

# Shawna L. Thomas

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## Education

**M.S./Ph.D. in Computer Science (In Progress)**, Texas A&M University, College Station, TX 1/02 – Present  
Advisor: Nancy M. Amato.  
Research Focus: Robotic motion planning algorithms and their application to biology problems such as protein folding and RNA folding.

**B.S. in Computer Engineering**, Texas A&M University, College Station, TX 8/98 – 12/01  
3.97/4.00 GPA. Summa Cum Laude. University Undergraduate Research Fellow with Senior Honors Thesis.

## Honors and Awards

### Scholarships and Fellowships

IBM Ph.D. Fellowship, 2008–2009  
IBM Fran Allen Ph.D. Fellowship, 2007–2008  
Graduate Assistance in Areas of National Need Fellowship, 2006–2007  
Philanthropic Educational Organization Scholar Award, 2005–2006  
NSF Graduate Research Fellowship, 2002–2005  
Astronaut Scholarship, 2000–2001  
Lechner Scholarship, Fall 1998–Fall 2001

### Awards

Graduate Research Excellence Award, Department of Computer Science, 2007–2008  
Mentoring Award, Department of Computer Science, 2007–2008  
Undergraduate Research Excellence Award, Department of Computer Science, 2001–2002  
CRA Distributed Mentor Program Award, Summer 2001  
University Undergraduate Research Fellow, 2000–2001  
Best Senior Thesis, Computer Science Group, Spring 2001  
Best Senior Thesis Presentation, Computer Science Group, Spring 2001  
Undergraduate Summer Research Grant, Summer 2000  
Best Presentation, Computer Science Group, Summer 2000

### Travel Grants

International Conference on Research in Computational Molecular Biology (RECOMB) Travel Grant, 2007  
IEEE International Conference in Robotics and Automation (ICRA) Travel Grant, 2007  
International Conference on Research in Computational Molecular Biology (RECOMB) Travel Grant, 2006  
Workshop on Flexibility in Biomolecules Travel Grant, 2005  
International Conference on Research in Computational Molecular Biology (RECOMB) Travel Grant, 2004  
Workshop on Modeling Protein Flexibility and Motions Travel Grant, 2004  
IEEE International Conference in Robotics and Automation (ICRA) Travel Grant, 2003

## Experience

**Research Assistant**, Parasol Lab, Department of Computer Science, Texas A&M University 1/02 – Present  
Studying folding, motions, and kinetics of proteins and RNA using motion planning techniques from robotics. Currently refining existing techniques and developing a parallel implementation to facilitate the study of larger, more complex molecules. Expanding the types of experimental data to validate our simulations with by developing new analysis tools. Extending the implementation of two probabilistic roadmap algorithms (motion planning techniques) for journal submissions. Supervising changes to the research group's common C++ code base.

**Teaching Assistant**, Department of Computer Science, Texas A&M University 6/07 – 8/07  
Assisted Dr. Teresa Leyk in CPSC 211: Data Structures, an undergraduate course in the Department of Computer Science. Duties included administering 1 hour lab sessions twice a week, providing assistance during office hours to students, and grading labs and homework assignments.

**Researcher**, Department of Computer Science, Rice University 6/01 – 8/01  
Studied protein-protein interactions with Dr. Lydia Kavragi through the CRA Distributed Mentor Program. Applied motion planning techniques from robotics, specifically variations of probabilistic roadmap algorithms, to interactions between proteins. Proposed a new approach to interaction simulation and began implementation.

**University Undergraduate Research Fellow**, Department of Computer Science, Texas A&M University 8/00 – 5/01  
Developed a variation of the probabilistic roadmap algorithm using clearances. Published and presented the results in a Senior Honors Thesis. Awarded Best Senior Thesis and Best Presentation for the Computer Science Group.

**Undergraduate Researcher**, Department of Computer Science, Texas A&M University 10/99 – 12/01  
Worked on an adaptive version of the probabilistic roadmap algorithm. Published and presented a paper at the 2001 *IEEE International Conference on Robotics and Automation* in Seoul, Korea, May 2001. Continued the development of VIZMO, an interactive graphics software package that visualizes probabilistic roadmaps.

