



**PHYS 760: Selected Topics in Computational Physics
[Algorithmic Techniques in Artificial Intelligence and
Machine Learning]**

Units: 3

**Term—Day—Time: Summer 2022; May 18 to Aug 9;
Mondays and Wednesdays 6:00-7:20pm.**

Location: Online Zoom Meetings

Instructor: Prof. Satish Kumar Thittamaranahalli

Office Hours: By Appointment

Contact Info: tskwork@gmail.com

Course Description

Being able to efficiently and effectively solve hard real-world problems critically depends on what algorithmic techniques are employed at what abstraction levels of these problems. This course will provide a comprehensive introduction to algorithmic techniques used in artificial intelligence (AI) and machine learning (ML). It will provide PhD-level training on how to build abstraction levels for real-world problems and apply the most effective algorithms at each level. The course will involve research-level projects and initiate students into AI and ML-guided interdisciplinary research.

Learning Objectives

Students will learn to do the following: (a) think about real-world problems at different abstraction levels; (b) recognize the easy and hard parts of the problems using complexity theory and modern algorithmic techniques in combinatorial optimization; (c) build practically-viable algorithms for hard parts of the problems using heuristic search and constraint programming methods; (d) employ ML and data-driven methods at appropriate places; and (e) build integrated algorithmic frameworks for solving interdisciplinary research problems.

Recommended Preparation

Discrete Mathematics; Design and Analysis of Algorithms.

Description of Student Project

The project will have to be original research. Its topic will be agreed upon by the student and the course instructor. The instructor will suggest suitable resources for the selected topic and will meet with each student to give guidance on the project. Project deliverables will include a written report and an oral presentation in class.

Grading Breakdown

Course Element	% of Grade
Class Participation	5%
Student Project (Report)	85%
Student Project (Presentation)	10%
TOTAL	100%

Statement for Observance of Religious Holidays

USC's policy grants students excused absences from class to observe religious holidays: <http://orl.usc.edu/life/calendar/absences/>. In this case, please contact your instructor in advance to agree on alternative course requirements.

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" 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 policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call

studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention and Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call

studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298

equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following *protected characteristics*: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations. The university also prohibits sexual assault, non-consensual sexual contact, sexual misconduct, intimate partner violence, stalking, malicious dissuasion, retaliation, and violation of interim measures.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298

usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776

dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

uscsa.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.