About your instructor!

5th year CS and Data Science faculty and a Center for Computational Molecular Biology (CCMB) member!

Research Interests
Machine Learning, Data Mining, Computational Biology, Health Sciences

Office Location
Room 313, Data Science Institute (DSI)  
3rd Floor, 164 Angell Street

Office Hours (Starting this week!)  
Thursdays, 2:00-4:00 PM or by appointment

Where: Room 375, 3rd Floor, 164 Angell Street ← Not CIT!

Email: cs_deeplearning@brown.edu ← Please email here!
Website: www.ritambharasingh.com

I also teach:  
CSCI 2952-G: Deep Learning in Genomics
Introducing...

Your Awesome Course Staff!
Your Graduate TA 😊 Your HTAs!

Michal Golovanevsky
she/her

Raymond Dai
he/him

Erin Song
she/her

Joe Dodson
he/him

Karan Kashyap
he/him

Pranav Mahabeshwarkar
he/him

Earth Mokkamakkul
he/him
Your TAs!

Julian Dai
he/him

Calvin Eng
he/him

Taj Gillin
he/him

Spandan Goel
he/him

Naicheng (Arnie) He
he/him

Amanda Hernandez Sandate
she/her

Woody Hulse
he/him

Kelvin Jiang
he/him

Bumjin Joo
he/him

Sophia Qiiming
she/her

Aayush Setty
he/him

Jason Silva
he/him
Your TAs!

Torsten Ullrich
he/him

Mikayla Walsh
he/him

Emily Wang
she/her

Xlin (Rice) Wang
he/him

Ray Xu
he/him

Enyan Zhang
he/him

Alex Zheng
he/him

Alex Zhou
he/him
Your STAs!
Why take this course?
You may have heard of “Deep Learning” or “Artificial Intelligence (AI)” 😊
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https://chat.openai.com/
You may have heard of “Deep Learning” or “Artificial Intelligence (AI)” 😂

3 reasons to take deep learning class?

1. Enhance career opportunities: Deep learning is a highly sought-after skill in the tech industry, with demand for professionals with deep learning expertise continuing to grow. Taking a deep learning class can help you gain the skills and knowledge needed to pursue a career in this field.

2. Solve complex problems: Deep learning allows you to build models that can automatically learn from large amounts of data, and achieve state-of-the-art performance on a wide range of tasks. The ability to train deep neural networks on vast amounts of data allows for the creation of models that can generalize well to new data, and achieve high accuracy on a wide range of tasks.

3. Be part of cutting-edge technology: Deep learning is a rapidly evolving field, with new breakthroughs and advancements being made regularly. Taking a deep learning class will give you the opportunity to learn about the latest research and techniques, and be part of shaping the future of this technology.

https://openai.com/blog/chatgpt/
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Training a single AI model can emit as much carbon as five cars in their lifetimes

Deep learning has a terrible carbon footprint.

by Karen Hao
June 6, 2019

In review of fatal Arizona crash, U.S. agency says Uber software had flaws

By David Shepardson

WASHINGTON (Reuters) - An Uber self-driving test vehicle that struck and killed an Arizona woman in 2018 had software flaws, the National Transportation Safety Board said Tuesday as it disclosed the company’s autonomous test vehicles were involved in 37 crashes over the prior 18 months.
You may have heard of “Deep Learning” or “Artificial Intelligence (AI)”.

Dall-E 3 Is So Good It’s Stoking an Artist Revolt Against AI Scraping

Artists are worried AI will take their jobs — so they’re getting creative.
Our goal is to answers some important questions

- What is deep learning?
- What are the the different types of deep learning models?
- How to implement a deep learning models?
- What models are appropriate for different applications?
- Will our approach improve our understanding of the data or the problem?
- What are the ethical considerations when using deep learning models?
Next time when you come across “Deep Learning” you will know:

What is Deep Learning?

(1) What is Machine Learning?

(2) How does it connect to Deep Learning?

(3) What is NOT Deep Learning?
What is Machine Learning?

Input: X

Function: f

Output: Y

"Cooking?"

f(X) → Y
What is Machine Learning?

Supervised Learning

Input: X

Learned function: f

Output: Y

"Cooking?"

f(X) → Y
What is Machine Learning?

Input: X

I do not want sour cream in my burrito

Learned function: f

Output: Y

No quiero crema agrea en mi burrito

f(X) → Y
What is Deep Learning?

Input: X

Output: Y

\[ f_4(f_3(f_2(f_1(X)))) \]
What is Deep Learning?

Input: X  
Output: Y

Deep Learning DOES NOT mimic the brain!

TURN ANY PHOTO INTO AN ARTWORK – FOR FREE!

We use an algorithm inspired by the human brain. It uses the stylistic elements of one image to draw the content of another. Get your own artwork in just three steps.

[https://deepart.io]

WHAT IS DEEP LEARNING?

A newly re-invigorated form of machine learning, which is itself a subset of artificial intelligence, deep learning employs powerful computers, massive data sets, “supervised” (trained) neural networks and an algorithm called backpropagation (backprop for short) to recognize objects and translate speech in real time by mimicking the layers of neurons in a human brain’s neocortex.

