CL205: Artificial Intelligence and Data Science (AI&DS) Division S1

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Course Overview

- Contact details
- Course objectives and outline
- Reference books
- Evaluation
- Tutorials/Lecture schedule
- Other issues

Contact details:

- Instructor S1: : Mani Bhushan,
  Automation Lab, 2nd Floor, Chemical Engineering dept.
  Phone: 7214, Email: mbhushan@iitb.ac.in
- Teaching Assistants:
  - Abhilash Dev: 214020006@iitb.ac.in
  - Ankur Verma: 20d070014@iitb.ac.in
  - Aadya Pipersenia: 20d170002@iitb.ac.in
- Moodle course page is set up
- Class representative to contact us for **common** concerns.

Course objectives

- Get introduced to various problems and paradigms in Artificial Intelligence and Data Science, with some exposure to problems from Chemical Engineering
- Learn fundamental concepts of random variables and probability
- Learn fundamental concepts in statistics
- Learn some popular data-driven modeling methods: regression, etc.

Course outline

- AI and DS: Types of problems, learning paradigms.
- Elements of Probability.
- Random Variables, Expectations.
- Distributions.
- Parameter Estimation.
- Hypothesis testing.
- Regression: Linear/nonlinear, Logistic

Reference books: Probability and Statistics

- Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier, 4^{th} Edition.
- Peter Maybeck, Stochastic Models, Estimation and Control, Volume 1, Academic Press, 1979 [Random variables, multivariate probability distributions]
- Montgomery and Runger, Applied Statistics and Probability for Engineers, John Wiley, 3^{rd} Edition.
- B. A. Ogunnaike, Fundamentals of Probability and Statistics for Engineers, CRC Press, 2010.

Reference books: Data Science/Machine Learning

- Sam Lau, Joey Gonzalez, and Deb Nolan, Learning Data Science, 2019; available online at `https://learningds.org/intro.html`
- Raghunathan Rengaswamy, and Reshmi Suresh, Data Science for Engineers, CRC Press, 2023.
- Duda, Hart, and Stork, Pattern Classification, John Wiley & Sons, 2005.

Reference books: AI in Chemical Engineering

Venkat Venkatasubramanian, The promise of artificial intelligence in chemical engineering: Is it here, finally?, AIChE Journal, Volume 65, Issue 2 p. 466-478, year 2019.

Evaluation

1. 1 midsem exam worth 25%.
2. 1 final exam worth 50%.
3. Tutorial attendance/surprise-quizzes 5%.
4. Assignments/mini-project 5%.
5. Best 3 of approx 4 announced quizzes worth 15%.

Course Timetable

- Lectures in slot 4 (Monday: 11.30, Tues: 8.30, Thurs: 9.30), Venue: LH301
- Tutorial slot: During lecture hours as and when announced.

Attendance Policy

- No marks for attendance in lectures but marks for attendance in tutorials.
- CL205 will NOT be an easy course if you are NOT regular!
  - Regular attendance is strongly recommended
  - Regular follow-up/work is strongly recommended

Other issues

- Strict penalty for any academic malpractice.
  - `https://www.iitb.ac.in/newacadhome/academicMalpractices.jsp`
  - Institute procedures, and punishments
  - Please go through the above documents
- Honour code.

Plagiarism: Lottery Analogy

- Lottery: A tax on people who are bad at statistics. [Unknown]
- Odds of winning low, say 10^{-5}.
- Still people invest in lotteries. Why?
- Payout on winning is high, say Rs. 10^7 (1 crore).
- Let ticket cost be Rs. 100.
- Compute expected winnings:

$$E[W] = 10^{-5} \times 10^7 + (1 - 10^{-5}) \times 0 - 100 = 0$$

- Expected winnings increases if payout becomes higher.
- Lottery creators ensure that payout is such that expected winnings is never positive.

So, what's the point?

- Copying is like buying a lottery ticket.
- Winning is like getting caught after copying.
- Odds of winning $\sim$ odds of getting caught: low.
- Price of lottery ticket $\sim$ advantage you get when you copy: low.
- The lottery prize $\sim$ penalty if caught.
- Expected winning $\sim$ expected penalty if caught.
- Instructor keeps penalty if caught high, thereby leading to a high expected penalty.
- This is just direct penalty, there is indirect penalty too.
- Moral: copying is not worth it.

Last but not the least ...

- Teaching/learning involves an unwritten social contract.
- Mutual respect, professionalism.
- Most important: keep communication channels open.
- Be negative but not indifferent !!

THANK YOU