Course Information

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Goals

- By the end of this part, you should be able to
  - Describe the goal this course
  - Summarize what you will learn
  - Understand the course evaluation
  - Know the pre-requisite for the course and prepare yourself for the exciting times ahead

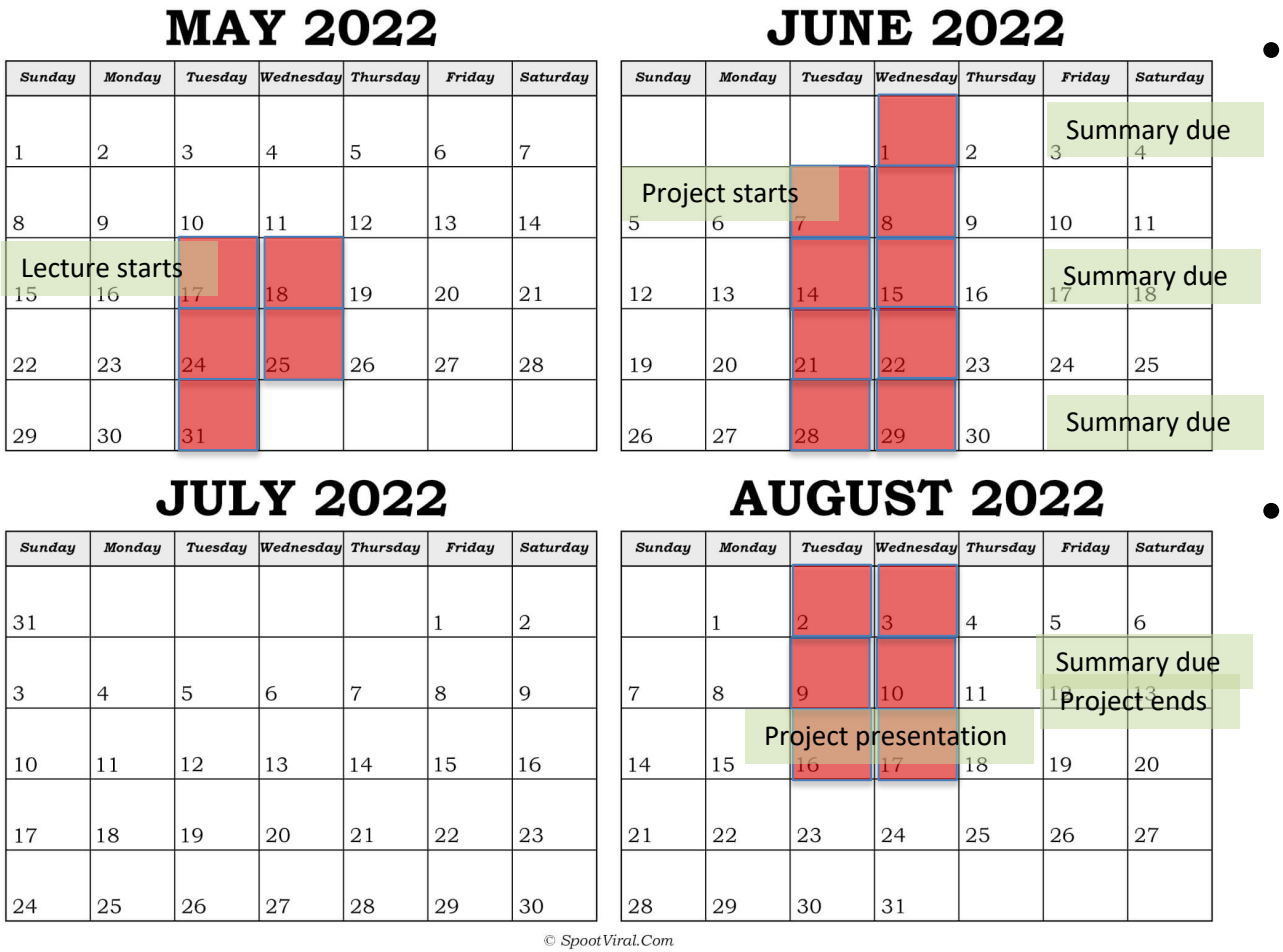
Course Goals

- Explain a few methods for Regression and Classification.
- Implement and apply these methods to real data.
- Discuss fundamental principles of machine learning.
- Create an assessment of current skill level, and devise a plan for ongoing learning.

