++ for 2-3 weeks)

AMS 520, Machine Learning in Quantitative Finance

AMS 560 Big Data System -- Recent progress on big data systems, algorithms and networks including the web graph, search engines, online algorithms, etc. (JAVA)

**Advanced Graduate Certificate in Data & Computational Science:**

Through ICAS (<https://iacs.stonybrook.edu/opportunities/certificates/cdcs>), we have a 17-credit Graduate Certificate in Data and Computational Science available to both AMS MS and PhD students. Here are some key points for AMS graduate students:

(1). For the core course AMS 561 -- we can replace it with AMS 595

(2). For the two Journalism (JRN) courses (1 credit each), they can be taken within one semester, please see the following site for details:

<https://www.aldacenter.org/training/courses-at-sbu>

(3). We can use 6 credits you have already earned before being registered to this certificate.

(4). It is important to **register** for the certificate program **early** (\*definitely before the second Fall semester) because up to 12 credits can be counted towards both your AMS degree program and this certificate.

(5). The key is that you need to take one 3-credit CS course (\*that is not cross-listed with AMS), plus another 3-credit course that is from ANY non-AMS department (CS, ECE, College of Business etc., not cross-listed with AMS)

For CS courses <https://www.cs.stonybrook.edu/students/Graduate-Studies/courses>, we think the following might be viable:

CSE505 Computing with Logic

CSE512 Machine Learning

CSE519 Data Science Fundamentals

CSE525 Introduction to Robotics

CSE532 Theory of Database Systems

CSE544 Prob/Stat for Data Scientists

CSE545 Big Data Analytics

CSE549 Computational Biology

CSE564 Visualization

**For our international master students in statistics who wish to get the advanced graduate certificate in Data Science, we recommend the following schedule (\*our domestic master students and doctoral students can follow the same schedule except you can take AMS 597 <core course> first, and AMS 562 <elective> last):**

1. Year 1, Fall semester: **AMS 507, AMS 510, AMS 572, AMS 595**
2. Year 1, Spring semester: **AMS 570, AMS 573, AMS 578,** AMS 580 (or AMS 530)
3. Year 2, Fall semester: **AMS 586**, **CS graduate course**, AMS 598, another machine leaning/AI course such as AMS 691.02, 03, 04
4. Year 2, Spring semester: **JRN 501 (1 credit), JRN 503 (1 credit)**, **AMS 597**, **CS graduate course (or another non-AMS graduate course)**, AMS 550

For our master’s students who are determined to graduate in 3 semesters, you can follow the schedule (35 credits in total) below:

1. Year 1, Fall semester: **AMS 507, AMS 510, AMS 572, AMS 595** (12 credits)
2. Year 1, Spring semester: **AMS 570, AMS 573, AMS 578, AMS 597** (12 credits)
3. Year 2, Fall semester: **AMS 586**, **JRN 501 (1 credit), JRN 503 (1 credit), CS graduate course**, **CS graduate course (or another non-AMS graduate course)** (11 credits)
4. **Advanced Graduate Certificate in Quantitative Finance (QF):**

\*\* Given that the track of Statistics is highly correlated with the track of Quantitative Finance, interested students can choose to take selected courses in QF and obtain the 15-credit Advanced Graduate Certificate in Quantitative Finance introduced below.

Any strong student (3.5+ GPA in first-semester core courses) in another track (such as statistics) may enroll in AMS 511, Foundations in Quantitative Finance. With the permission of the Quantitative Finance Program Director (Prof. Stan Uryasev <stanislav.uryasev@stonybrook.edu>), one may take additional quantitative finance courses to earn an Advanced Graduate Certificate in Quantitative Finance. You must formally apply for the secondary certificate program prior to taking the required courses. Only a maximum of six credits taken prior to enrolling in the certificate program may be used towards the requirements. The QF certificate requires **AMS 511, 512, 513**, one additional QF elective, and one additional AMS course.

**AMS 511 Foundations of Quantitative Finance**

**AMS 512 Portfolio Theory**

**AMS 513 Financial Derivatives and Stochastic Calculus**

**Permission to enroll in the certificate program will require the permission of Prof. Stan Uryasev and Prof. David Green.**

**The form** to apply for the secondary certificate program:

<http://grad.stonybrook.edu/_data/documents/forms/newforms/Permission%20to%20Enroll%20in%20a%20Secondary%20Certificate%20Program.pdf>

**For our international master’s students in statistics who wish to get the advanced graduate certificate in QF, we recommend the following schedule (\*our domestic master’s students and doctoral students can follow the same schedule except you can take AMS 597 <core course> first, and AMS 586 <elective> last):**

1. Year 1, Fall semester: **AMS 507, AMS 510, AMS 572,** AMS 595
2. Year 1, Spring semester: **AMS 570, AMS 573, AMS 578,** AMS 580 (or AMS 550, AMS 562, etc.)
3. Year 2, Fall semester: **AMS 586**, **AMS 511**, another machine leaning/AI course such as AMS 691.02, 03, 04, AMS 598 (\*One must take AMS 586 & 511 – however, to maintain full time status requiring 9 credits, you only need one more elective, so choose one from AMS 598 and other graduate courses)
4. Year 2, Spring semester: **AMS 512, AMS 513**, **AMS 597**, (AMS 580 etc. – optional)
5. **Advanced Graduate Certificate in Operations Research (OR):**

The department also has an 18-credit advanced graduate certificate in Operations Research (<http://www.stonybrook.edu/commcms/spd/graduate/operations.html>).

