

Manasi Datar

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RESEARCH INTERESTS

Statistical Shape Analysis and Visualization

non-parametric models, correspondence models, shape regression, longitudinal shape analysis, ensemble statistics, hypothesis testing

Image Processing and Machine Learning

multi-modality registration, image segmentation, unsupervised clustering, information fusion, hierarchical self-organizing maps (HSOM)

Computational Anatomy

characterization of morphological changes due to natural development or disease progression, visualization of early brain growth, longitudinal analysis of sub-cortical structures

EDUCATION

University of Utah

Advisor: Dr. Ross Whitaker

Thesis: Statistical Analysis of Ensembles of Nonregular Shapes

Ph.D., Scientific Computing

Aug 2008 - Oct 2013

Utah State University

Advisor: Dr. Heng-Da Cheng

Thesis: Natural Scene Segmentation using Information Fusion and HSOMs

M.S., Computer Science

Aug 2002 - May 2005

University of Mumbai

B.E., Computer Engineering

Jun 1998 - Dec 2002

RESEARCH EXPERIENCE

Siemens Healthcare GmbH

Erlangen, Germany

Research Scientist

Jul 2014 - present

1000shapes GmbH

Berlin, Germany

Software Developer

Jan 2014 - Jun 2014

RESEARCH AND DEVELOPMENT FOR IMAGE AND GEOMETRY PROCESSING

- Technical design and implementation of the requirements imposed on the software
- Development and implementation of test plans, planning and design of user interface

Scientific Computing and Imaging Institute (SCI)

Salt Lake City, UT, USA

Research Assistant

Aug 2008 - Oct 2013

ROBUST CORRESPONDENCES FOR NONREGULAR SURFACES

- Isotropy invariant correspondences via Geodesic-distance-to-landmark features
- Geodesic distance for correct inter-particle interactions
- Entropy based on surface normals to model highly curved features
- Intersection with a set of geometric primitives as constraints for open surfaces

CORRESPONDENCES FOR SHAPE CHANGE OVER TIME

- Regression models (linear regression, Gompertz growth model) for cross-sectional shape analysis
- High-dimensional linear mixed-effects model for longitudinal shape analysis

STATISTICAL SHAPE ANALYSIS FOR ORTHOPEDICS

- CAM-FAI study: comparison of complex 3D morphology to quantify morphologic differences
- MO in mouse models: study 'steal phenomenon' via localized correlation measures

GE Global Research (GRC)

Bangalore, India

MOLECULAR PATHOLOGY IMAGE SEGMENTATION

- Application: tissue quantification and staging for prostate cancer detection
- Adapted HSOM segmentation algorithm to segment molecular pathology images

MULTI-MODALITY IMAGE REGISTRATION

- Goal: Provide registration solutions spanning use-cases and applications
- Novel method to use anatomical cues for driving registration

MODELING MATERIAL PROPERTIES FOR NON-RIGID REGISTRATION

- Strategy to vary spatial deformation based on rigidity constraints
- Modified flow-based algorithms to incorporate varying degrees-of-freedom deformation

VISUALIZATION OF IMAGE FUSION

- Novel paradigm to visualize 3D motion fields derived from the fusion process
- Leveraged existing s/w architecture to facilitate visual debugging

Research Scientist

Jun 2005 - Jul 2008

Utah State University

Logan, UT, USA

Graduate Student

Aug 2002 - May 2005

SEGMENTATION OF NATURAL SCENES USING INFORMATION FUSION AND HSOM

- Novel strategy based on region inhomogeneity, to select training samples
- Unsupervised paradigm requiring no *a priori* knowledge of the image domain
- Combination of color and texture features for perceptually consistent segmentation

AUTOMATIC IMAGE ORIENTATION DETECTION

- Image representation based on sub-region color moments
- Reduced feature set using features only from peripheral blocks of an image
- Supervised SOM used to identify and correct image orientation

**JOURNAL
PUBLICATIONS**

I Oguz, J Cates, **M Datar**, B Paniagua, et al., "Entropy-based particle correspondence for shape populations," Int J CARS, 2016 11: 1221. doi:10.1007/s11548-015-1319-6

MD Harris, **M Datar**, RT Whitaker, E Jurrus, et al., "Statistical Shape Modeling of Cam Femoroacetabular Impingement," J Orthop Res., 2013 doi 10.1002/jor.22389

KB Jones, **M Datar**, S Ravichandran, H Jin, et al., "Toward an understanding of the short bone phenotype associated with multiple osteochondromas," J Orthop Res. 2013 Apr;31(4):651-7. doi: 10.1002/jor.22280

**CONFERENCE
PUBLICATIONS**

R Mollro, JA Hauser, X Pennec, **M Datar**, et al., "Longitudinal Parameter Estimation in 3D Electromechanical Models: Application to Cardiovascular Changes in Digestion," FIMH, 2017, pp.432-440

R Mollro, D Neumann, M-M Roh, **M Datar**, et al., "Propagation of Myocardial Fibre Architecture Uncertainty on Electromechanical Model Parameter Estimation: A Case Study," FIMH, 2015, pp.448-456

