

# Welcome to Data Structures & Algorithms

Or, how to pass technical interviews given by programmers

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# Course contents

<https://github.com/parrt/msds689>

- How to read code
- A formula for problem-solving simple algorithm problems
- Core data structures, a unifying perspective
- Algorithm complexity analysis
- Recursion
- Walking and searching data structures
- Sorting (with all of my dirty tricks)
- Graphs and graph algorithms

# Course projects

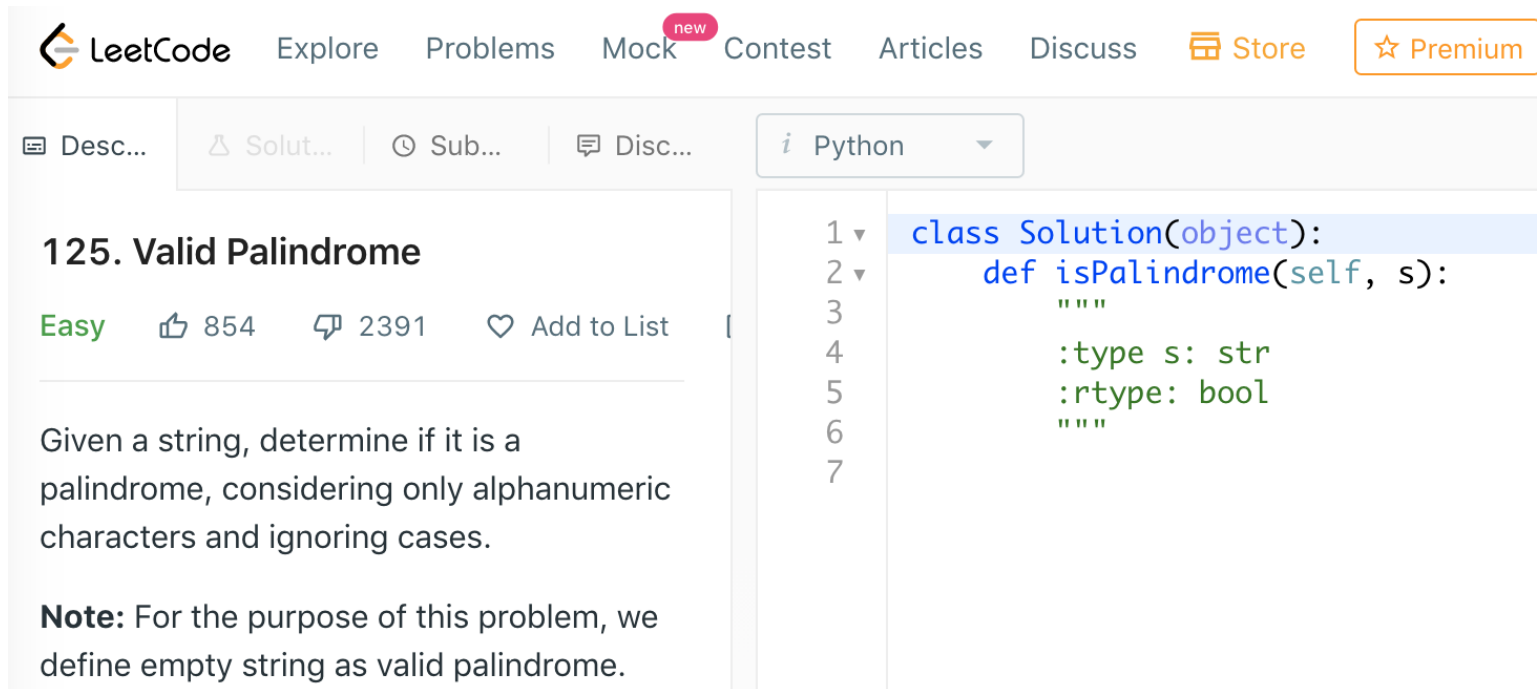
- Convert htable project to object-oriented version (8%)
  - With some extensions
  - ...and using somebody else's code from two years ago!
  - hint: it's kinda stinky code. ha!
- kmeans clustering, kmeans++ initial point selection (17%)
  - Spectral clustering, ...
  - Image compression applications
- Feature importance and selection (20%)
  - MRMR, Permutation, and drop column, ...
  - Automatic feature selection

# Student evaluation

Artifact	Grade Weight	Due date
OO hashtable	8%	Fri, Feb 3 11:59pm
Clustering	17%	Fri, Feb 21 11:59pm
Feature selection and importance	20%	March, Mar 8 11:59pm
Exam 1	25%	4:30PM-5:30PM Thur Feb 17 ---
Exam 2	30%	10AM-11:00AM Fri Mar 10 ---

# Extra things you can do

- Lots of little practice quizzes; e.g., <https://github.com/parrr/msds689/blob/master/labs/quiz-oo.ipynb>
- LeetCode algorithm and data structures challenges. e.g., <https://leetcode.com/problems/valid-palindrome/>



The screenshot shows the LeetCode website interface. At the top, there's a navigation bar with links: LeetCode, Explore, Problems, Mock (with a 'new' badge), Contest, Articles, Discuss, Store, and Premium. Below this, there's a sub-navigation bar with tabs: Desc..., Solut..., Sub..., and Disc..., along with a language selector set to 'Python'. The main content area displays the problem '125. Valid Palindrome' with a difficulty of 'Easy', 854 likes, 2391 comments, and an 'Add to List' button. The problem description states: 'Given a string, determine if it is a palindrome, considering only alphanumeric characters and ignoring cases.' A note specifies: 'Note: For the purpose of this problem, we define empty string as valid palindrome.' To the right of the problem description, a code editor shows a Python solution:

```
1 class Solution(object):
2     def isPalindrome(self, s):
3         """
4         :type s: str
5         :rtype: bool
6         """
7
```

# Resources

- A great free book on [algorithms by Jeff Erickson](#)
- Kleinberg and Tardos, *Algorithm Design*
  - Please see compressed pdf kleinberg-common-running-times.7z in Canvas course files area (do not post material publicly please)
- A very useful set of [programming-concepts-for-data-science](#) and [data science coding questions](#) by former USF MSDS student [Shikhar Gupta](#)
- [10 steps to solving a programming problem](#)
- Review [OO notebook](#) and [Operator overloading notebook](#)

# Administrivia

- The usual academic honesty rules will be enforced; in projects, reports, exams or any other artifact; [Honor Code](#)
  - Do not represent another person's work as your own
  - Don't leave your laptop unattended/unlocked; others can take a picture of your code or simply use a USB key quickly
- Students with Disabilities
  - If you are a student with a disability or disabling condition, or if you think you may have a disability, please contact USF [Student Disability Services](#) (SDS) for information about accommodations.
  - If you are sick, please let us know beforehand, not after-the-fact
  - More details on the course syllabus: <https://github.com/USFCA-MSDS/msds689>

# Why this course, why now?

- At least for the moment, many of the people interviewing you will be programmers, pretending to be data scientists
- What do they know? Programming, data structures, and algorithms
- Being able to organize data within a machine or across machines is a key skill for a data scientist
- The larger the data, the more critical it is to understand how to measure algorithm performance and how to design efficient solutions
- Optimally, you'd get this course much earlier, but the timing is good for your interviewing and was only spot we could jam this course in



# How to get a job

1. Be accomplished, be interesting
  2. Know lots of people
  3. Mine social network looking for job
- When that fails or simultaneously
    - Cold apply to jobs via the web (a lot!)