

# MICHAEL D. SHAH CURRICULUM VITAE

<http://www.mshah.io>

Somerville, MA 02145

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## PERSONAL

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- Last Updated: January 28, 2020
- Citizenship: U.S.A.
- Title of Thesis for Most Advanced Degree
  - Understanding and Tuning the Performance of Synchronized Methods in Java with Program Analysis and Software Visualization Tools
- Principal Fields of Interest:
  - Computer Systems (Concurrency and Performance)
  - Program Analysis
  - Software Visualization
  - Computer Graphics and Gaming (Data Structures)

## EDUCATION

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<b>Tufts University</b> Ph.D. Department of Computer Science Engineering	<i>July 2017</i>
<b>Tufts University</b> Master of Science Department of Computer Science Engineering	<i>May 2013</i>
<b>The Ohio State University</b> Bachelors of Science Department of Computer Science Engineering	<i>June 2011</i>

## ACADEMIC APPOINTMENTS/EMPLOYMENT

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- 2018-Present, Assistant Teaching Professor<sup>1</sup>, Northeastern University in Khoury College of Computer Sciences
- 2017-2018, Lecturer, Northeastern University in College of Computer and Info Sciences
- 2017, Lecturer, Tufts University in Computer Science Engineering Department

## WORK EXPERIENCE

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- 2017 Part-time, Graphics Engineer, Oblong Industries
- 2016 Intern, Graphics Software Engineer, Intel Corporation.
- 2015 Intern, Compiler Engineer, Sony Computer Entertainment America
- 2014 Intern, Concurrency Engineer, Intel Corporation

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<sup>1</sup>Typical promotion to this rank takes 3 years at lecturer level.

- 2013 Helpdesk Representative, Tufts University
- 2013 Simulation and Modeling Programmer, Boston Medical Center
- 2011-2012 Research Assistant, Tufts University
- 2011 Intern, Validation Engineer, Intel Corporation
- 2010 Research Intern, Oregon Health and Sciences University
- 2009-2011 Undergraduate Research Assistant, Ohio Supercomputing Center
- 2008-2010 Java/C++ Help desk, The Ohio State University
- 2008 Intern, Web Developer, StudioCT
- 2005-Present Freelance Game Programmer, The Game Creators

## **PAPERS IN PROCEEDINGS OF REFEREED CONFERENCES**

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1. M. Shah, “Lib Metamorphosis: A Performance Analysis Framework for Exchanging Data Structures in Performance Sensitive Applications” 2019 IEEE International Conference on Software Maintenance and Evolution (ICSME), Cleveland, OH, USA, 2019, pp. 379-381.
2. E.C. Sheffield, M. D. Shah, “Dungeon Digger: Apprenticeship Learning for Procedural Dungeon Building Agents”, Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts, 2018.
3. M. D. Shah, S. Z. Guyer, “Iceberg: A Dynamic Analysis of Java Synchronized Methods Investigating Runtime Performance Variability”, Proceedings of the 7th ACM SIGPLAN International Workshop on State Of the Art in Program Analysis, 2018.
4. M. D. Shah, S. Z. Guyer, “Iceberg: A Tool for Static Analysis of Java Critical Sections”, Proceedings of the 5th ACM SIGPLAN International Workshop on State Of the Art in Program Analysis, 2016.
5. M. D. Shah, S. Z. Guyer, “An Interactive Microarray Call-Graph Visualization”, IEEE Working Conference on Software Visualization, 2016.
6. M. D. Shah, S. Z. Guyer, “Critical Section Investigator-Building Story Visualizations with Program Traces”, IEEE Working Conference on Software Visualization, 2016.

