ITP 499 – Data Structures and Applications
Units: 4
Spring 2019 – Tuesday/Thursday – 2:00pm-3:50pm

Instructor: Raymond Kim
Office: OHE 530G
Office Hours: TBD
Contact Info: raymonmk@usc.edu

Teaching Assistant: TBD
Office: TBD
Office Hours: TBD
Contact Info: TBD

IT Help: Provided by Viterbi IT
Hours of Service: 8am–5pm M-F
Walk-in: DRB 205
Contact Info: (213) 740-0517
Email: engrhelp@usc.edu
Course Description
Advanced topics in: optimization, advanced data structures, recursion, advanced data analysis and regression. Using MATLAB to program graphical user interfaces.

Learning Objectives
Creating and using tables; using map objects; categorical arrays; data analysis using linear and non-linear regression techniques; recursive programming; creating datastores and tall arrays for large data processing; creating graphical user interfaces through MATLAB for advanced data analysis.

Prerequisite(s): None
Recommended Preparation: some programming experience
Co-Requisite(s): None
Concurrent Enrollment: None

Course Notes
All lecture slides and course content including homework will be posted to the course Blackboard page. Midterm and Final Examination are to be done by hand.

Technological Proficiency and Hardware/Software Required
Students are expected to be able to perform the following tasks before the course begins:
- Create a ZIP file that contains one or more files
- UnZIP a file that contains one or more files
- Submit files through Blackboard’s submission page
- Install MATLAB

Required Readings and Supplementary Materials

Grading Breakdown
The course is graded with the following weights:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>40%</td>
</tr>
<tr>
<td>Midterm</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Grading Scale
Course final grades will be determined using the following scale
A    93+
A-    90 - <93
B+    87 - <90
B     83 - <87
B-    80 - <83
C+    77 - <80
Assignment Submission Policy
The assignments will be posted on Blackboard under the “Assignments” section. Each assignment will include instructions, due date, and a link for submission. All assignments must be submitted through Blackboard. Homework assignments that are emailed to instructors or lab assistants will be ignored completely.

Late assignments may be accepted up until 72 hours after the due date/time. After the due date/time up until 24 hours after the due date/time the student will be penalized 10% of the full assignment points. After 24 hours after the due date/time and up until 48 hours after the due date/time, the student will be penalized 20% of the full assignment points. After 48 hours after the due date/time and up until 72 hours after the due date/time, the student will be penalized 40% of the full assignment points. After 72 hours after the due date/time, the student will receive no credit for the assignment.

It is the responsibility of the student to ensure that all work is submitted properly. All homework assignments will be submitted through Blackboard. In issues of incorrect submission, the student will receive a 0 for the assignment and will not be allowed to resubmit the assignment for a grade once the grade has been entered. This policy will be enforced at all times.

If a student resubmits an assignment before the grading of that assignment has been done, the student will be graded based on their last submission. If the submission is late, it will be penalized for being submitted late.

Extensions for homework will only be granted for those students who have a medical/family emergency or illness resulting in an inability to complete the assignment on time. Students must provide official documentation.

Homework Descriptions
Homework 1: In this first homework you will be tasked with writing several functions that perform a variety of statistical functions on a given set of data.

Homework 2: Using optimization techniques and data structures, you will be asked to create and model an n-dimensional system and determine optimized solutions given several constraints.

Homework 3: You will take in tabular data and manipulate it to determine key characteristics for the data.

Homework 4: You will be given a large set of input files from which you will compile a large list of tabular data. From that data, you will have to write map functions and reduce functions to compact the data into manageable chunks and redistribute the data into a collection of files based on different factors.

Homework 5: You will work to model a system and provide optimization techniques, regression, and support of large data sets. You will create a GUI that allows user interaction and manipulation based solely on GUI components.
Grading Timeline
Grading of homework will be done within one week of the deadline.

Additional Policies
Make-up policy for exams: To make up for a missed exam, the student must provide a satisfactory reason (as determined by the instructor) along with proper documentation. Make-up exams are generally only offered in emergency situations.

Before logging off any ITP-owned computer (laptops, desktops in OHE 540, OHE 542, KAP 107, KAP 160, KAP 162, KAP 267) students must ensure that they have saved any work to either a USB drive or a service such as Dropbox. Any work saved to the computer will be erased after restarting the computer. ITP is not responsible for any work lost.

ITP offers Open Lab use for all students enrolled in ITP classes. These open labs are held beginning the second week of classes through the last week of classes. Hours are listed at: http://itp.usc.edu/labs/.

