

Seminar in Medical Image Segmentation

CSE 702, University at Buffalo SUNY

Syllabus for Fall 2007

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Course Webpage: http://www.cse.buffalo.edu/~jcorso/t/2007fall_smis.

Syllabus in pdf: http://www.cse.buffalo.edu/~jcorso/t/2007fall_smis/syllabus.pdf.

Downloadable course material can be found on the UBLearns site.

Course Overview: The seminar will survey the recent literature in medical image segmentation. We treat the definition of segmentation loosely and include the related problems of detection, segmentation, and labeling. Topics include knowledge-based heuristics, voxel-based statistical classification, deformable models and level-sets, hierarchical modeling, medial-axis shape representations, graph-cuts, and learning-based approaches. We will focus on constructing a complete taxonomy of approaches in this area. Students will be required to make one paper presentation and do a project to explore a method, which can be new research, in detail. Familiarity with vision and medical image computing is suggested but not required.

Course Goals:

1. Breadth Goal: Each student will gain an understanding of the breadth of methods used in medical image segmentation.
2. Depth Goal: Each student will gain a detailed understanding of one particular approach.

Textbooks: Required material distributed by instructor or found on the UB Libraries electronic journal archive.

Meeting Times: Time is Wednesday at 3:30-6PM.

Location: Bell Hall 224

Office Hours: T1-3 and R1-2

Grading: Letter grading distributed as follows:

- Discussion (25%)
- Paper Presentation (25%)
- Project (50%)

Programming Language: Depends on student chosen project (generally, C++).

Calendar

	Week	Topics and Readings	Presenter
1	8/29	Introduction. Definition of problems and difficulties in medical image segmentation.	

2	9/5	Discussion of proposed taxonomy and review of some classical approaches. Primary Readings: (Bezdek <i>et al.</i> , 1993; Pham <i>et al.</i> , 2000) Secondary Readings: (Van Ginneken <i>et al.</i> , 2001; McInerney <i>et al.</i> , 1996; Clarke <i>et al.</i> , 1995; Noble & Boukerroui, 2006; Engle Jr., 1992)	
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Part I: Paper Reading and Presentations

Each week one student is responsible for preparing a 30 minute talk on the primary paper for that week. The class-time is split up into three parts. For the first 45 minutes, the instructor will give background material to the class and lead the discussion during which the class will define a set of questions to ask the presenter. During this time, the presenter for the week is not present. Following this initial discussion, the presenter will give his or her talk (30 minutes). For the remaining time (roughly an hour), the class will query the presenter with the prepared questions followed by a general discussion. (This process follows the Study Groups at the IPMI conference.)

3	9/12	Statistical Classification via Expectation-Maximization Primary Reading: (Leemput <i>et al.</i> , 2003) Secondary Readings: (Dempster <i>et al.</i> , 1977; Dellaert, 2002)	V. Singh
4	9/19	Statistical Classification in a Hierarchical Model Primary Reading: (Blekas <i>et al.</i> , 2005; Pohl <i>et al.</i> , 2007) Secondary Readings: (Dempster <i>et al.</i> , 1977; Dellaert, 2002)	C. Hoeflich (Blekas) C. Kao (Pohl)
5	9/26	Markov Random Fields Modeling for Medical Image Segmentation Primary Readings: (Held <i>et al.</i> , 1997) Secondary Readings: (Winkler, 1995, Ch. 3) (Zhang <i>et al.</i> , 2001; Rajapakse <i>et al.</i> , 1997)	R. Alomari
6	10/3	Graph-Shifts Segmentation: Dynamic Hierarchical Energy Minimization Primary Readings: (Corso <i>et al.</i> , 2007b; Corso <i>et al.</i> , 2007a) Secondary Readings: (Lafferty <i>et al.</i> , 2001; Kumar & Hebert, 2003; Tu, 2005)	A. Chen
7	10/10	Bayesian Segmentation by Weighted Aggregation Primary Readings: (Corso <i>et al.</i> , n.d.; Akselrod-Ballin <i>et al.</i> , 2006) Secondary Readings: (Corso <i>et al.</i> , 2006; Sharon <i>et al.</i> , 2000; Sharon <i>et al.</i> , 2001)	I. Nwogu
8	10/17	Hybrid Generative-Discriminative Models and 3D Region Competition Primary Readings: (Tu <i>et al.</i> , 2007) Secondary Readings: (Zhu & Yuille, 1996; Tu, 2005)	M. Yaqub
9	10/24	Minimum Description Length Active Shape Models Primary Readings: (Heimann <i>et al.</i> , 2005) Secondary Readings: (Cootes <i>et al.</i> , 1995; Cootes <i>et al.</i> , 2001; Davies <i>et al.</i> , 2002)	P. Noel
10	10/31	Class Cancelled For MICCAI 2007	
11	11/7	Deformable Medial-Axis Shape-Based Segmentation Primary Readings: (Pizer <i>et al.</i> , 2003) Secondary Readings: (Joshi <i>et al.</i> , 2001; McInerney <i>et al.</i> , 1996)	J. Evanko
12	11/14	Shape Regression Machine and Image-Based Regression Primary Readings: (Zhou & Comaniciu, 2007) Secondary Readings: (Zhou <i>et al.</i> , 2005; Viola & Jones, 2001; Freund & Schapire, 1997)	R. Rodrigues

Part II: Project Presentations

Each student doing a project will give a 20-minute conference style presentation of the work.

13	11/21	Class Cancelled for Thanksgiving Holiday	
14	11/28		
15	12/5		

References

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