## **POSTERS PRESENTED AT REFEREED CONFERENCES**

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1. 2017 PLDI - Iceflow A Dynamic and Data Flow Analysis of Critical Sections
2. 2016 IEEE VISSOFT, An Interactive Microarray Call Graph Visualization

## **AWARDS, SCHOLARSHIPS, AND HONORS**

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- 2019 Northeastern University Teaching Inquiry Fellow
  - A year long series of teaching workshops, readings of literature, and development of pedagogy.
- 2016 Tufts Ignite Research Talks, 3rd Place Winner
- 2016 Tufts Graduate Institute for Teaching Fellowship (GIFT) Awardee
- 2016 Tufts Outstanding Graduate Student Organization (Founder)
  - Computer Science League of Learning
- 2015 Tufts Ignite Research Talk, 3rd Place Winner

- 2015 Outstanding Graduate Student Service Award
- 2014 Programming Languages Mentoring Workshop Scholarship Awardee
- 2011 GEM Ph.D. Graduate Fellowship Awardee
- 2010 Choose Ohio First for Bioinformatics Scholarship Award Winner

## GRANTS AND FELLOWSHIP

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### External Research Grants

- XSEDE Empower Grant, January 2020 — Received \$1500 NSF XSEDE funding for one undergraduate students to work on program analysis and building performance assertion profiler.
- Google Faculty Research Award, November 2019 — Received \$75,000
  - Project Title: Intelligent Data Structure Swap
- Applied Nov '19 (not received) Mozilla Research Grants 2019H2 — \$40,000
- XSEDE Empower Grant, September 2019 — Received \$5700
  - NSF XSEDE funding for three undergraduate students to work on semester long research projects on cache-oblivious data structures and program analysis.
  - NSF XSEDE funding for one undergraduate students to work on program analysis and building performance assertion profiler.
- XSEDE Empower Grant, May 2019 — Received \$5600
  - NSF XSEDE funding for three undergraduate students to work on semester long research projects on cache-oblivious data structures.
- XSEDE Empower Grant, January 2019 — Received \$1500
  - NSF XSEDE funding for two undergraduate students to work on semester long research projects on high performance computing.
- NVIDIA GPU Grant, June 2018 — Received \$1299
- Google Cloud Grants, June 2018 — Received \$7100

### Internal Research Grants

- Mathworks Mini-grant (Internal to Northeastern) (Applied - not received) \$17,400
- Tufts University Research Competition Awardee, Fall 2016 — \$800
- Tufts University Research Competition Awardee, Spring 2016 — \$400

### Travel Grants

- 2017 ACM SIGPLAN PLDI Conference on Programming Language Design and Implementation Travel Grant Awardee
- 2017 Boost Foundation Travel Grant Awardee for CPPCON 2017
- 2016 ACM SIGPLAN PLDI Conference on Programming Language Design and Implementation Travel Grant Awardee
- 2013 ACM SIGPLAN PLDI Conference on Programming Language Design and Implementation Travel Grant Awardee

## CONFERENCE ACTIVITY/PARTICIPATION

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- 2018 Game Developers Conference (GDC) Conference Associate
- 2017 ECOOP Summer School on Programming Languages scholarship
- 2017 Programming Language Design and Implementation (PLDI) Student Volunteer
- 2017 CPPNow Student Volunteer
- 2016 Programming Language Design and Implementation (PLDI) Student Volunteer
- 2015 Programming Language Design and Implementation (PLDI) Student Volunteer
- 2013 Programming Language Design and Implementation (PLDI) Student Volunteer

## INVITED TALKS AT REFEREED VENUES

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- 2019, ACCU Autumn in Belfast, UK — Introduction to Cache Oblivious Algorithms
- 2018, CPPCON in Bellevue, WA — Let's Intercept OpenGL Function Calls...for Logging!
- 2018, FOSDEM in Brussels, Belgium — Introduction to LLVM
- 2013, PLDI(Fun and Interesting Thoughts) in Seattle, WA — Hot Streak Cold Streak Programming

## INVITED TALKS

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- 2017, February at Massachusetts Institute of Technology — Introduction to LLVM Performance Engineering Course Lecture
- 2016, November at Massachusetts Institute of Technology — Profile Guided Optimizations, LLVM Seminar
- 2016, October at Massachusetts Institute of Technology — Introduction to LLVM, LLVM Seminar
- 2016, May at Pint of Science — How do Computers Compute so Fast in Cambridge, MA

