

PSYCH 143P: Human Problem Solving, Fall 2019.

Department of Cognitive Sciences

Instructor: **Zygmunt Pizlo**

SSL 140, MWF 9:00-9:50am.

Office hour: SSPA 2187, Mon 10-11am.

Problem solving is a good example of goal-directed activity. The field called "Artificial Intelligence" (AI) has always considered problem solving this kind of activity, and many problems studied in the cognitive literature have been approached in this way. The list of such problems includes the Traveling Salesman Problem, and the Tower of Hanoi problem, as well as a host of practical problems that we humans face in our everyday lives. It also includes the science problems students solve in Math and Physics classes. It turns out that all goal-directed actions (behaviors) require forming mental representations of the problem at hand. At the very minimum, this mental representation must include the start state, the goal state and a list of possible actions that may lead to a sequence of steps towards the goal. This characterization of problem representation is how Newell and Simon, the fathers of AI, viewed the essential features of their General Problem Solver.

This class will include some classical readings from Cognitive Science starting with Wolfgang Köhler, Edward Tolman, and Max Wertheimer, as well as Newell and Simon. This will be followed by the examination of a set of studies on search problems in which the search spaces are very large. Next, we will discuss the role of "insight" in problem solving. The explanation of the nature of visual representation will set the stage for a discussion of cognitive inferences, games and the Theory of Mind. The class will conclude with a review of selected topics taken from math and physics problem solving.

There will be a short quiz in class once a week. The score will count towards your semester grade. The quiz questions will be based on the material covered in the prior 3 lectures.

Your course grade will be based on the lecture quizzes (33.3%) and on two exams, midterm and final (each exam counts 33.3%). The final exam will *not* be cumulative. These exams will have multiple-choice questions, short answer questions, and problems to solve. The scores in each exam will be normalized to the average of two highest scores. The semester grades will be assigned using the conventional cutoff points: 90% and above is A, 80%-90% is B and so on.

Topics:

Week 1: Introduction – goal-directed, purposive behavior and purposive reasoning.

Week 2: Animal problem solving.

Weeks 3-4: Search problems.

Week 5: Review and mid-term exam.

Midterm: November 1.

Week 6: Insight problems.

Week 7: Visual perception as inference.

Week 8: Cognitive inferences.

Week 9: Games and Theory of Mind.

Week 10: Review.