西北工業大學
NORTHWESTERN POLYTECHNICAL UNIVERSITY

有朋自远方来,不亦乐乎

It is always a pleasure to greet a friend from afar.

西北工業大學
NORTHWESTERN POLYTECHNICAL UNIVERSITY

Digital Image Processing

About

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What, When, and Where

- Week 9-16: Prof. Yong Xia (夏勇) http://jszy.nwpu.edu.cn/yongxia.html
- Week 17-18: Prof. Tao Yang (杨涛) https://teacher.nwpu.edu.cn/taoyang.html

夏勇(2014010004)

2021-2022春 | 全部周次 | 本周 | 上一周 | 下一周 | 学期起始日期: 2022-02-21 | 含实验 | 全部课程 | 打印

	星期一	星期二	星期三	星期四	星期五	星期六	星期日
1							
2							
3							
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6							
7		数字图像处理 (英) U10M12021.01 (9~16周) (7-8节 14:00 -15:40) 长安校区 教西 B107 夏勇		数字图像处理 (英) U10M12021.01 (9~16周) (7-8节 14:00 -15:40) 长安校区 教西 B107 夏勇			
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Professor Yong Xia

基本信息 The basic information

姓名: 夏勇

学院: 计算机学院

学历: 博士研究生毕业

学位: 工学博士

职称: 教授

职务: 副院长

学科: 计算机科学与技术

邮箱: yxia@nwpu.edu.cn

综合介绍 General Introduction

夏勇，男，西北工业大学教授、博导，1997年考入西北工业大学教育实验学院，分别于2001、2004和2007年从西北工业大学计算机学院获得学士、硕士和博士学位（获中国计算机学会优秀博士论文奖和中国优秀博士学位论文提名）；2007年1月加入悉尼大学计算机学院（原信息技术学院）生物医学与多媒体技术（BMIT）实验室，在冯大淦院士指导下进行博士后研究，2013年入选国家"青年海外人才"计划，并于同底回到西北工业大学计算机学院，开展医学影像大数据分析、计算机辅助诊断和深度学习等领域的教学和科研工作，现为空天地海一体化大数据应用技术国家工程实验室成员；主持国家自然基金面上项目三项，近三年在IEEE-TPAMI/TMI/TIP/JBHI、MedIA、NeurIPS、CVPR、IJCAI和MICCAI等本领域顶级期刊和会议发表论文40余篇，指导学生获得了ISBI 2019"急性白血病恶性B-淋巴母细胞分类竞赛"第一名、MICCAI 2020胶质瘤分割竞赛（BraTS 2020）第二名等多个国际医学影像分析竞赛奖励；现为中国图象图形学学会视觉大数据专委会常委、中国体视学学会图像分析分会常委、中国抗癌协会肿瘤影像专业委员会人工智能学组副组长、陕西省计算机学会人工智能专委会主任；先后担任ISBI 2017、MICCAI 2019、MICCAI 2020等国际会议的Session Chair或Area Chair。Google Scholar: https://scholar.google.com/citations?hl=en&user=Usw1jeMAAAAJ

Background

What is an image?

- An image refers to a 2D light intensity function f(x,y), where (x,y) denote spatial coordinates and the value of f at any point (x,y) is proportional to the brightness or gray levels of the image at that point.
- A digital image is an image f(x,y) that has been discretized both in spatial coordinates and brightness.
- The elements of such a digital array are called image elements, pixels or voxel.

Background

What is digital image processing?