## CAMPUS OR DEPARTMENTAL TALKS

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- July 2019 at Northeastern — Joint Northeastern and MIT Introduction to Program Analysis - LLVM/Systems Seminar Series
- June 2019 at Northeastern — Joint Northeastern and MIT Introduction to Clang - LLVM/Systems Seminar Series
- June 2019 at Northeastern — Joint Northeastern and MIT Introduction to LLVM - LLVM/Systems Seminar Series
- October 2018 at Northeastern — Teaching Seminar Talk on Introduction to Github Classroom
- March 2018 at Northeastern — Guest Lecture for Nathaniel Tuck's Systems Course
- November 2015 at Tufts — Guest Lecture Concurrency (Undergraduate), GPGPU programming
- April 2015 at Tufts — Guest Lecture Game Design (Graduate Level), Physics and Unity3D
- March 2015 at Tufts — Guest Lecture Game Design (Graduate Level), C# and Unity3D
- April 15, 2014 at Tufts — Guest Lecture Computer Graphics (Graduate Level), Programming with Shaders Using OpenGL.
- April 22, 2014 at Tufts — Guest Lecture Computer Graphics (Graduate Level), GPU Programming with OpenGL and CUDA.

- April 2013 at Tufts — Guest Lecture Human Computer Interaction (Graduate Level), Looking into the Future of HCI

## TEACHING EXPERIENCE OF MICHAEL D. SHAH

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- CS 5500 Foundations of Software Engineering, Northeastern University Sp '20
  - (Grad) Designed course on building software learning design patterns, Git, Object-Oriented Programming, UML, and implemented in C++.
- CS 4955 Teaching Computer Science, Northeastern University Sp '20
  - (Undergrad) Developed first iteration of course on how to teach computer science.
- CS 4850/5850 Building Game Engines, Northeastern University Sp '18,'19
  - (Undergrad/Grad) Designed course on building large-scale game engines from scratch in C++.
- CS 5006 Computer Algorithms, Northeastern University Sp '19, Summer '19
  - (Graduate, ALIGN Program) Introduction to algorithms course in C.
- CS 4300/5310 Computer Graphics, Northeastern University Sp '18, Fall '19, Summer '19
  - (Undergrad/Grad) Introductory course to traditional rasterized computer graphics and ray tracing.
- CS 3650 Computer Systems, Northeastern University Fall '17,'18,'19
  - (Undergrad) Introductory course on systems programming concepts: C, assembly, operating systems, memory management, threads.
- CS 5600 Computer Systems, Northeastern University Summer '18
  - (Grad) Advanced systems programming course covering operating systems, memory management, and multiprocessing culminating in a final research project.
- CS 5007 Computer Systems, Northeastern University Summer '18,'19
  - (Graduate, ALIGN Program) Introductory course on systems programming concepts: C, assembly, operating systems, memory management, threads.
- CS 1802 Discrete Mathematics Seminar, Northeastern University Fall '17
  - (Undergrad) Introduction to number systems, logic, probability, modular arithmetic, sorting, graph theory, induction, and cryptography.
- CS 5340 Human-Computer Interaction, Northeastern University Fall '17
  - (Grad) Introduction to designing software for humans, designing user studies, culminating in a final research project.
- Comp 11 Introduction to Computer Science, Tufts University, Lecturer Summer '17
  - (Undergrad) Introduction to programming using C++.

