Curriculum Vitae of Md Ariful Islam

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RESEARCH OVERVIEW

I develop computational and analytical tools and techniques to make the Cyber-Physical Systems (CPSs) safe and reliable. CPSs constitute the base of todays most exciting future-facing initiatives including **Internet of Things (IoT)**, **Automated Vehicles**, **Industry 4.0**, **Machine-to-Machine** (M2M), and **TSensors** (Trillion Sensors). For the last seven years, I have been working on model-driven verification and validation of CPSs by integrating techniques from system engineering, formal methods, and control theory.

EMPLOYMENT

- **Carnegie Mellon University, Pittsburgh** *January 2016-*
  Postdoctoral Scholar
  Mentor: Edmund Clarke
  Project: HYCIRCA, dReach, CyberCardia
- **Stony Brook University, Stony Brook** *June 2011-December 2015*
  Graduate Research Assistant
  Mentors: Scott Smolka and Radu Grosu
  Project: CyberCardia, CMACS
- **Modeling and Simulation Group, Novartis, East Hanover** *June 2012-August 2012*
  Research Intern
  Mentor: Melissa Hallow
  Project: Modeling Hypertension
- **Stochastic Logic, Dhaka, Bangladesh** *March 2009- July 2010*
  Quantitative Developer
  Mentor: Dr. Arif Doula
  Project: Stock market analysis

EDUCATION

- **Stony Brook University, Stony Brook, NY** *December 2015*
  Ph.D. in Computer Science
  Dissertation title: Formal verification of nonlinear biological systems
  Advisors: Scott Smolka and Radu Grosu
  Committee: Scott Smolka, Radu Grosu, Allen Tannenbaum, and Sayan Mitra
- **Bangladesh University of Engineering and Technology (BUET), Dhaka** *March 2009*
  Bachelor of Science (B.S.) in Computer Science and Engineering

AWARDS & HONORS

- **Travel Grant**, SRI Summer School on Formal Techniques, 2014 & 2015
- **CMSB Student Travel Grant**, IST, Austria, 2013
- **RAP Travel Scholarship**, Graduate Student Organization, Stony Brook University, 2013
- **CCGG Student Travel Grant**, Waterloo, Canada, 2013
- **University Fellowship**, Stony Brook University, 2010
- **Academic Excellence Scholarship** , BUET, Bangladesh, 2005-2009

- **Dean's List Award**, BUET, Bangladesh, 2006-2009
- **Education Board Scholarship**, Government of Bangladesh, 2001 & 2001
- **Primary & Junior School Scholarship**, Government of Bangladesh, 1996 & 1999

SELECTED PUBLICATIONS

Peer-Reviewed Journal Articles:

1. **Md Ariful Islam** , Rance Cleaveland, Flavio H. Fenton, Radu Grosu, Paul L. Jones, Scott A. Smolka. Probabilistic Reachability for Multi-Parameter Bifurcation Analysis of Cardiac Alternans. Theoretical Computer Science (TCS), 2018.
2. Abhishek Murthy, **Md Ariful Islam**, Radu Grosu and Scott Smolka. Computing compositional proofs of input-to-output stability using SOS optimization and δ-decidability. Nonlinear Analysis: Hybrid Systems (NAHS), 2017.
3. **Md Ariful Islam**, Abhishek Murthy, Ezio Bartocci, Elizabeth Cherry, Flavio Fenton, James Glimm, Scott A. Smolka and Radu Grosu. Model-order reduction of ion channel dynamics using approximate bisimulation. Theoretical Computer Science (TCS), 2014.
4. Syed Ishtiaque Ahmed, Masud Hasan and **Md Ariful Islam**. Cutting a convex polyhedron out of a sphere. Graphs and Combinatorics (GC), 2011.
5. Syed Ishtiaque Ahmed, **Md Ariful Islam** and Masud Hasan. Cutting a cornered convex polygon out of a circle. Journal of Computers (JCP), 2010.

Peer-Reviewed Conference & Workshop Papers:

6. Nicola Paoleti, **Md Ariful Islam**, Shan Lin, Scott Smolka. Synthesizing Stealthy Reprogramming Attacks on Cardiac Devices. International Conference on Embedded Software (EMSOFT), 2018. (submitted)
7. Jacek Cyranka*, **Md Ariful Islam***, Greg Byrne, Paul Jones, Scott Smolka, Radu Grosu. Tight Continuous-Time Reachtubes for Lagrangian Reachability. The 57^{th} IEEE Conference on Decision and Control (CDC), 2018 (submitted). [*- equal contribution]
8. Jacek Cyranka*, **Md Ariful Islam***, Greg Byrne, Paul Jones, Scott Smolka, Radu Grosu. Lagrangian Reachability. The 29^{th} International Conference on Computer-Aided Verification (CAV), 2017. [*- equal contribution]
9. Junxing Yang, **Md Ariful Islam**, Abhishek Murthy, Scott A. Smolka, and Scott D. Stoller. A Simplex Architecture for Hybrid Systems using Barrier Certificates. The 36^{th} International Conference on Computer Safety, Reliability and Security (SAFECOMP), 2017.
10. **Md Ariful Islam**, Greg Byrne, Soonho Kong, Edmund M. Clarke, Rance Cleaveland, Flavio H. Fenton, Radu Grosu, Paul L. Jones, Scott A. Smolka. Bifurcation Analysis of Cardiac Alternans Using δ -Decidability. The 14^{th} International Conference on Computational Methods in Systems Biology (CMSB), 2016.
11. **Md Ariful Islam**, Qinsi Wang, Ramin M. Hasani, Ondrej Balun, Edmund M. Clarke, Radu Grosu, Scott A. Smolka: Probabilistic Reachability Analysis of the Tap Withdrawal Circuit in Caenorhabditis elegans. The 18^{th} IEEE International Workshop High-Level Design Validation and Test Workshop (HLDVT), 2016.
12. **Md Ariful Islam**, Hyunkung Lim, Nicola Paoletti, Houssam Abbas, Zhihao Jiang, Jacek Cyranka, Rance Cleaveland, Sicun Gao, Edmund Clarke, Radu Grosu, Rahul Mangharam, Elizabeth Cherry, Flavio Fenton, Richard A. Gray, James Glimm, Shan Lin, Qinsi Wang, and Scott A. Smolka. CyberCardia Project: Modeling, Verification and Validation of Implantable Cardiac Devices. IEEE International Conference on Bioinformatics and Biomedicine (BIBM), 2016.