M Datar, I Lyu, SH Kim, J Cates, et al., "Geodesic distances to landmarks for dense correspondence on ensembles of complex shapes," in Proc. MICCAI (2), 2013, pp.19-26

M Datar, P Muralidharan, A Kumar, S Gouttard, et al., "Mixed-Effects Shape Models for Estimating Longitudinal Changes in Anatomy," in Proc. STIA, 2012, pp.76-87

MD Harris, **M Datar**, E Jurrus, CL Peters, et al., "Statistical Shape Modeling of CAM-type Femoroacetabular Impingement," in Proc. CMBBE, 2012

B Paniagua, L Bompard, J Cates, RT Whitaker, **M Datar**, et al., "Combined SPHARM-PDM and Entropy-based Particle Systems Shape Analysis Framework," Proceedings of SPIE , Volume 8317 (1), 2012

	<p>M Datar, Y Gur, B Paniagua, MA Styner, RT Whitaker, “Geometric Correspondence for Ensembles of Nonregular Shapes,” in Proc. MICCAI (2), 2011, pp.368-375</p> <p>M Datar, J Cates, PT Fletcher, S Gouttard, et al., “Particle Based Shape Regression of Open Surfaces with Applications to Developmental Neuroimaging,” in Proc. MICCAI (1), 2009, pp.167-174</p> <p>JV Miller, G Gopalakrishnan, M Datar, PRS Mendonça, R Mullick, “Deformable Registration with Spatially Varying Degrees of Freedom Constraints,” in Proc. ISBI, 2008, pp.1163-1166</p> <p>M Datar, D Padfield, H Cline, “Color and Texture Based Segmentation of Molecular Pathology Images using HSOMs,” in Proc. ISBI, 2008, pp.292-295</p> <p>M Datar, D Padfield, H Cline, “Color and Texture Based Segmentation of Molecular Pathology Images using HSOMs,” in Proc. MIAAB, 2007, url: http://www.miaab.org/miaab-2007-papers.html</p> <p>M Datar, X Qi, “Automatic Image Orientation Detection Using the Supervised Self-Organizing Map,” in Proc. SIP’06, 2006</p> <p>HD Cheng, M Datar, W Ju, “Natural Scene Segmentation Based on Information Fusion and Homogeneity Property,” in Proc. CVPRIP, 2006</p>
TALKS/ POSTERS	<p>M Datar, “Shape Analysis in Orthopedics,” Graduate Recruitment Visit 2013, SCIx 2012</p> <p>M Datar, “Statistical Shape Analysis with Biomedical Applications,” Engineering Scholars Program, 2012</p> <p>M Datar, Elizabeth Jurrus, “ShapeWorks: Case study, demo and tutorial,” EMBC Workshop, 2012, url: http://www.sci.utah.edu/cibcwks2012-agenda.html</p> <p>MD Harris, M Datar, E Jurrus, CL Peters, RT Whitaker, AE Anderson, “Statistical Shape Modeling of Cam Femoroacetabular Impingement,” ORS Annual Meeting, 2013</p> <p>B Peterson, M Datar, M Hall, RT Whitaker, “GPU Accelerated Particle System for Triangulated Surface Meshes,” SAAHPC, 2010</p> <p>M Datar, J Chang, E Han, Y Mallya, et al., “Correlating Perfusion/Diffusion to Anatomy: A Clinical Study Assessing Automated Image Registration,” ASNR, 2007</p> <p>M Datar, G Gopalakrishnan, S Ranjan, R Mullick, “Anatomically Guided Registration for Multimodal Images,” in Proc. IEEE AIPR, 2006</p> <p>DP Stormont, A Arora, M Chandrasekharan, M Datar, U Dave, C Gharpure, J Jorge, A Kutiyawala, V Patel, B Ramaswamy, L Sackett, and Z Song, “Blue Swarm 3: Integrating Capabilities for an Autonomous Rescue Robot Swarm,” Thirteenth AAAI Robot Competition and Exhibition (AAAI 2004)</p>
PATENTS	<p>D Padfield, M Datar, H Cline, “Segmentation of Tissue Images using Color and Texture.” U.S. Patent 7,949,181</p> <p>R Mullick, G Gopalakrishnan, M Datar, “System and Method for Geometry Driven Registration.” U.S. Patent Application 20070280556</p>
SOFTWARE	<p>ShapeWorks https://github.com/SCIInstitute/shapeworks 2009 - 2013 method for constructing compact, non-parametric point-based models of shape ensembles</p> <p>ShapeWorks Remote Client http://www.sci.utah.edu/software/shapeworks.html 2011 provides a UI and allows ShapeWorks computation to be performed in a Client/Server setting</p>
PROGRAMMING	C, C++, Python, R, Matlab, ITK, VTK, FLTK, OpenGL, QT, CUDA

AWARDS/ RECOGNITION	Travel Award - WiSH Workshop [IPAM, UCLA]	2013
	Top10 Best Poster - Graduate Recruitment Visit	2013
	Travel Award - CRA-W Workshop on Computational Geometry [Tufts University]	2009
	Dushman Award - GRC's highest team technical award [PET VCAR]	2007
	GRC Patents and Publications Citation	2007
	GE Technology Development Fund Award - Project: Visualization of Fusion	2006