### Additional Teaching

- Fall 2016 Concurrency (Undergrad), Teaching Fellow and Curriculum Developer, Tufts University
- Spring 2015 Game Design (Graduate and Undergrad), Co-Teacher and Lab Instructor, Tufts University
- Summer 2013 Data Structures (Undergraduate), Lab Instructor and Head TA, Tufts University

## TEACHING ASSISTANT EXPERIENCE OF MICHAEL D. SHAH

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- Spring 2017 Human-Computer Interaction, Teaching Assistant, Tufts University
- Spring 2016 Computer Graphics (Graduate and Undergrad), Teaching Assistant, Tufts University
- Fall 2015 Concurrency (Undergrad), Teaching Assistant and Curriculum Developer, Tufts University
- Fall 2014 Concurrency (Undergrad), Teaching Assistant and Curriculum Developer, Tufts University
- Spring 2014 Computer Graphics (Graduate and Undergrad), Teaching Assistant, Tufts University
- Fall 2013 Data Structures (Undergraduate), Teaching Assistant, Tufts University
- Spring 2013 Human-Computer Interaction, Teaching Assistant, Tufts University
- Fall 2012 Algorithms (Grad and Undergrad), Teaching Assistant, Tufts University
- Fall 2012 Operating Systems (Grad and Undergrad), Teaching Assistant, Tufts University
- Spring 2012 Data Structures (Undergraduate), Teaching Assistant, Tufts University
- Winter 2011 Data Visualization (Grad only), Teaching Assistant, The Ohio State University
- Summer 2010 Programming Languages (Grad and Undergrad), The Ohio State University

## PROFESSIONAL ORGANIZATION MEMBERSHIP

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- Association of Computing Machinery Professional Member (2008 - Present)
- ISOCPP SG20
  - Study group regarding best practices for teaching C++ to new, intermediate, and advanced learners.

## PROGRAM COMMITTEES

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- PLDI 2020 Artifact Evaluation Committee
- EuroLLVM 2020 Program Committee Member
- SIGCSE 2020 Program Committee Paper Reviewer
- CPPCON 2019 Program Committee Member
- ECOOP 2019 Poster Committee Reviewer
- SIGCSE 2019 Program Committee Paper Reviewer
- VISSOFT 2018 Program Committee Paper Reviewer

## SERVICE AND ORGANIZATIONS

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- Joint Northeastern University and MIT
  - Summer 19 LLVM Seminar
    - \* Co-organized with T.B. Schardl and Daniele Vettorel a series of workshops on LLVM, Systems, and Program Analysis tools.
- Northeastern University
  - 2018-2020 Undergraduate Committee

- \* Responsible for overseeing all undergraduate courses and degree programs offered in the College. The committee approves all new undergraduate course proposals and degree programs, and maintains the curricula for all existing Khoury degree programs.
- 2019-2020 Khoury Awards Committee
  - \* Responsible for taking part in selecting, voting, and organizing awards primarily for undergraduate students.
- 2019-2020 Systems Advisory Committee
  - \* Responsible for communicating, discussing, and working with the College's Systems group to deploy new initiatives.
- 2018-2020 Full-time Non-tenure Track Hiring Committee
  - \* Responsible for hiring teaching faculty, which includes reviewing materials, attending lectures, and providing hiring recommendations.
- 2018-2019 Director of Khoury Teaching Scholars
  - \* Role is to develop a new program for training and mentoring undergraduate teaching assistants.
- Tufts University
  - 2016-2017 Tufts Graduate Student Council President
  - 2016-2017 Tufts University Graduate Student Rep on Planning and Policy Committee
  - 2016-2016 Volunteered in Roxbury Massachusetts to teach programming to non-programmers in urban area
  - 2016, National Association of Graduate and Professional Students Northeast Regional Conference Attendee
  - 2016, National Association of Graduate and Professional Students National Conference. Open Panel Discussion
  - 2014-2016 Tufts University Graduate Student Rep on University IT Committee
  - 2014-2016 Tufts Graduate Computer Science League of Learning Founder and President
  - 2014-2015 Tufts Graduate Student Council Academic and Career Development Chair
  - 2014, National Association of Graduate and Professional Students Northeast Regional Conference. Talk presented on Data-Driven Advocacy for Graduate Students.
  - 2013-2014 Tufts Graduate Student Council Secretary
  - 2013, National Association of Graduate and Professional Students National Conference. Talk presented on Technologies Role in Graduate Student Organizations.
  - 2012-2013 Tufts Graduate Student Council Computer Science Department Representative
- The Ohio State University
  - 2010 - 2011, Ohio State Game Creation Club Treasurer
  - 2007 - 2011, Ohio State Running Club President and webmaster
  - 2009 - 2011, Media, Marketing, and Communications Scholars ASP.net and Animation Assistant Teacher.

