# Digital Image Processing

- Introduce the fundamentals of digital image processing.

- It covers principles and algorithms used in various image processing applications.

- **Background**: Calculus, Linear algebra, Probability, Signals & Systems, and DSP;

  **Programming in C/C++ and Matlab**

# Time/Date/Instructor

- Monday 13:20pm – 15:10pm, ED301 (工程四館)
  Thursday 16:30 –17:20pm, EDB06
  (Sept. 18, 2013 – Jan. 17, 2014)
  → **Lecture in English**

- **Instructor**: Hsueh-Ming Hang, 杭學鳴 (ED209; ED609)
  hmhang@mail.nctu.edu.tw

- **Office hours**: (need appointment)
  Wednesday 3:30pm -- 5:30pm (ED209)
  Friday 1:30pm -- 3:20pm (ED209)

- **Classnotes**: http://cwww.ee.nctu.edu.tw/
  (password: )
  (By Prof. Sheng-Jyh Wang (王聖智教授) with modifications)

# Hsueh-Ming Hang 杭學鳴

- 1984: Ph.D. in EE, RPI (Rensselaer Polytechnic Inst), NY, USA
- 1976,1980: BS and MS, Chiao Tung Univ, Hsinchu
- 1991.11~: Nat'l Chiao-Tung Univ., Professor
- 2010.2~2014.1/2014.2~: NCTU, ECE College, Associate Dean/Dean
- 2006.8~2009.7: Nat'l Taipei Univ Tech, EECS College, Dean
- 1998.11~2004.7: NCTU, Telecom Research Center, Director
- 1984.6~1991.11: AT & T Bell Labs., USA; MTS
- 2008: IET Fellow
- 2002: IEEE Fellow
- 2000: IEEE Third Millennium Medal
- Associate Editor, *IEEE Trans Image Processing* (1992-1994, 2008-2012), *IEEE Circuits and Systems for Video Technology* (1997-1999)

# Teaching Assistant

- **TA**:
- Helen 翁司頻  helen199132@gmail.com   ED529
  Office hours: (appointment) – Tuesday 13:20-15:10
- (?) Nick 陳治戎 nickmath15@yahoo.com.tw
  ED529  Office hours: (appointment) – Wed. 13:20-15:10

- ◆ Make-up class hours:
  Thursday 15:30-16:20 ??
  Thursday 17:20-18:00 ??

# Grading

- **Homework: 50 %** (~ 3 computer assignments)
- **Examine: 25%** (2 hours, open book – one book, class notes, and your own notes)
- **Term Project: 25%** (Computer simulation + presentation + written report) (Two or three students together as a group.)
- Scores will be adjusted to meet the 85 average value suggested by the School. ← Additional adjustment may be considered if needed.
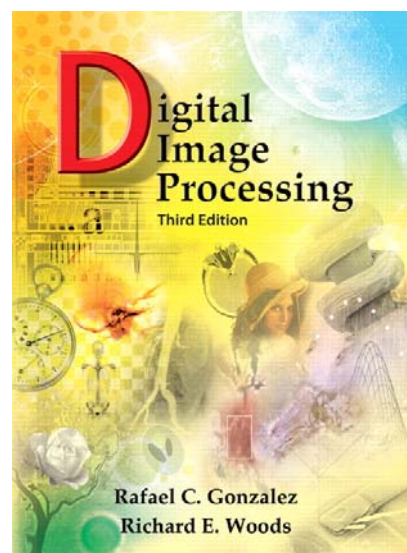
# Textbook and Recommended Readings

- **Textbook:**

  R.C. Gonzalez and R.E. Woods, ***Digital Image Processing***, 3rd edition, Pearson Education, 2008.

  **Reference Web:**
  http://www.imageprocessingplace.com/index.htm

# Recommended Readings

- A.N. Netravali and B.G. Haskell, *Digital Pictures*, 2nd Ed., Plenum Press, 1995.
- R.C. Gonzalez, R.E. Woods, and S.L. Eddins, *Digital Image Processing Using Matlab*, 2nd Ed., McGraw Hill, 2009.
- A. Bovik, *The Essential Guide to Image Processing*, Academic Press, 2009.
- R. Szeliski, *Computer Vision*, Springer-Verlag, 2011

# Term Project

- Each group consists of two to three students. Your report should include **computer simulations** on the assigned subject.
- A 15-min **oral presentation** is expected at the end for each student including a **demo** of your program.
- In addition, each group should hand in a **written report**. Computer programs for simulating codes will be checked by the TA.

# Contents of Term Project

- Describe briefly the algorithms (do not repeat the class notes). Flowcharts are helpful.
- Write (revise) computer programs (C, C++, Matlab) that perform your proposed algorithm.
- Describe your program (inputs, outputs, procedure, features, etc.) with block diagrams and flowcharts. If your program is modified from an existing code, explain your changes. How the programs are used. (How to set parameter values etc.)
- Conduct experiments (simulations) similar to those in the computer assignment.
- Analyze data and discuss your results.
- Attach your program and references to your report **(packed into an electronic file)**.

# Course Outline

1) Introduction
2) Fundamentals
3) Human Visual System
4) Image Transforms
5) Image Enhancement
6) Color
7) Image Segmentation
8) Image Coding
9) Image Restoration
10) Representation & Description
11) Selected Topics