

The University of Michigan – Dearborn
Department of Computer and Information Science
CIS 505 Algorithms Analysis and Design
Summer I (May – June) 2025
Term Project

Total points: 60

Submission deadlines:

- Report file (PDF) and presentation video (mp4): 11:59pm, June 22, 2025
- Presentation feedback: 3:00pm, June 25, 2025
- Submission platform: Canvas

The primary objective of this term project is to apply the algorithmic design and analysis techniques learned in this course to solve an interesting problem in the automotive industry or related vehicular application domains. You are encouraged to choose a problem of your interest from potential application areas including, but not limited to:

- Navigation and route optimization
- Travel and trip planning
- Transportation and fleet logistics
- Vehicle maintenance and repair scheduling
- Electric vehicle (EV) infrastructure planning
- Autonomous driving systems
- Driver/driver-focused recommendation systems
- Vehicle diagnostics and telematics
- Cargo and goods distribution
- Smart traffic management.

You are expected to work in a group of 2-3 students on this project. Communication tools such as Canvas, Zoom, Google Meet, WhatsApp, etc. may be used for the collaboration. Your project will be evaluated based on several criteria including significance, correctness, completeness, efficiency, difficulty level, report quality, presentation effectiveness, individual efforts and team cooperation. All students in a group will receive the same score for the project.

The specific tasks of the project are the following:

- Identify and specify an interesting problem related to automotive/vehicular applications.
- Apply one or more algorithm design techniques learned in the course such as divide-and-conquer, dynamic programming, greedy, backtracking, branch-and-bound, randomization, and approximation to develop an efficient algorithm for your problem.
- Use some applicable algorithm analysis techniques learned in the course such as worst-case/average-case complexity analysis, asymptotic bounds/categories, recurrences, Monte Carlo estimation, and lower bound theory to discuss the efficiency of your algorithm.
- Use a high-level programming language of your choice (e.g., Python, C++, Java, etc.)

to implement your algorithm.

- Discuss the strengths, weaknesses and possible future improvements of your algorithm.

You are required to submit:

- Your report (**50 points**, due in Canvas: **11:59pm on June 22, 2025**) in one PDF file (with no page limit), which should cover, but not limited to, the following elements:
 - Application background and motivation
 - Specification of the problem and its parameters
 - Justification of your choice of algorithm design technique(s)
 - High-level pseudocode and explanation of your algorithm
 - Illustrative examples of your algorithm running on several problem instances
 - Discussion on efficiency (complexity) of your algorithm
 - Description of the implementation design and environment for your algorithm (e.g., programming language, data structure, hardware and software environments, etc.)
 - Screenshots of your program execution on sample problem instances
 - Observations on your program execution performance (time)
 - Discussion on strengths, weaknesses, and possible future improvements of your algorithm
 - Specification of each group member's role and contribution
 - Attachment of the source code of your program as an appendix at the end of your report.
- Your presentation (**8 points**, due in Canvas: **11:59pm on June 22, 2025**) and your feedback on other groups' presentations (**2 points**, due in Canvas: **11:59pm on June 25, 2025**):

A presentation video (in a playable video format such as .mp4) of 8 - 10 minutes will be due with your report in Canvas by 11:59pm on June 22, 2025. All project presentation videos will be made available on Canvas for students in the class to watch from 2:00pm on June 23, 2025, until 2:00pm on June 25, 2025. Each student is required to submit an individual (not group) feedback form with your feedback about the presentations from other groups by 3:00pm on June 25, 2025.