## **MENTORSHIP AND DIRECTED STUDIES**

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- Spring 2020, Undergraduate Research, Zachery Casey, Performance Assertions
- Fall 2019, Directed Study, Robert Carney, LLVM Data Structure Profiler
- Summer 2019, Xiangxi Guo, Parallel Cache Oblivious Algorithms and Data Structures
- Summer 2019, Robert Carney, LLVM Data Structure Profiler
- Spring 2019, Directed Study, Trevor Day on Real-time Ray Tracing using OpenCL
- Spring 2019, Summer 2019, Fall 2019 Directed Study with Faridat Yusuf on Cuda GPGPU Programming
- Summer 2018, Directed Study with Amanda Fode on Volume Visualization using WebGL
- Fall 2014-Spring 2015 Undergraduate Research Assistant mentoring of Caleb Helbing
- Fall 2014-Spring 2015 Engineering Mentoring Program: Aahlad Gahligni, Cecily Lo, and Stephen Michel
- Fall 2013 Head TA of Comp 15 Data Structures (Supervised 20 undergraduate and graduate TAs)

## **MASTERS THESES, COMMITTEE MEMBER**

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- Fall 18-Spring 19 Ge Zhu, Masters Computer Science Project, Northeastern University
- Spring 18-Fall 18 Evan Sheffield, Masters Computer Science Project, Northeastern University
- Fall 17-Spring 18 Suraj Gutti, Masters Computer Science Project, Northeastern University
- Fall 17-Spring 18 Shubham Gupta, Masters Computer Science Project, Northeastern University



## PROFESSIONAL BIOGRAPHY

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**Michael D. Shah** completed his Ph.D. at Tufts University in the Redline Research Group in 2017. His Ph.D. thesis advisor was Samuel Z. Guyer. Michael finished his Masters degree in Computer Science in 2013 at Tufts University and Bachelors in Computers Science Engineering at The Ohio State University in 2011. Currently Michael is an assistant teaching professor at Northeastern University.

Michael discovered computer science at the age of 13 when googling "how do I make games". From that google search, Mike has worked as a freelance game developer, worked in industry for Intel, Sony PlayStation, Oblong Industries, and researched at The Ohio Supercomputer Center to name a few. Mike cares about building tools to help programmers monitor and improve the performance of realtime applications—particularly any visual multimedia. Mike believes computer science can be learned by all.

In Michael's spare time he goes for long runs, plays video games while on his exercise bike, learns guitar, and considers himself an amateur pizza and wine maker.

## REFERENCES

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- Samuel Guyer
    - Relationship: Advisor
    - Title: Associate Professor, Computer Science and Engineering, Tufts University
    - Contact: sguyer@cs.tufts.edu
  - Remco Chang
    - Relationship: Thesis Committee Member and worked under as teaching assistant
    - Title: Associate Professor, Computer Science and Engineering, Tufts University
    - Contact: remco@cs.tufts.edu
  - TB Shardl
    - Relationship: Thesis Committee Member, Collaborated on Summer long Performance Engineering Seminar
    - Title: Research Scientist, MIT
    - Contact: neboat@mit.edu
  - Charles Leiserson
    - Relationship: Collaborated on LLVM Seminar Series
    - Title: Professor, Computer Science , MIT
    - Contact: cel@mit.edu
- Mark Sheldon
- Relationship: Helped Co-develop and teach a concurrency programming course.
  - Title: Lecturer, Computer Science and Engineering, Tufts University
  - Contact: msheldon@cs.tufts.edu
- Jason Wiser
    - Relationship: Helped Co-develop and teach a new game programming course.
    - Title: Instructor, Computer Science and Engineering, Tufts University
    - Contact: jasonwiserart@gmail.com