This certificate has 5 REQUIRED COURSES (15 credits):

AMS 507 Introduction to Probability

**AMS 540 Linear Programming**

**AMS 550 Stochastic Models**

**AMS 553 Simulation and Modeling**

AMS 572 Data Analysis I

Plus one ELECTIVE (3 credits) which can be any graduate course in AMS, management and policy, or computer science, which has been approved by the student's advisor. For students in statistics, one only needs to be sure to take AMS 540, 550, and 553. **Permission to enroll in the certificate program will go through the School of Professional Development as shown in the above link.**

**For our international master’s students in statistics who wish to get the advanced graduate certificate in OR, we recommend the following schedule (\*our domestic master’s students and doctoral students can follow the same schedule except you may wish to take AMS 597 <core course> first, and AMS 586 <elective> last):**

1. Year 1, Fall semester: **AMS 507, AMS 510, AMS 572,** AMS 595
2. Year 1, Spring semester: **AMS 570, AMS 573, AMS 578,** AMS 580
3. Year 2, Fall semester: **AMS 586**, **AMS 540**, another machine leaning/AI course such as AMS 691.02, 03, 04, AMS 598 (\*One must take 586 & 540 – however, to maintain full time status requiring 9 credits, you only need one more elective, so choose one from 598 and other graduate courses)
4. Year 2, Spring semester: **AMS 550, AMS 553**, **AMS 597**, (AMS 580, AMS 562 etc. – optional)
5. **Doctoral qualifying exam requirements:**

Our doctoral students are expected to take and pass the following doctoral qualifying exams in 1-2 years. Each exam is offered twice per year in January and June. **(\*During this special time, online exams are offered if deemed necessary\*)**

1. **Foundation Exam**: 4-hour close-book exam covering AMS **507** and AMS **510**.
2. **STAT Area Exam**: ***This is a 4-hour in-class exam with two parts:***
   1. *Math STAT Exam*: 2-hour close-book exam covering AMS **570**.
   2. *Applied STAT Exam*: 2-hour open-book exam covering AMS **572,** AMS **573,** AMS **578,** and one can choose one question from AMS **580** or AMS **586.** One problem from each course will be given. One must choose to do exactly 3 out of these 4 problems given. Four books, 4 notes, & a calculator are allowed but no computers.

\*\*\* Students are expected to take and pass the Foundation Exam first before taking the STAT Area Exam. However, they are allowed to take both exams together. Also, our master’s students in good standing (grades of B+ or better in all related courses) can take these doctoral qualifying exams.

We urge those of you who wish to take the qualifying exams to study for the exams early. Please check out the outlines of these exams in the following website – and please note that at the end of the page, you have a link to past qualifying exam questions. Prepare early for success.

<http://www.stonybrook.edu/commcms/ams/graduate/resources/quals-website.php>

<http://www.stonybrook.edu/commcms/ams/graduate/resources/past-qualifying-exams.php>

1. **Be safe on campus and off campus:**

We are a beautiful campus located in a very safe town. However one must always be cautious and does not put oneself in any potentially dangerous position. For example, do not get into any stranger’s car; and always wait for the pedestrian walking sign before you cross the street – and look around before stepping into the cross section. When taking the train or subway, stay away from the edge of the platform. It is also very important that you do not drive without a proper driver’s license. For emergencies, contact University Police at 333 from campus phones or (631) 632-3333 from non-campus phones. The general emergency phone number is **911** for the entire USA. Our safety advice goes on and on, following the same lines as those from your parents.

**In this special time of Pandemics, please follow all University regulations of social distance, wearing facemasks, wash-hands, etc. in the following website:**

[**https://www.stonybrook.edu/comingback/**](https://www.stonybrook.edu/comingback/)

**Be safe & diligent, we wish you all the successes!**

**Three new courses for Fall 2023:**

1. **Title:** Recent Progress in AI/ML: Applications, Architectures, and Systems (Fall 2023) (on SOLAR, sign up for **AMS 691.02**, a topics course number, used for new courses)

Credits: 0-3 Units

**Instructor:** Zhenhua Liu, zhenhua.liu@stonybrook.edu, http://www.ams.stonybrook.edu/~zhliu/

**Timing:** Tuesdays+Thursdays, 8:30-9:50 AM, in Frey 301 and online over Zoom

**Course Description:** This course will cover recent progress in AI/ML in applications, architectures, and systems. The course will be self-contained as much as possible. If you are unsure about your background, please send the instructor an email inquiry with your background.

