

JOSEPH SCHLECHT — CURRICULUM VITAE

US Citizen

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EDUCATION

- PhD, Department of Computer Science** May 2010
University of Arizona
Learning 3-D Models of Object Structure from Images
- MS, Department of Computer Science** May 2006
University of Arizona
Statistical Inference of Biological Structure in Images
- BS, Department of Computer Science** May 2003
North Dakota State University
McNair Scholar Research: Autonomous Mission Planning for
Unmanned Air Vehicles

INTERESTS

Object detection and recognition in images; Scene understanding; Machine learning;
Bayesian statistical methods; Pattern recognition in scientific data

RESEARCH

Postdoctoral Fellow, Computer Vision Jan 2010 – Present
Interdisciplinary Center for Scientific Computing
University of Heidelberg
Supervisor: Prof. Björn Ommer

Currently researching view-based shape representations to detect objects in images. Developed a generative model for object shape that statistically describes contour and appearance-based features. Local contour curvature and junctions were encoded with a non-parametric distribution over oriented line segments. Created a statistical inference method that estimates detection probability and resamples image features given an object hypothesis. Experiments reveal local contour and appearance features are complementary and together improve detection performance. Results further show resampling features under the generative model increases detection accuracy and identifies which object parts are visible in an image.

Collaborated with humanities scholars to analyze illustrations of legal gestures within medieval manuscripts of German law. Developed an efficient, template-based algorithm to detect several types of depicted gestures. Detection results enable a systematic analysis of gesture usage within the manuscripts.

Research Assistant, Department of Computer Science

Aug 2003 – Dec 2009

University of Arizona

Supervisor: Prof. Kobus Barnard

Developed an approach to learn three-dimensional models of object structure from single view images. Represented object structure with a collection of 3-D geometric primitives that are organized by a topology and specified by shape statistics. Image features were modeled as statistically generated by object geometry projected under a camera hypothesis. Created an inference algorithm to learn object and camera models simultaneously from a set of images containing the object category. Recognition results demonstrate the method successfully learns category-level structure, enabling object identification in unseen views, autonomous scene interaction, and inferring function from structure.

Collaborated with plant scientists to apply our 3-D object model and inference algorithm to images of biological structures. Built a grammar-based growth representation for a microscopic genus of fungus, and fit instances of the grammar and imaging system to data. The inferred model facilitates automatic classification and quantification of biological structure in images.

Research Assistant, Arizona Research Labs

Jun 2005 – Dec 2009

University of Arizona

Supervisor: Nirav Merchant, Director of Biotechnology Computing

Designed an ensemble of machine learning methods for predicting male haplogroup from Y chromosome short tandem repeats (STRs). Implemented the approach as a high-throughput prediction system for STR samples, eliminating most manual analysis by lab technicians. Results show the predicted haplogroup accurately places an individual in a temporal and geographic hierarchy of human migration out of Africa. The system was deployed in National Geographic's Genographic Project.

Undergraduate Research Assistant, Computer Science

Nov 2001 – Jun 2003

North Dakota State University

Supervisor: Prof. Kendall Nygard

Explored autonomous mission planning for unmanned air vehicles (UAVs) as part of a McNair research scholarship. Developed emergent behavior models for UAVs using behavior-based robotics, multi-agent systems, and swarm intelligence. Designed and implemented an extensive software simulation framework for experiments and performance evaluation.

TEACHING**Teaching Assistant, Department of Computer Science**

Aug 2006 – Dec 2006

University of Arizona

Computer Graphics, Graduate and Undergraduate

Regularly met with students during office hours for individual tutoring and guidance on course reading and programming assignments. Graded homework, quizzes, and exams on content including polygon scan-line algorithms, 3-D graphics rendering pipeline, and ray tracing. Received high feedback marks from students for consistency, helpfulness, and clarity in communication.

INDUSTRY

IBM Corporation, Disk Access Storage Device, Co-op

May 2000 – Dec 2000

Rochester, MN

Supervisor: Russell Mettler

Analyzed performance and reliability tests for new models of SCSI hard disks deployed to enterprise servers. Diagnosed and solved issues between SCSI hard disk microcode and controller hardware in the AS/400. Developed software to run automated regression tests on networked systems controlling hundreds of hard disks, reducing time to disk integration and increasing team efficiency.

