

*Special one-week intensive course*

**“Dynamic Programming and Optimal Control”**

at Tokyo Metropolitan University

for Sept. 6 – 10, 2010

*Instructor:*

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

*Textbook:*

*The Art and Theory of Dynamic Programming*  
(Stuart Dreyfus and Averill Law, Academic Press, 1977).

*Course description:*

The art of formulation illustrated by Dynamic Programming is useful in learning creative thoughts rather than rote repetition of formulas and proofs. It stimulates thought rather than memory.

This short course is designed to cover Chapters 1, 6, and 7 of the textbook posted above. (Photocopies of those chapters will be provided in advance; permission granted by Stuart Dreyfus.) The main topics are as follows:

- (1) Elementary minimum-cost path problems;
- (2) Problems with linear dynamics and quadratic criteria;
- (3) Discrete-time optimal-control problems.

For the last topic, we show that the so-called Kelley-Bryson optimal-control gradient formula is equivalent to the widely-employed backpropagation in neural-network learning.

If the time permits, we describe several extensions of textbook problems including neighboring optimum control (or guidance scheme), stagewise Newton algorithm.

Before the course begins, students are encouraged to read pages 1 through 18 of the above textbook. During the week, several in-class quizzes will be given as well as homework.