Prashant Vaidyanathan

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I am a researcher and leader working at the interface of computer science, design automation, and biology. As a researcher, I have used my formal training as an electronics and computer engineer, to identify and solve computational and mathematical problems in the field of genetic engineering and synthetic biology. As a Group Lead at Oxford Biomedica and the Chair of the SBOL data standard, I'm leading various efforts in data standardisation, data pipelines, and developing semi-automated workflows to enable the design of biological experiments using machine learning. Throughout my career, I have worked in diverse interdisciplinary academic and industrial environments in research, software development, and leadership roles, which have resulted in articles published in Science and Proceedings of IEEE among other journals and conferences. I have significant experience in managing large project teams, product and project management, writing business case, project proposals, and technology documents, leading strategic discussions, mentoring, and organizing workshops and conferences.

Career

- **Group Lead - Data Archicture** — 11/21 - Present
  Oxford Biomedica — *Oxford, UK*
  As the strategic architect and driving force behind OXB's data transformation and software development initiatives, I am spearheading company-wide efforts, setting the direction for critical projects and ensuring their successful execution. I spearheaded the full-scale implementation of an Electronic Lab Notebook at OXB, leading a diverse team of 60 subject matter experts, and overseeing all aspects including procurement, budget management, and technical direction.

- **Senior Researcher** — 1/21 - 10/21
  Microsoft Research — *Cambridge, UK*
  Developed of a knowledge graph for biological data and am co-led the lab automation efforts at Station-B. In collaboration with research scientists at Microsoft and Oxford BioMedica, I developed workflows to enable automated design of biological experiments using Machine Learning. I also developed computational methods to gain insight from multi-omics data sets.

- **Researcher** — 1/19 - 1/21
  Microsoft Research — *Cambridge, UK*
  Developed proofs-of-concept and prototypes for external partners to store structured data that could be used in Machine Learning frameworks. I also played a leading role in identifying and evaluating strategic external research partnerships.

- **Research Intern** — 6/17 - 9/17
  Microsoft Research — *Cambridge, UK*
  Ceated an F# implementation for the SBOL standard data model and implemented an inference graph to chain parameters for inference in large and complex genetic circuits.

- **Assistant Computer Programmer** — 9/12 - 1/14
  Boston University - Information Services & Technology — *Boston, Massachusetts USA*

- **Junior Software Developer** — 2/12 - 7/12
  Microsoft (Gulf) - Developer Platform Technologies — *Dubai, UAE*
  A 6 month internship where I created Windows Phone 7 Apps for the Gulf region, developed internal software tools and Apps for the Microsoft Gulf Team, and conducted and organized hackathons and workshops.

- **Research & Development Intern** — 6/09 - 8/09
  Larsen & Toubro - EBG Department — *Mumbai, Maharashtra India*

Education

- **Ph.D., Computer Engineering** — 9/14 - 1/19
  Boston University — *Boston, Massachusetts USA*
  Dissertation: "Functional Synthesis of Genetic Systems"

- **M.S., Computer Engineering** — 9/12 - 1/14
  Boston University — *Boston, Massachusetts USA*
  Thesis: "Implementation, Benchmarking, And Evaluation of FPGA Multipliers"

- **B.E., Electronics and Electrical Engineering** — 8/08 - 8/12
  Birla Institute of Technology and Science - Pilani — *Dubai, UAE*

Technical Proficiency

- **Programming Languages:** C, C++, C#, F#, Python, Java, Verilog, LaTeX

- **Operating Systems:** Linux (Ubuntu, CentOS, Amazon Linux, and RHEL) and Windows

- **Tools and Frameworks:** Microsoft Azure Stack, Amazon EC2, Amazon S3, Visual Studio, Expression Studio, Adobe Illustrator

Awards, Fellowships, and Patents

- *Mixed reality for laboratories - Patent pending*, **Microsoft**, 2021
- *Outstanding Dissertation of the Year (Computer Engineering)*, **Boston University**, 2019
- *First-place winner of company-wide Hackathon*, **Microsoft**, 2019
- *BBF Scholar Travel Award*, **BioBricks Foundation**, 2017
- *Distinguished Electrical and Computer Engineering Fellowship*, **Boston University**, 2014
- *Award for Science and Technology Transfer*, **World Association for Innovative Technologies**, 2011

Publications

total citations = 754 (Google Scholar, 3rd August 2021)   *Joint first authorship

Journal Articles

1. Alec Nielsen, Bryan Der, Jonghyeon Shin, **Prashant Vaidyanathan**, Vanya Paralanov, Elizabeth Strychalski, David Ross, Douglas Densmore, and Christopher A. Voigt, *Genetic Circuit Design Automation*, Science, vol. 352, iss. 6281, 2016. **PMID: 27034378**

2. **Prashant Vaidyanathan**, Bryan Der, Swapnil Bhatia, Nicolas Roehner, Ryan Silva, Christopher A. Voigt, and Douglas Densmore, *A Framework for Genetic Logic Synthesis*, Proceedings of IEEE, vol. 103, iss. 11, pp. 2196-2207, 2015.

3. **Prashant Vaidyanathan***, Evan Appleton*, David Tran, Alex Vahid, George Church, and Douglas Densmore, *Algorithms for the selection of fluorescent reporters*, Nature Communications Biology, vol. 4, iss. 1, 2021.