**Topics (subject to change):**

· Overview of recent AI/ML applications

· ChatGPT overview

· Techniques behind ChatGPT: transformer

· Systems behind ChatGPT: GPU clusters, accelerators

· Algorithms behind ChatGPT: reinforcement learning

· Other applications based on ChatGPT

· Survey of competitive models vs transformer

· Survey of key systems development

· Survey of algorithmic innovations

· Sustainable AI and AI for sustainability

· Other topics: responsible AI, secure AI, edge AI (depends on time)

1. **Title: Deep Learning (Fall 2023)**

(on SOLAR, sign up for **AMS 691.03**, a topics course number, used for new courses)

**Instructor:** Yi Liu, yi.liu.4@stonybrook.edu

**Timing:** Tuesdays+Thursdays, 10:00-11:20 AM, in CS 2311 ("Old CS")

**Prerequisites:** Basic machine learning (e.g., supervised learning, linear regression, logistic regression, support vector machines), linear algebra (e.g., matrix computations, eigenvalues and eigenvectors, singular value decomposition), multivariate calculus, access to GPU, proficiency in Python programming

Description: An introduction to the field of deep learning, including basic machine learning, logistic regression, loss functions, neural networks, optimization, error back-propagation, regularization and generalization, unsupervised learning and auto-encoders, convolutional neural networks, recurrent neural networks, graph neural networks, attention models, advanced topics of deep learning, applications to natural language processing and computer vision.

**Topics by week:**

1. Introduction to machine/deep learning

2. Linear and logistic regression

3. Softmax regression

4. Fully connected neural networks

5. Convolutional neural networks

6. Convolutional neural networks

7. Training and optimization

8. Backpropagation

9. Regularization and loss functions

10. Neural network and kernel methods

11. PCA and autoencoders

12. Recurrent neural networks

13. Attention mechanism

14. Graph neural networks

15. Advanced topics and review

**Textbooks:**

Main text:

Charu C. Aggarwal: Neural Networks and Deep Learning, Springer, September 2018 <https://www.amazon.com/dp/3319944622>

<http://www.charuaggarwal.net/neural.htm>

<https://rd.springer.com/book/10.1007/978-3-319-94463-0>

**Additional materials:**

YS Abu-Mostafa, M Magdon-Ismail, HT Lin: Learning from Data, only Chapters 3 and 7 http://amlbook.com/

<https://www.amazon.com/Learning-Data-Yaser-S-Abu-Mostafa/dp/1600490069>

Aston Zhang, Zack C. Lipton, Mu Li, Alex J. Smola

Dive into Deep Learning

<https://www.d2l.ai/>

1. Title: Fundamentals of Reinforcement Learning (Fall 2023)

(on SOLAR, sign up for **AMS 691.04**, a topics course number, used for new courses)

**Instructor:** Jian Li, jian.li.3@stonybrook.edu

**Timing:** Mondays+Wednesdays, 7:00-8:20PM, in Frey 309

**Prerequisites:** Calculus and Linear Algebra; Basic Probability and Statistics; Python

**Description:** Deep understanding of reinforcement learning (RL) is essential for machine learning researchers, data scientists and practicing engineers working in areas such as artificial intelligence, machine learning, data/network science, natural language processing, computer vision, among others. RL has found its applications in our everyday life such as AlphaGo, AlphaFold, autonomous driving, healthcare, etc. This course will provide an introduction to the field of RL, and emphasize on hands-on experiences. Students are expected to become well versed in key ideas and techniques for RL through a combination of lectures, written and coding assignments. Students will advance their understanding and the field of RL through a course project. The topics that will be covered (time permitting) include but not limited to

Markov Decision Processes (MDPs);

Value Functions;

Policy Iteration and Value Iteration;

Monte Carlo Methods;

Temporal Difference (TD) Learning;

SARSA and Q-Learning;

TD();

(Linear) Function Approximation;

Policy Gradient Algorithms;

Other topics (e.g., Multi-Agent RL, RL Theory; Deep RL).

**Textbooks:**  
There is no official textbook for the class but some supporting readings will be based on:Reinforcement Learning: An Introduction,Sutton and Barto (Available at [Sutton’s university website](https://www.amii.ca/about/our-people/richard-s-sutton/)). There is no requirement for owning the book; however, it is a fantastic introduction to the topic. Some other additional references that may be useful are listed below:

\*Artificial Intelligence: A Modern Approach, Stuart J. Russel and Peter Norvig. [[Link](http://aima.cs.berkeley.edu/)]  
\*Deep Learning. Ian Goodfellow, Yoshua Bengio, and Aaron Courville. [[Link](http://www.deeplearningbook.org/)]  
\*Reinforcement Learning: State-of-the-Art, Marco Wiering and Martijin van Otterlo, Eds. [[Link](https://link.springer.com/book/10.1007%2F978-3-642-27645-3)]  
\*Dynamic Programming and Optimal Control, Vol. I, 3rd Edition, D. P. Bertsekas, 2005.   
\*Dynamic Programming and Optimal Control, Vol. II: Approximate Dynamic Programming, 4th Edition, D. P. Bertsekas, 2012.   
\*Applied Probability Models with Optimization Applications, S. M. Ross, 1992. \*Optimization and Control, R. Weber, 2016. (Course notes available on Prof. Weber’s website at Cambridge University.)