curriculum vitæ of
Jacob Scott Laurel

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Education

Aug. 2017 – present **Ph.D.** in Computer Science — University of Illinois at Urbana-Champaign
Advisor: Sasa Misailovic
Research area: Probabilistic and Differentiable Programming Languages, Abstract Interpretation, Neural Network Verification and Approximate Computing

Aug. 2012 – May 2017 **B.S.** in Mathematics (summa cum laude) — University of Alabama at Birmingham
B.S.E.E in Electrical Engineering (summa cum laude)
GPA: 3.95/4.0

Work Experience

July 2018 – Present Research Assistant — University of Illinois Urbana-Champaign
Advisor: Sasa Misailovic

May 2019 – Aug. 2019 Ph.D. Research Intern — NASA Langley Research Center
Mentors: Cesar Muñoz and Aaron Dutle
Applied Program Analysis to quantify floating point error in probabilistic programs

May 2016 – Aug. 2016 Undergraduate Research Intern — University of Central Florida
Helped develop a novel video summarization technique using LSTM Deep Neural Networks. Work published in **CVPR 2017** (8)

Publications

Conference and Journal Publications

1. Rem Yang, **Jacob Laurel**, Sasa Misailovic, Gagandeep Singh. Provable Defense Against Geometric Transformations. In *11th International Conference on Learning Representations* **(ICLR 2023)**. Acceptance rate: 31%. Designated **notable, top 25% of papers**.

2. Ashitabh Misra, **Jacob Laurel**, Sasa Misailovic. ViX: Analysis-driven Compiler for Efficient Low-Precision Differentiable Inference. In *Design Automation and Test in Europe* **(DATE 2023)**. Full Paper Acceptance rate: 25%.

3. **Jacob Laurel**, Rem Yang, Shubham Ugare, Robert Nagel, Gagandeep Singh, Sasa Misailovic. A General Construction for Abstract Interpretation of Higher-Order Automatic Differentiation. In *Object-Oriented Programming, Systems, Languages, and Applications* **(OOPSLA 2022)**. Acceptance rate: 31%.

4. **Jacob Laurel**, Rem Yang, Gagandeep Singh, Sasa Misailovic. A Dual Number Abstraction for Static Analysis of Clarke Jacobians. In *Symposium on Principles of Programming Languages* **(POPL 2022)**. Acceptance rate: 23%.

5. Vimuth Fernando, Keyur Joshi, **Jacob Laurel**, Sasa Misailovic. Diamont: Dynamic Monitoring of Uncertainty for Distributed Asynchronous Programs. In *21st International Conference on Runtime Verification* **(RV 2021)**. Acceptance rate: 38%.

6. **Jacob Laurel**, Rem Yang, Atharva Seghal, Shubham Ugare, Sasa Misailovic. Statheros: A Compiler for Efficient Low-Precision Probabilistic Programming . In 58^{th} *Design Automation Conference* **(DAC 2021)**. Acceptance rate: 23%.

7. **Jacob Laurel**, Sasa Misailovic. Continualization of Probabilistic Programs with Correction. In 29^{th} *European Symposium on Programming* **(ESOP 2020)**. Acceptance rate: 31%.

8. Aidean Sharghi, **Jacob Laurel**, Boqing Gong. Query-Focused Video Summarization: Dataset, Evaluation, and A Memory Network Based Approach. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition* **(CVPR 2017)**. Acceptance rate: 29%.

Posters

9. **Jacob Laurel**. Exact Quantification of Continuity Correction Error in Probabilistic Programs. Poster presented at *1st International Conference on Probabilistic Programming* ***(PROBPROG 2018)***.