## Publications in Refereed Journals and Conferences

- [1] “Simulating RNA Folding Kinetics on Approximated Energy Landscapes.” Xinyu Tang, Shawna Thomas, Lydia Tapia, David Giedroc, Nancy M. Amato, in the *Journal of Molecular Biology (JMB)*, to appear.
- [2] “Kinetics Analysis Methods for Approximate Folding Landscapes.” Lydia Tapia, Xinyu Tang, Shawna Thomas, and Nancy M. Amato, in *Proc. of the International Conference on Intelligent Systems for Molecular Biology (ISMB)/European Conference on Computational Biology (ECCB)* Vienna, Austria, published in *Bioinformatics*, 23(13): i539–i548, July 2007. (acceptance rate: 15%)
- [3] “Simulating Protein Motions with Rigidity Analysis.” Shawna Thomas, Xinyu Tang, Lydia Tapia, and Nancy M. Amato, in *Journal of Computational Biology (JCB)*, 14(6): 839–855, July 2007. A preliminary version appeared in [9].
- [4] “Planning with Reachable Distances: Fast Enforcement of Closure Constraints.” Xinyu Tang, Shawna Thomas, and Nancy M. Amato, in *Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Roma, Italy, April 2007, pp. 2694–2699. (acceptance rate: 44%)
- [5] “Biasing Samplers to Improve Motion Planning Performance.” Shawna Thomas, Marco Morales, Xinyu Tang, and Nancy M. Amato, in *Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Roma, Italy, April 2007, pp. 1625–1630. (acceptance rate: 44%)
- [6] “Tools for Simulating and Analyzing RNA Folding Kinetics.” Xinyu Tang, Shawna Thomas, Lydia Tapia, and Nancy M. Amato, in *Proc. of the International Conference on Research in Computational Molecular Biology (RECOMB)*, Oakland, CA, April 2007, pp. 268–282. (acceptance rate: 21%)
- [7] “RESAMPL: A Region-Sensitive Adaptive Motion Planner.” Samuel Rodriguez, Shawna Thomas, Roger Pearce, and Nancy M. Amato, in *Proc. of the International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, New York City, NY, July 2006. (acceptance rate: 49%)
- [8] “Incremental Map Generation (IMG).” Dawen Xie, Marco A. Morales A., Roger Pearce, Shawna Thomas, Jyh-Ming Lien, and Nancy M. Amato, in *Proc. of the International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, New York City, NY, July 2006. (acceptance rate: 49%)
- [9] “Simulating Protein Motions with Rigidity Analysis.” Shawna Thomas, Xinyu Tang, Lydia Tapia, and Nancy M. Amato, in *Proc. of the International Conference on Research in Computational Molecular Biology (RECOMB)*, pp. 394–409, April 2006. (acceptance rate: 18%)
- [10] “Parallel Protein Folding with STAPL.” Shawna Thomas, Gabriel Tanase, Lucia K. Dale, Jose M. Moreira, Lawrence Rauchwerger, and Nancy M. Amato, in *Concurrency and Computation: Practice and Experience*, 17(14): 1643–1656, December 2005. A preliminary version appeared in [13].
- [11] “Protein Folding by Motion Planning.” Shawna Thomas, Guang Song, and Nancy M. Amato, in *Physical Biology*, 2:S148–S155, November 2005.
- [12] “Using Motion Planning to Study RNA Folding Kinetics.” Xinyu Tang, Bonnie Kirkpatrick, Shawna Thomas, Guang Song, and Nancy M. Amato, in *Journal of Computational Biology (JCB)*, 12(6): 862–881, July 2005. A preliminary version appeared in [14].