13. Abhishek Murthy, **Md Ariful Islam**, Radu Grosu and Scott Smolka. Computing bisimulation bunctions using SOS optimization and delta-decidability over the Reals. The 18^{th} International Conference on Hybrid Systems: Computation and Control (HSCC), 2015. (**Best Paper Session**)
14. **Md Ariful Islam**, Richard DeFrancisco, Chuchu Fan, Radu Grosu, Sayan Mitra, Scott Smolka. Model checking tap withdrawal in C. Elegans. The 4^{th} International Workshop on Hybrid Systems Biology (HSB), 2015.
15. Konstantin Selyunin, Denise Ratasich, Ezio Bartocci, **Md Ariful Islam**, Scott Smolka, Radu Grosu. Neural programming: towards adaptive controls in cyber-physical systems. The 54^{th} IEEE Conference on Decision and Control (CDC), 2015.
16. **Md Ariful Islam**, Abhishek Murthy, Antoine Girard, Scott Smolka and Radu Grosu. Compositionality results for cardiac cell dynamics. The 17^{th} International Conference on Hybrid Systems: Computation and Control (HSCC), 2014.
17. **Md Ariful Islam**, Abhishek Murthy, Ezio Bartocci, Scott Stoller, Scott Smolka and Radu Grosu. Tracking action potentials of nonlinear excitable cells using model predictive control. The 6^{th} International Conference on Bioinformatics, Biocomputational Systems and Biotechnologies (BioTechno), 2014.
18. Abhishek Murthy, **Md Ariful Islam**, Ezio Bartocci, Elizabeth Cherry, Flavio Fenton, James Glimm, Scott Smolka and Radu Grosu. Approximate bisimulations for sodium channel dynamics. The 10^{th} International Conference on Computational Methods in Systems Biology (CMSB), 2012.
19. Syed Ishtiaque Ahmed, Masud Hasan and **Md Ariful Islam**. Cutting a convex polyhedron out of a sphere. The 4^{th} International Workshop on Algorithms and Computation (WALCOM), 2010.
20. Syed Ishtiaque Ahmed, **Md Ariful Islam** and Masud Hasan. Cutting a cornered convex polygon out of a circle. The 11^{th} International Conference on Communications and Information Technology (ICCIT), 2008.

Theses:

21. **Md Ariful Islam**. Formal verification of nonlinear biological systems. Advised by Scott Smolka and Radu Grosu. PhD dissertation, Department of Computer Science, Stony Brook University, 2015.
22. **Md Ariful Islam**, Syed Ishtiaque Ahmed. Algorithms in computational geometry. Undergraduate Thesis, Department of Computer Science and Engineering, BUET, Dhaka, 2009.

TEACHING EXPERIENCE

- Fall 2010
  Teaching Assistant: ISE 320 - Information Management
  Grader: CSE 102 - Introduction to Web Design and Programming

- Spring 2011
  Teaching Assistant: CSE 215 - Foundations of Computer Science

POSTERS & PRESENTATIONS

1. Probabilistic Reachability Analysis of the Tap Withdrawal Circuit in Caenorhabditis elegans. IEEE International Workshop High-Level Design Validation and Test Workshop (HLDVT), Santa Cruz, 2016.
2. Computing bisimulation functions using SOS optimization and δ-decidability over the reals. International Conference on Hybrid Systems: Control and Computation, Seattle, April, 2015.
3. Compositionality results for cardiac cell dynamics. Tutorial Workshop on Parameter Estimation for Biological Models, NC State University, Raleigh, NC, August, 2014.(Poster)
4. Compositionality results for cardiac cell dynamics. Computational Methods in Systems Biology (CMSB), IST Austria, 2013. (Poster)

5. Approximate bisimulations for sodium channel dynamics. Computational Methods in Systems Biology, The Royal Society, London, UK. October, 2012.
6. Bisimulation-based abstraction of sodium channel dynamics in cardiac cell models. Workshop on Systems Biology and Formals Methods, NYU, NY, Mar. 30, 2012.
7. Cutting a cornered convex polygon out of a circle. International Conference on Computer and Information Technology (ICCIT), Khulna, Bangladesh, Dec. 2008.

PROFESSIONAL ACTIVITIES

PC Member:

- 2018: DARS
- 2017: MSE@SEFM, HSCC (RE Committee)
- 2016: FMBBS, CMSB (Tool Evaluation Committee)

Reviewer/Sub-reviewer:

- 2017: Systems & Control Letters
- 2016: TACAS
- 2015: ATVA, HSCC, HSB, ICFEM, TACAS
- 2014: FMMB, ICFEM,
- 2013:CMSB, HSCC
- 2012: HSCC
- 2011: RV, FORMATS

REFERENCES

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