

---

# Medical Imaging Summer School 2014

28 July - 1 Aug 2014 Favignana, Sicily

---

## *Medical Imaging meets Computer Vision*

---

**Polina Golland**

Massachusetts Institute of Technology, US

### **Lecture 1 (in joint with Ramin Zabih): Segmentation in Medical Image Analysis**

*Syllabus: segmentation, atlases, boundary finding, shape models*

We will discuss key approaches to medical image segmentation that have withstood the test of time and have been used across many applications and imaging modalities. We will examine how prior information can be injected into the segmentation process in a form of atlases, shape models or spatial priors. We will also review how local intensity information is incorporated into the segmentation process and integrated with the prior knowledge to produce patient-specific segmentation results.

### **Lecture 2: Segmentation, Visualization and Analysis of Large Multimodal Clinical Image Studies: Application to Stroke**

*Syllabus: segmentation, population studies, stroke, multimodal imaging*

We present an analysis framework for large studies of multimodal clinical quality brain image collections. Processing such datasets is challenging due to low resolution, poor contrast, misaligned images, and restricted field of view. We adapt existing registration and segmentation methods and build a computational pipeline for spatial normalization and feature extraction. The resulting aligned dataset enables clinically meaningful analysis of spatial distributions of relevant anatomical features and of their evolution with age and disease progression. We demonstrate the approach on a neuroimaging study of stroke with more than 1,000 patients across multiple imaging sites. We show that by combining data from several modalities, we can automatically segment important biomarkers such as white matter hyperintensity and characterize pathology evolution in this heterogeneous cohort. Specifically, we examine two sub-populations with different dynamics of white matter hyperintensity changes as a function of age.