- [13] “Parallel Protein Folding with STAPL.” Shawna Thomas and Nancy M. Amato, in *Proc. of the IEEE International Workshop on High Performance Computational Biology (HiCOMB)*, Santa Fe, New Mexico, April 2004.
- [14] “Using Motion Planning to Study RNA Folding Kinetics.” Xinyu Tang, Bonnie Kirkpatrick, Shawna Thomas, Guang Song, and Nancy M. Amato, in *Proc. of the International Conference on Research in Computational Molecular Biology (RECOMB)*, San Diego, California, March 2004, pp. 252–261. (acceptance rate: 17%)
- [15] “A General Framework for Sampling on the Medial Axis of the Free Space.” Jyh-Ming Lien, Shawna L. Thomas, and Nancy M. Amato, in *Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Taipei, Taiwan, May 2003, pp. 4439–4444. (acceptance rate: 61%)
- [16] “A General Framework for PRM Motion Planning.” Guang Song, Shawna Thomas, and Nancy M. Amato, in *Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Taipei, Taiwan, May 2003, pp. 4445–4450. (acceptance rate: 61%)
- [17] “A Path Planning-Based Study of Protein Folding with a Case Study of Hairpin Formation in Protein G and L.” Guang Song, Shawna Thomas, Ken A. Dill, J. Martin Scholtz, and Nancy M. Amato, in *Proc. of the Pacific Symposium on Biocomputing (PSB)*, Lihue, Hawaii, January 2003, pp. 240–251.
- [18] “Customizing PRM Roadmaps at Query Time.” Guang Song, Shawna Miller<sup>1</sup>, and Nancy M. Amato, in *Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Seoul, Korea, May 2001, pp. 1500–1505. (acceptance rate: 65%)
- [19] “Modeling Protein-Protein Interactions with the Aid of Motion Planning Algorithms.” Shawna Miller<sup>1</sup>, CRA Distributed Mentor Program Final Report, September 2001.
- [20] “Using Spheres to Improve Motion Planning Algorithms.” Shawna Miller<sup>1</sup>, Senior Honors Thesis, Texas A&M University, April 2001.

## Posters at Conferences and Workshops

- [1] “Elucidating the Protein Folding Core.” Shawna Thomas, Lydia Tapia, and Nancy M. Amato, at the *Texas Protein Folders Meeting*, Navasota, TX, March 2008, and at the *Alliance for Bioinformatics, Computational Biology and Systems Biology (ABCS) Workshop*, College Station, TX, February 2008,
- [2] “Distinguishing Folding Behavior with Rigidity Analysis.” Shawna Thomas, Xinyu Tang, Lydia Tapia, and Nancy M. Amato, at the *2007 Grace Hopper Celebration of Women in Computing*, Orlando, FL, October 2007, and at the *International Conference on Research in Computational Molecular Biology (RECOMB)*, Oakland, CA, April 2007.
- [3] “Folding Core Prediction from Rigidity Analysis and Approximate Landscape Models.” Shawna Thomas and Nancy M. Amato, at the joint *International Conference on Intelligent Systems for Molecular Biology (ISMB)* and the *European Conference on Computational Biology (ECCB)*, Vienna, Austria, July 2007.
- [4] “A Motion Planning Approach to Studying Protein Folding.” Xinyu Tang, Lydia Tapia, Shawna Thomas, and Nancy M. Amato, at the *German-American Frontiers of Engineering Symposium (GAFOE)*, Hamburg, Germany, April 2007.
- [5] “Tools for Simulating and Analyzing RNA Folding Kinetics.” Xinyu Tang, Shawna Thomas, Lydia Tapia, and Nancy M. Amato, at the *International Conference on Research in Computational Molecular Biology (RECOMB)*, Oakland, CA, April 2007 and at the joint *2007 International Conference on Intelligent Systems for Molecular Biology (ISMB)* and the *European Conference on Computational Biology (ECCB)*, Vienna, Austria, July 2007.
- [6] “Kinetics Analysis Methods for Approximate Folding Landscapes.” Lydia Tapia, Xinyu Tang, Shawna Thomas, and Nancy M. Amato, at the *Texas Protein Folders Meeting*, Navasota, TX, March 2007 and at the *International Conference on Research in Computational Molecular Biology (RECOMB)*, Oakland, CA, April 2007.
- [7] “Tools for Simulating and Analyzing RNA Folding Kinetics.” Xinyu Tang, Shawna Thomas, and Nancy M. Amato, at the *Texas Protein Folders Meeting*, Navasota, TX, March 2007.

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<sup>1</sup>Former last name.