[https://builtin.com/artificial-intelligence/deep-learning]
What is NOT Deep Learning?

Deep Learning is NOT AI
Recap

Input: X

Machine Learning

f(X) → Y

"Cooking?"

Deep Learning is NOT AI

Deep Learning DOES NOT mimic the brain!

Deep Learning

f_4 (f_3 (f_2 (f_1 (X)))) → Y

Deep Learning
Questions?
Ice-breaker
(a.k.a “please-don’t-make-me-do-this” activity)

• Turn to the person sitting next to you and introduce yourself!

• What do you hope to learn/be able to do by the end of this course?

Join at menti.com | use code 3533012
Course Logistics
The Course Website

Welcome to Deep Learning

- Your one-stop-shop for:
  - Syllabus
  - Lecture, lab, & assignment schedules
  - Links to important forms, etc.
  - ...

http://cs.brown.edu/courses/csci1470
Welcome to CSCI 1470/2470! Over the past few years, Deep Learning has become a popular area, with deep neural network methods obtaining state-of-the-art results on applications in computer vision (Self-Driving Cars), natural language processing (Google Translate), and reinforcement learning (AlphaGo). These technologies are having transformative effects on our society, including some undesirable ones (e.g. deep fakes).

This course intends to give students a practical understanding of how Deep Learning works, how to implement deep neural networks, and how to apply them ethically. We introduce students to the core concepts of deep neural networks, including the backpropagation algorithm for training neural networks, as well as specific operations such as convolution (in the context of computer vision) and word embeddings, and recurrent neural networks (in the context of natural language processing).
Which Version of the Course Should I Take?

**CS 1470**
- Undergrads + grads
- Lectures
- Labs
- Assignments (Code + Written)
- Group final project
  - Implement existing research paper
  - Poster presentation

**CS 2470**
- Grad students only
- Same Lectures
- Same Labs
- Same Assignments, plus:
  - Additional required features
  - Additional written questions
- Group final project
  - Try something new
  - Oral presentation
Which Version of the Course Should I Take?

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  - Additional required features
  - Additional written questions
- Group final project
  - Try something new
  - Oral presentation
Six Awesome Assignments

TensorFlow 2.0

Language modeling

Image Captioning

Variational Autoencoders
Brown Deep Learning Day!

• Course final project

• In-person mini conference!

• Poster sessions and presentations
  • Grouped by theme: e.g. vision, language, robotics, ...

• Tentative Date: May 6-7, 2024

• Details forthcoming!

Deep Learning Day (Spring 2022)
Lectures and class participation

• In-person Lectures
  • Lecture recordings available
  • Recordings posted to Canvas (Media Library)

• Weekly quiz on Canvas
  • Released on Wednesday (starts next week!)
  • Due on Thursday
  • Minimum time/effort if you attend class or watch lectures regularly
  • No deadline extensions!
Labs and office hours

• In-person lab and office hours
  • Will take a week or so to finalize
  • Team work highly encouraged for lab hours!
  • Might have remote options (in the works!)

• NEW FORMAT for office hours
  • Conceptual hours (group-based help/discussion on concepts)
  • Collab hours (group-based help/discussion on code)
  • TAs will only look at your code in the first week of assignment release (including 1-1 debugging) during collab hours
Assignment logistics

• Assignments
  • Get stencils via Github Classroom
  • Submission via Gradescope
Homework and Lab 0 + SRC discussions

• Homework 0 (will be released today!)
  • Review of relevant math and probability concepts
  • Setting up programming environment
  • Points for completion only (deadline Feb 02)

• Lab 0 (will be released today!)
  • Review of python and numpy
  • Complete on your own (preferably by Jan 29)

• SRC discussion sessions
  • Sign up to attend 2 sessions for this semester
  • STAs will provide prompts related to that week’s homework
The only thing set in stone is our excitement to learn!

- Will try things for class engagement
- Due dates might move around
- We might have make-up classes/labs
- The schedule will remain flexible till the end
- Suggestions are welcome!
This course is also offered in the Fall!

Professor Chen Sun (taught in Fall 2022)

Acknowledgements

Original course material developed by Professor Daniel Ritchie and previous FABULOUS TA staff
Immediate Action Items

- **Read the course missive**: sign the collaboration policy form

- Make sure you can access the course Ed Discussion page via Canvas (all announcements will happen there)

- Create a GitHub account (if you don’t have one already)

- Make sure you can access the course GradeScope via Canvas (all assignments will be submitted there)

- **Start working on HW0 – Submission deadline Feb 02 (Friday 6PM EST)**

- **Do Lab 0 (Especially if you’ve never used Python and/or numpy before!) – Finish before lab 1!**

- If you want to do work on CS department machines over SSH, you’ll need a CS login
  - All enrolled students automatically have one (it’s the same as your Brown ID)
  - If you are not yet enrolled, you’ll need to email problem@cs.brown.edu
  - More information about CS accounts can be found here.
  - **Note that a CS login is not required for this course, as we are not using handin or any other department infrastructure to manage files or submissions**
Questions?