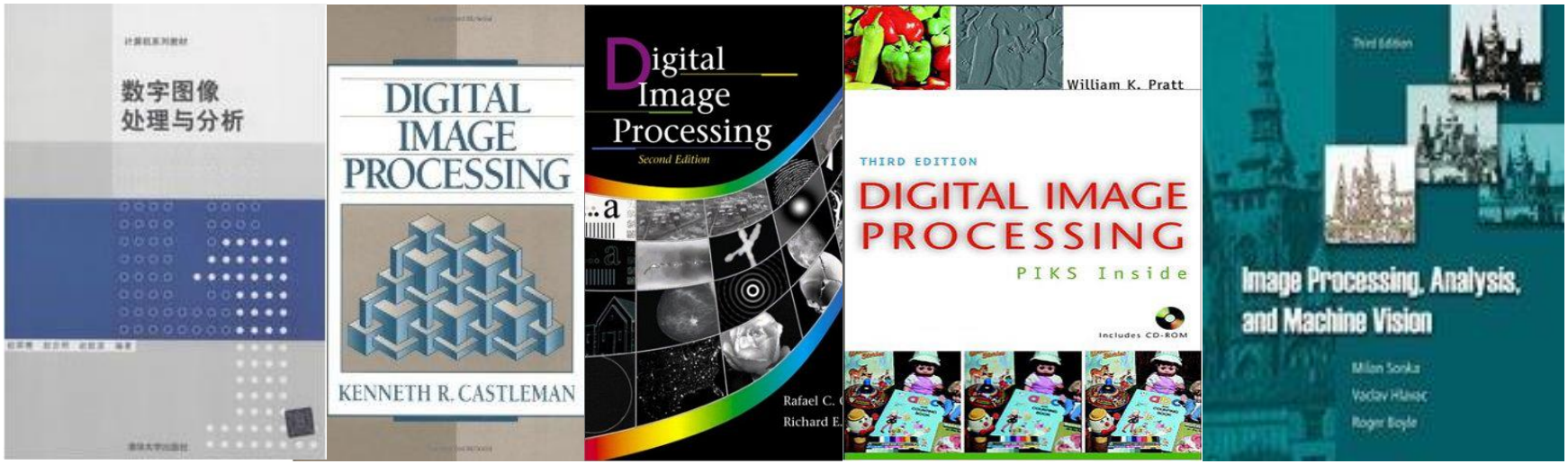
Digital image processing is the use of computer algorithms to perform image processing on digital images. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing. Since images are defined over two dimensions (perhaps more) digital image processing may be modeled in the form of multidimensional systems. Recently, digital image processing has been applied widely to space exploration, remote sensing, biomedicine, artificial intelligence and industry detection.

Course Description

This unit emphases on the general principles, methods and theories. Understand and implement acknowledge by combining other subjects such as multimedia, intelligent information processing, computer vision, and pattern recognition. Students will also need to develop programming skills in order to resolve problem in the actual scenarios.

Resources

- 《数字图像处理与分析》赵荣椿、赵忠明、赵歆波编著，清华大学出版社，2013
- Kenneth R. Castleman, "***Digital Image Processing***", Pearson Education (US)
- Rafael C. Gonzalez and Richard E. Woods， "***Digital Image Processing***", Prentice Hall, 2nd Edition
- William K. Pratt, "***Digital Image Processing***", Wiley-Interscience, 3rd Edition
- Milan Sonka, Vaclav Hlavac and Roger Boyle, "***Image processing, Analysis, and Machine vision***", Brooks/Cole, 2nd Edition



Important International Journals

- **IEEE Transactions on Pattern Analysis And Machine Intelligence (PAMI)**
- **International Journal of Computer Vision (IJCV)**
- **IEEE Transactions on Image Processing (TIP)**
- **IEEE Transactions on Medical Imaging (TMI)**
- **Medical Image Analysis (MIA)**
- IEEE Transactions on Multimedia (TMM)
- IEEE Transactions on Signal Processing
- IEEE Journal of Biomedical And Health Informatics (JBHI)
- Pattern Recognition (PR)
- Signal Processing