- [8] “Simulating Protein Motions with Rigidity Analysis.” Shawna Thomas, Xinyu Tang, Lydia Tapia, and Nancy M. Amato, at the *Texas Protein Folders Meeting*, Navasota, TX, April 2006.
- [9] “Using Motion Planning to Study RNA Folding Kinetics.” Xinyu Tang, Shawna Thomas, and Nancy M. Amato, at the *Texas Protein Folders Meeting*, Navasota, TX, April 2006.
- [10] “Simulating Protein Motions via Rigidity Analysis.” Shawna Thomas and Nancy M. Amato, at the *Texas Protein Folders Meeting*, Navasota, TX, June 2005.
- [11] “Better Simulation of Protein Motions via Rigidity.” Shawna Thomas and Nancy M. Amato, at the *Workshop on Flexibility in Biomolecules*, Tempe, AZ, May 2005.
- [12] “A Motion Planning Approach to Protein Folding.” Guang Song, Shawna Thomas, and Nancy M. Amato, at the *ACM Symposium on Computational Geometry (SCG)* in conjunction with *FCRC 2003*, San Diego, CA, 2003.

## Service and Professional Activities

### **2007 Grace Hopper Celebration of Women in Computing Scholarship Committee** 3/07 – 10/07

Served on the scholarship committee by developing websites for scholarship application submissions to the Grace Hopper Celebration of Women in Computing Conference, the Richard Tapia Celebration of Diversity in Computing Conference, and Bridge Day, for applicant reviewing by external academic and industrial professionals, for awarding scholarships to applicants by the committee, and for applicant acceptance/rejection of scholarships. The website also included automated email tools for notifying applicants and their references of deadlines and statuses. The committee received 423 applications to Grace Hopper only, 64 applications to Richard Tapia only, and 203 applications to both Grace Hopper and Richard Tapia.

### **Undergraduate Distributed Mentor Project (DMP) Mentor** 6/07 – 8/07, 6/06 – 8/06

Mentored an undergraduate student in a 10-week research program sponsored by the Committee on the Status of Women in Computing Research (CRA-W) each summer. Their projects (simulating tryptophan fluorescence and incorporating Molecular Dynamics data into our simulations) were related to my thesis work on protein folding.

### **Graduate Teaching Academy** 8/06 – 5/07

Participated in professional teaching development through the Graduate Teaching Academy for the 2006–2007 academic year. The program included attending weekly seminars, developing a teaching statement, and classroom observation under the supervision of a faculty mentor.

### **Undergraduate Honors Thesis Mentor** 10/04 – 5/06

Mentored two undergraduate students in research projects related to my thesis work on motion planning and protein folding through organizing weekly meetings, selecting relevant work for them to read, and discussing their reading and research. Both undergraduates participated in the University Undergraduate Research Fellows program.

### **Aggie Women in Computer Science, ACM-W Chapter, President** 8/02 – 10/04

Organized outreach events for women in computer science at Texas A&M University such as the Mentor Match-Up Party for our peer mentoring program and coffee breaks. Helped organize the annual Computer Science Awards Banquet and developed a selection committee for the student mentoring awards. Organized trip to the 2004 Grace Hopper Celebration of Women in Computing Conference for 23 of our members including 2 undergraduates.

### **CSNet Advisory Committee** 6/04 – 8/04

Served on the CSNet Advisory Committee as the graduate student representative to create the Computer Science Department’s new intranet and communication portal.

### **Aggie Women in Computer Science, ACM-W Chapter, Distinguished Lecturer Co-Chair** 8/01 – 7/02

Managed Distinguished Lecture events including luncheons for the speaker with our members, department-wide receptions, and securing lecture rooms and equipment. Volunteered on “Girl Scouts Go To College Day” to lead a workshop teaching elementary age girls how to use the computer.

### **Reviewer for Scientific Conferences and Journals:**

Bioinformatics, Eurographics, IEEE International Conference on Robotics and Automation (ICRA), IEEE International Symposium on Parallel and Distributed Processing (IPDPS), IEEE Transactions on Robotics and Automation (TRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), International Conference on Research in Computational Molecular Biology (RECOMB), International Journal of Robotics Research (IJRR), International Workshop on the Algorithmic Foundations of Robotics (WAFR), Robotics: Science and Systems Conference (RSS), Physical Biology, and Proteins: Structure, Function, and Bioinformatics.

**Other Departmental Service:**

Served on student panels for both undergraduate and graduate audiences, student representative to Industrial Affiliates Program (IAP) meetings, helped organize Aggie Women in Computer Science (AWICS) trip to the 2006 Grace Hopper Celebration on Women in Computing Conference for 21 of our members including 3 undergraduates, student representative to meetings with faculty candidates, and assisted setup and preparation for annual departmental activities such as the fall picnic, the spring awards banquet, and the alumni picnic.