PUBLICATIONS

Contour-based Object Detection

J. Schlecht and B. Ommer

In *Proceedings of the British Machine Vision Conference (BMVC)*, Sept 2011

Detecting Gestures in Medieval Images

J. Schlecht and B. Ommer

In *IEEE International Conference on Image Processing (ICIP)*, Sept 2011

Sampling Bedrooms

L. Del Pero, J. Guan, E. Ernesto, J. Schlecht and K. Barnard

In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 2009-2016, June 2011

Learning 3-D Models of Object Structure from Images

J. Schlecht

PhD Thesis, University of Arizona, May 2010

Learning Models of Object Structure

J. Schlecht and K. Barnard

In *Advances in Neural Information Processing Systems (NIPS)*, pp. 1500-1500, Dec 2009

Machine Learning Approaches for Classifying Haplogroup from Y Chromosome STR Data

J. Schlecht, M. Kaplan, K. Barnard, T. Karafet, M. Hammer and N. Merchant

PLoS Computational Biology, doi:10.1371/journal.pcbi.1000093, June 2008

Inferring Grammar-based Structure Models from 3D Microscopy Data

J. Schlecht, K. Barnard, E. Spriggs and B. Pryor

In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Oral presentation, pp. 1-8, June 2007

Statistical Inference of Biological Structure and Point Spread Functions in 3D Microscopy

J. Schlecht, K. Barnard and B. Pryor

In *Proceedings of the Third International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT)*, Oral presentation, pp. 373-380, June 2006

Decentralized Search by Unmanned Air Vehicles Using Local Communication

J. Schlecht, K. Altenburg, B. Md Ahmed and K. Nygard

In *Proceedings of the International Conference on Artificial Intelligence (IC-AI)*, pp. 757-762, Oral presentation, June 2003

PRESENTATIONS

- Detecting Gestures in Medieval Images, Paper presentation, *IEEE International Conference on Image Processing (ICIP)*, Sept 2011
- Learning 3-D Models of Object Structure from Images, Invited Talk, *Heidelberg Collaboratory for Image Processing Colloquium*, University of Heidelberg, July 2010
- Sampling Structure, Invited Talk, *Uncertainty Quantification Workshop*, University of Arizona, April 2008
- Inferring Grammar-based Structure Models from 3D Microscopy Data, Paper presentation, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, June 2007
- Statistical Inference of Biological Structure and Point Spread Functions in 3D Microscopy, Paper presentation, *Third International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT)*, June 2006
- Statistical Inference of Structure in 3D Microscopy, Invited talk, *University of Arizona Bio-computing Seminar*, Jan 2006
- Extracting Structure from 3D Images, Invited talk, *Symposium Internacional de Informática Aplicada*, Sinaloa, Mex, Nov 2005
- Haplogroup Classification, Invited talk, *University of Arizona Bio-computing Seminar*, Sept 2005

AWARDS & DISTINCTIONS

- Awarded Galileo Circle Scholarship from University of Arizona College of Science, 2009
- Awarded Biology, Mathematics and Physics Initiative (BMPI) Fellowship at the University of Arizona (BIO5), 2007-2008 and 2008-2009
- Awarded Department of Computer Science Outstanding Graduate Research Award, 2008
- Selected by the Department of Computer Science for the College of Science award in scholarship at the University of Arizona, 2008
- Nominated for the University of Arizona's *Team Award for Excellence* as a member of the Arizona Research Labs Genographic Team, 2006
- Awarded a Graduate College fellowship at the University of Arizona, 2003 – 2004
- McNair Scholar at North Dakota State University, 2001 – 2003
- Award for outstanding co-op at IBM, Rochester, 2000

- Graduated from North Dakota State University with honors

ACTIVITIES

- Reviewer for IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2011, 2012
- Reviewer for International Conference on Computer Vision (ICCV) 2011