Important International Conferences

- **Rank 1:**
  CVPR: IEEE Conference on Comp Vision and Pattern Recognition (Rank A)
  ICCV: International Conference on Computer Vision (Rank A)
  ECCV: European Conference on Computer Vision (Only second to ICCV in Computer Vision, developing quickly)
  ACM-MM: ACM Multimedia Conference (Rank A)
  IPMI: International Conference on Information Processing in Medical Imaging
  MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention
- **Rank 2:**
  ICME: International Conference on Multimedia & Expo (One of the world's leading conference in Multimedia)
- **Rank 3:**
  BMVC: British Machine Vision Conference
  ACCV: Asian Conference on Computer Vision (High ranking in Asia-Pacific Conferences)
  ICIP: International Conference on Image Processing (One of the world's leading conference in Image Processing)
  ICPR: International Conference on Pattern Recognition (One of the world's leading conference in Pattern Recognition)
  ICASSP: International Conference on Acoustics, Speech, and Signal Processing
  ISBI: International Symposium on Biomedical Imaging

Important International Conferences

- **Artificial Intelligence**

  ICLR: International Conference on Learning Representations

  COLT: Annual Conference on Learning Theory

  NIPS: Conference on Neural Information Processing Systems

  ICML: International Conference on Machine Learning

  AAAI: AAAI Conference on Artificial Intelligence

  IJCAI: International Joint Conference on Artificial Intelligence

- **Data Mining**

  KDD: SIGKDD Conference on Knowledge Discovery and Data Mining

Important National Journals

- Science China (中国科学)
- Chinese Journal of Computers (计算机学报)
- Acta Electronica Sinica (电子学报)
- Journal of Software (软件学报)
- Acta Automatica Sinica (自动化学报)
- Journal of Computer Research and Development (计算机研究与发展)
- Journal of Image and Graphics (中国图像图形学报)

Assessment & Assignments

Tasks	Introduced	Due	Marks
Class Attendance	Week 9	Week 18	10%
Assignment 1 (Presentation)	Week 10	Week 16	30%
Assignment 2	Week 11	Week 18	60%

Assignment 1

- **Oral Presentation** (worth 30 % of the student's final mark)

  Each group of students has been asked to:

  - Select a topic in the field of DIP
  - Select an academic paper published in a top journal or top conference, which reports the state-of-the-art research on the topic you selected
  - Make a comprehensive understanding of the paper, including the background, motivation, method, results, and conclusion, via group reading and discussions
  - Prepare a PPT that covers the contents of that topic
  - Give an oral presentation + Q / A (12+3 minutes)

  Assessment criteria:

  - PPT: Well organized and written, covering most important issues - 30%
  - Presentation: Clear and coherent (audience can understand) – 30%
  - Q / A: Accurate and appropriate – 20%
  - Layout of PPT and style of presentation – 20%

Assignment 1

- **Oral Presentation Topics**
  1. Homomorphic filtering
  2. Histogram Equalization
  3. Morphological Dilation / Erosion
  4. Canny Algorithm
  5. Hough Transform
  6. Watershed Algorithm
  7. Active Contour Models
  8. HOG Feature Extraction
  9. SIFT Feature Extraction

Assignment 2

- **Write a Literature Review** (worth 60% of the student's final mark)

  Each student has been asked to:

  - Submit a report that is a critical review of the literature you have found that is related to a topic in the field of DIP
  - Format the report as: single column, double space, at least 10 numbered pages (a simple guideline is that a page will have about 28 lines of text of font 11)
  - Include at least 20 properly referenced articles or books.
  - Organize the review around the questions or claims relevant to your research rather than just listing the papers you have read.

  Assessment criteria:

  - - Covers the most important relevant work – 20%
  - - Clearly identifies the contributions of the literature reviewed – 20%
  - - Identifies the research methods used in the literature reviewed – 20%
  - - Connects the literature to the research topic by identifying its relevance – 10%
  - - Uses consistent reference style (Endnote) – 10%
  - - Clarity of presentation and language – 20%

Academic Honesty and Prohibition on Plagiarism

The role of Northwestern Polytechnical University (NPU) is to create, preserve, transmit and apply knowledge through teaching, research, creative works and other forms of scholarship. This course requires all students to act honestly, ethically and with integrity in conducting their exams, presentations, and submissions. It is the responsibility of all students to ensure that they do not commit or collude with another person to commit Plagiarism. All identified cases of student Plagiarism will be reported to the School of Computer Science and Engineering and the students' supervisors.