

Special one-week intensive course

“Introduction to dynamic programming with applications”

at Hino Campus, Tokyo Metropolitan University
for Sept. 3 – Sept. 7, 2012.

Instructor: 國立台灣科技大學助教授 水谷英二 先生 (Prof. Eiji Mizutani)

Course Description:

Dynamic Programming (DP) has been widely employed in a variety of contexts for optimization purposes. The DP applications are diversified in the fields of computer science and operations research. We begin with the problem of finding a best path from a specified starting point to a final destination in a simple directed acyclic graph (DAG). Here, we introduce the Bellman’s principle of optimality, the backbone of DP, and the basic concepts of DP formulations. We then translate the simple DAG context into the problem of pattern matching and discuss a DP solution approach known as dynamic time warping (DTW). Furthermore, we consider the problem of path-finding using the Dijkstra and A* algorithms; both are based on the DP principle.

The objective of this short course is to learn the basic DP principles and formulations through those problems mentioned above. Roughly, we will proceed as follows:

- Day 1 (Sept. 3): Basic DP principle and formulation in a DAG shortest-path problem.
- Day 2 (Sept. 4): From a DAG-shortest-path problem to DTW problems.
- Day 3 (Sept. 5): DTW problem and formulation.
- Day 4 (Sept. 6): Dijkstra algorithm for path-finding.
- Day 5 (Sept. 7): Related issues of DP.

During the week, several in-class exercises and quizzes will be given. Before the lecture, students are encouraged to read the handout, the excerpts from the book of Dreyfus and Law: “The art and theory of dynamic programming (Academic Press, 1977).”