This course will make use of Piazza, an online discussion forum. Students will be invited to join the class discussion, but are not required to. Students may post questions, answer other student’s questions, post anonymously, or post privately. Students are not allowed to post homework or lab code to Piazza publicly. Students may post homework or lab code privately on Piazza to instructors only. Any student caught posting homework or lab code on Piazza will be punished through SJACS.
## Course Schedule: A Weekly Breakdown

<table>
<thead>
<tr>
<th>W</th>
<th>Topic(s)</th>
<th>Suggested Reading</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MATLAB Refresher: Loops, Structures</td>
<td>MM: Chapter 11, 13.2-13.4, 9.6</td>
<td>None</td>
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<tr>
<td></td>
<td>MATLAB Refresher: File I/O, Regular Expressions</td>
<td></td>
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<tr>
<td>2</td>
<td>Functions</td>
<td>MM: Chapter 12</td>
<td>Homework 1 Assigned</td>
</tr>
<tr>
<td></td>
<td>Functions</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>Optimization Basics: Zero Finding</td>
<td>MM: Chapter 22</td>
<td>Homework 1 Due</td>
</tr>
<tr>
<td></td>
<td>Optimization Basics: Multi-parameter Optimization</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Recursion: Recursive Functions</td>
<td>MG: Chapter 10.9</td>
<td>None</td>
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<tr>
<td></td>
<td>Data Structures: Cell Arrays</td>
<td>MM: Chapter 8.1-8.6</td>
<td></td>
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<tr>
<td>5</td>
<td>Data Structures: Structures</td>
<td>MM: Chapter 8.6-8.11</td>
<td>Homework 2 Assigned</td>
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<td></td>
<td>Data Structures: Map Objects</td>
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<tr>
<td>6</td>
<td>Data Structures: Categorical Arrays</td>
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<td>None</td>
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<tr>
<td></td>
<td>Data Structures: Tables</td>
<td></td>
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<tr>
<td>7</td>
<td>Data Structures: Time Series</td>
<td></td>
<td>Homework 2 Due</td>
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<tr>
<td></td>
<td>Data Structures: Time Series</td>
<td></td>
<td>Homework 3 Assigned</td>
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<tr>
<td>8</td>
<td>Midterm Review</td>
<td></td>
<td>None</td>
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<td></td>
<td><strong>MIDTERM</strong></td>
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<tr>
<td>9</td>
<td>Linear Regression Analysis</td>
<td>MM: Chapter 17</td>
<td>None</td>
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<td></td>
<td>Nonlinear Regression Techniques</td>
<td></td>
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<tr>
<td>10</td>
<td>Data Filtering</td>
<td>MM: Chapter 18</td>
<td>Homework 3 Due</td>
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<td></td>
<td>Data Pre-Processing</td>
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<td>Homework 4 Assigned</td>
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<tr>
<td>11</td>
<td>Data Stores</td>
<td></td>
<td>None</td>
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<tr>
<td></td>
<td>Tall Tables</td>
<td></td>
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<tr>
<td>12</td>
<td>Map Reduce Basics</td>
<td></td>
<td>None</td>
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<tr>
<td></td>
<td>Map Reduce Functions: Map Functions</td>
<td></td>
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</tr>
<tr>
<td>13</td>
<td>Map Reduce Functions: Reduce Functions</td>
<td></td>
<td>Homework 4 Due</td>
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<td></td>
<td>GUIs: Programming GUIs</td>
<td>MATLAB GUI Guide</td>
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<tr>
<td>14</td>
<td>GUIs: Callback functions</td>
<td></td>
<td>None</td>
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<tr>
<td></td>
<td>GUIs: Callback functions</td>
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<tr>
<td>15</td>
<td>GUIs: Packaging</td>
<td></td>
<td>Homework 5 Due</td>
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<tr>
<td></td>
<td>Mathworks Guest Speaker</td>
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<tr>
<td>16</td>
<td><strong>FINAL EXAM</strong></td>
<td></td>
<td>According to Schedule of Classes</td>
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</tbody>
</table>
Statement on Academic Conduct and Support Systems

Academic Conduct:
Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” https://policy.usc.edu/scampus-part-b/. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct

In this class, all homework submissions will be compared with current, previous, and future students’ submissions. If your work is found to be a copy of another person’s work, or if you submit someone else’s work as your own, the instructors will file a report with SJACS with a recommended penalty of an F in the course.

It is not okay to look through another student’s code. It does not matter if this code is online or from a student you know, it is cheating. Do not share your code with anyone else in this or a future section of the course, as allowing someone else to copy your code carries the same penalty as you copying the code yourself.

Support Systems:
Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. https://engemannshc.usc.edu/counseling/

National Suicide Prevention Lifeline - 1-800-273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. http://www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. https://engemannshc.usc.edu/rsvp/

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: http://sarc.usc.edu/

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. https://equity.usc.edu/

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. https://studentaffairs.usc.edu/bias-assessment-response-support/

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. http://dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic [https://studentaffairs.usc.edu/ssa/](https://studentaffairs.usc.edu/ssa/)

*Diversity at USC*
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. [https://diversity.usc.edu/](https://diversity.usc.edu/)

*USC Emergency Information*
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, [http://emergency.usc.edu](http://emergency.usc.edu)

*USC Department of Public Safety* – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime.
Provides overall safety to USC community. [http://dps.usc.edu](http://dps.usc.edu)