4. Göksel Misirli, Tramy Nguyen, James Alastair McLaughlin, **Prashant Vaidyanathan**, Timmothy Jones, Douglas Densmore, Chris Myers, Anil Wipat, *A computational workflow for the automated generation of models of genetic designs.* ACS Synthetic Biology, 2018.

5. **Prashant Vaidyanathan**, Nitish Malhotra, and Jagadish Nayak, *A new encryption technique for the secured transmission and storage of text information with medical images.*, Engineering Review 32, no. 1, pp. 57-63, 2012. Initially presented in the IN-TECH 2011 conference where the paper won an award.

6. Hasan Baig, Pedro Fontanarrosa, Vishwesh Kulkarni, James McLaughlin, **Prashant Vaidyanathan**, et. al, *Synthetic Biology Open Language (SBOL) Version 3.0.0*, Journal of Integrative Bioinformatics, 2020.

7. Hasan Baig, Pedro Fontanarrosa, Vishwesh Kulkarni, James McLaughlin, **Prashant Vaidyanathan**, et. al, *Synthetic Biology Open Language Visual (SBOL Visual) Version 2.2*, Journal of Integrative Bioinformatics, 2020.

8. James Alastair McLaughlin, Jacob Beal, Göksel Mısırlı, Raik Grünberg, Bryan Bartley, James Scott-Brown, Thomas E. Gorochowski, **Prashant Vaidyanathan**, Pedro Fontanarrosa, Ernst Oberortner, Anil Wipat, and Chris J. Myers, *The Synthetic Biology Open Language (SBOL) version 3: A lightweight standard for data exchange across scales of bio-engineering*, Frontiers in Bioengineering and Biotechnology, 2020.

9. Neil Dalchau, Paul K. Grant, **Prashant Vaidyanathan**, Colin Gravill, Carlo Spaccasassi, and Andrew Phillips, *Scalable dynamic characterization of synthetic gene circuits*, bioRxiv, 2019.

Conference Papers

10. Curtis Madsen*, **Prashant Vaidyanathan***, Sadra Sadraddini*, Cristian Ioan Vasile*, Nicholas A. DeLateur, Ron Weiss, Douglas Densmore, Calin Belta, *Metrics for Signal Temporal Logic Formulae*, 57th IEEE Conference on Decision and Control, Miami Beach, FL, USA, 2018

11. **Prashant Vaidyanathan**, Rachael Ivison, Giuseppe Bombara, Nicholas A. DeLateur, Ron Weiss, Douglas Densmore, and Calin Belta, *Grid-Based Temporal Logic Inference*, 56th IEEE Conference on Decision and Control, Melbourne, Australia, 2017.

Selected Tools, Frameworks, and Projects

I have worked as either the lead or co-lead developer for various software frameworks, packages, and tools. To see the full list, please visit: `http://prashantvaidyanathan.github.io/project/`

Synthetic Biology

- **Cello** - A compiler to automate the design of Boolean Genetic circuits
- **Phoenix** - Automated design of genetic circuits with temporal verification
- **FPselection** - Selection algorithms to pick an optimal set of Fluorophores for a measurement instrument
- **FSBOL** - An F# implementation for the Synthetic Biology Open Language data model
- **GEC** - Genetic Engineering of Living Cells - A tool for modular design of genetic circuits.
- **BCKG** - A biological knowledge graph for experimental data, metadata, and multi-omics measurements.

Formal Methods

- **Grid TLI** - A Temporal Logic Inference tool to infer temporal properties from data
- **STL Metrics** - A metric to compute the distance between two bounded Signal Temporal Logic formulas

Teaching

I have worked as a teaching fellow and have designed lectures, exams, and courses for both undergraduate and postgraduate courses in Software Engineering, Computational Synthetic Biology, Digital Logic Design at Boston University. I have also been a guest lecturer for 4 courses at Boston University.

Selected Professional Activities

Positions

- **SBOL Chair**, The Synthetic Biology Open Language Group (05/23 - Present)
- **Editor**, The Synthetic Biology Open Language Group (01/20 - 01/23)
- Technical Advisor and Development Support, NONA Research Foundation (6/16 - 12/18)

Talks

- 2018 - **Invited Talk**, MIT Synthetic Biology Center - Data on Tap
- 2016 - **Plenary**, NSF Biological Cyber-Physical Systems - Kickoff meeting

Technical Reviewer

- ACS Synthetic Biology 2021
- International Workshop on Bio-Design Automation (IWBDA) 2018, 2019, 2020
- Journal of Open Source Software 2019

Organizing Committee

- **General Chair** - IWBDA 2021
- Program Committee Chair and Publication Chair - IWBDA 2019
- Co-organized Microsoft Imagine Cup UAE Regional Finals in Microsoft Gulf - 2012
- Organized the Windows Phone App Hackathon in Microsoft Gulf - 2012
- Student Convener for the Inter-university Technology Fest - 2011

Outreach Activities

Mentoring

- *Boston University Undergraduate Research Opportunity Program (UROP)* mentor, 2013 - 2016
  I have mentored **12 undergraduate students**, each for at-least 2 semesters or more.
- *Boston University Research Internship in Science and Engineering (RISE)* mentor, 2016

Workshops

- *Microsoft - Windows Phone 7 App Workshop, Dubai, UAE, 2012*
  I conducted 20+ workshops in 4 major universities in UAE (BITS Pilani, University of Wollongong, University of Sharjah, American University of Sharjah)
- *Basics of .NET, Dubai, UAE, 2012*
  I conducted 10+ workshops to train over 30 students in the basics of App and Software development