(A rough) Outline of the Course

- Week 1 (online): Intro + regression (linear models)
- Week 2 (online): (Stochastic) gradient descent, Newton's method,
- Week 3 (online): Overfitting, cross-validation, bias-variance decomposition
  - Project starts
- Week 4 (online): Classification: Logistic regression
- Week 5 (online): Classification: Support vector machines
- BREAK FOR PROJECTS
- Week 10 (online): Deep Learning methods
- Week 11 (online/in-person): Gaussian Process Regression and Classification
- Week 12 (in-person): Machine Learning from a Bayesian Perspective
- Week 13 (in-person): Machine Learning from a Bayesian Perspective,
  - Project ends
- Week 14 (in-person): Recap and project presentations

Course Schedule



- 10 week lectures
  - Tu, Wed (1-3pm), 1h30m, with many discussions/breaks
  - Summary due every 2 weeks of lecture on Fridays.
- 10 week project
  - Starts in week 4 (June 6)
  - Ends on week 13 (Aug12)
  - Presentation on Aug. 16-17

Course Evaluation

- [40%] Class summary
  - Students will summarize every two weeks of lecture in their own words (a total of 5 such reports). This needs to be a summary based on understanding and can be as short as 2 pages.
- [40%] Project report and presentation:
  - 10 week project
  - Define a good project (should involve applying ML methods on a real-world problem/data, and report the findings)
  - students will submit a final project report in Week 13, and present their work in Week 14.
  - The grading will be based on constructive feedback from the class on the project and presentation.
- [20%] Class participation
  - Participate in in-class quizzes and discussions
- Due dates are always on Fridays at noon JST.

The Teaching Team

- We will hold office hours on request
- Please ask the day before earlier than 5pm JST. Then we will then announce the session in slack.
  - Emti: 5-5:30pm on May 17, 31, June 14, 28, July 12, 26, Aug. 9
  - Tom: 12-1:30pm on May 23, June 6, 20
  - David: Office hours in June and July, when requested

Thomas Burns
(https://tfburns.com/)

David Pere Tomas Cuesta
(david.tomas@oist.up)

Resources

- Course Webpage
  - https://emtiyaz.github.io/teaching/oist_B39_2022/main.html
  - Join the course Slack (if you haven't joined yet, send us a request by email and we will send an invite link).
- Lecture notes
  - During the lectures, I will use lecture notes (with blank space for you to take note if you want).
  - These will be available on the course webpage beforehand.
  - You can either print them or use a tablet to annotate
  - An annotated copy (with my annotations from the class) will be available after the lecture.

Books (for reference only)

- T. Hastie, R. Tibshirani and J. Friedman: Elements of statistical learning
  - http://statweb.stanford.edu/~tibs/ElemStatLearn/
- C. Bishop: Pattern Recognition and Machine Learning
  - https://www.microsoft.com/en-us/research/publication/pattern-recognition-machine-learning/
- K. Murphy: Machine Learning: A Probabilistic Perspective
  - https://probml.github.io/pml-book/book1.html

What not to expect!

- You will not learn ALL advanced methods.
- You will not learn ALL the details.
- This course is not about big data or largescale methods.
- This is not a course about numerical optimization, neither is it about statistics. We will use both of these and learn basic techniques only.
- We will not teach the pre-requisite for ML. You have to learn that on your own, but we are happy to hold office hours to help you through them
- This course does not teach you all that you need to know to be able to apply machine learning, but this course will get you started for sure

Prerequisite (must know)

- Matrix calculus.
  - How to take derivative with respect to vectors and matrices.
    - https://atmos.washington.edu/~dennis/MatrixCalculus.pdf
    - https://en.wikipedia.org/wiki/Matrix_calculus
  - You can learn more about it from wikipedia or Matrix Cookbook
    - http://www.imm.dtu.dk/pubdb/views/edoc_download.php/3274/pdf/imm3274.pdf
- Basic Probability
  - Normal distribution
  - Read Chapter 2 in Bishop's book on Machine Learning

Prerequisite (must know)

- Matrix algebra.
  - Basics: Vector and matrix multiplication, (https://en.wikipedia.org/wiki/Matrix_multiplication)
  - More advance topics (see Wikipedia): Matrix inversion and determinants, rank, null and range space, eigenvalue decomposition.
  - There is also a handout posted on the course webpage.

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