Honors and Awards

2023-2024	UIUC Mavis Future Faculty Fellowship ($ 2000 Award)
2023	UIUC CS Department Graduate Student Outstanding Ambassador ($ 100 Award)
2017-Present	UIUC Sloan UCEM Scholarship ($ 40,000 Award)
2012-2017	UAB Presidential Honors List for 4.0 GPA during semester
2012-2016	UAB Presidential Scholarship as National Hispanic Recognition Program Scholar
2015	UAB School of Engineering Dupuis Scholarship
2015	UAB School of Engineering Undergraduate Research Award for Honors Research
2013	Inducted into Tau Beta Pi Engineering Honor Society

Talks and Presentations

Fall 2022	*A General Construction for Abstract Interpretation of Higher-Order Automatic Differentiation* - UIUC Compilers Seminar
Summer 2022	Invited Talk: *Abstract Interpretation for Differentiable Programming* - Stanford Software Seminar (host: Clark Barrett)
	Invited Talk: *Abstract Interpretation for Differentiable Programming* - UC Berkeley Formal Methods Seminar (host: Sanjit Seshia)
Fall 2021	*Statheros: A Compiler for Efficient Low-Precision Probabilistic Programming* - UIUC Compilers Seminar

Teaching Experience

Spring 2023	UIUC CS 477 Formal Software Development Methods (Guest Lecture)
Fall 2019	UIUC CS 421 Programming Languages and Compilers (Teaching Assistant)
Spring 2019	UIUC CS 126 Software Design Studio (Teaching Assistant)
Fall 2018	UIUC CS 173 Discrete Structures (Teaching Assistant)
Spring 2018	UIUC CS 374 Algorithms and Models of Computation (Teaching Assistant)
Spring 2014	UAB ECE 312 Electrical Systems (Undergraduate Course Assistant)

Research Mentoring

Feb. 2020-present	Rem Yang (BS, UIUC) - Co-author on (4,6,1,3)
Mar. 2020-May 2021	Atharva Seghal (BS, UIUC) - Co-author on (6)
May. 2021-present	Robert Nagel (BS, UIUC) - Co-author on (3)
Nov. 2020 -present	Shubham Ugare (PhD, UIUC) - Co-author on (6,3)
May. 2022 -present	Ashitabh Misra (PhD, UIUC) - Co-author on (2)
Jan. 2023 -present	Brant Qian (BS, UIUC/ZJU)

Service

Mar. 2023	Graduate Ambassador and Panelist for session on Diversity and Inclusivity for UIUC CS Visit Day
Fall 2022 - Present	Graduate Student Representative for UIUC's CS Graduate Study Committee
Summer 2022	Reviewer - ECCV 2022

Summer 2022	Artifact Evaluation Committee - SAS 2022
Fall 2021	Panelist for UIUC's Society of Hispanic Professional Engineers Graduate Student Panel
Summer 2021	Artifact Evaluation Committee - OOPSLA 2021
Mar. 2020	Graduate Ambassador for UIUC CS Visit Day
Jan. 2020	Graduate Volunteer for UIUC School of Engineering Undergraduate Research Expo
Fall 2019	Organizer - UIUC Brett Daniel Software Engineering Seminar

Open-Source Software

I have led the development of the following open-source software libraries:

AbstractAD: AbstractAD is a parametric abstract interpretation of higher-order differentiable programs that allows for expressive abstract domains (like Zonotopes), published in 3. It is available at `https://github.com/uiuc-arc/AbstractAD`
DeepJ: DeepJ is a sound abstract interpretation of Clarke Generalized Jacobians, published in 4. It is available at `https://github.com/uiuc-arc/DeepJ`
Statheros: Statheros is a compiler for fixed-point probabilistic programming, published in 6. It is available at `https://github.com/uiuc-arc/Statheros`

Other Experiences

Dec. 2020	Attended (virtually) Microsoft Research Ph.D. Summit as UIUC LEAP Fellow
Fall 2019	Attended Sloan Institute on Teaching and Mentoring Conference in Atlanta, GA
Fall 2019	Attended Midwest PL Summit at Purdue University
Summer 2018	Attended Oregon Programming Languages Summer School (*OPLSS*)