

JOSEPHINE LAMP

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PERSONAL STATEMENT

I am a final year Computer Science PhD Candidate, 2020 NSF Graduate Research Fellow, and Olive B. and Franklin C. Mac Krell Jefferson Fellow attending the University of Virginia in Charlottesville, Virginia, USA. I am advised by [Dr. Lu Feng](#) and [Dr. Dave Evans](#). My research is at the intersection of Healthcare, Machine Learning, Artificial Intelligence and Privacy. I am developing *trustworthy* clinical decision support systems by designing innovative ML and AI techniques that are robust, explainable and privacy-preserving. In particular, I focus on methods for time series data and/or medical trajectories. My research is actively applied to improve patient outcomes for individuals with Advanced Heart Failure and Type I Diabetes.

RESEARCH FOCUSES

Machine Learning **Artificial Intelligence** **Privacy** **Time Series** **Medical Trajectories**
Clinical Decision Support Systems **Type I Diabetes** **Advanced Heart Failure**

EDUCATION

PhD in Computer Science / UNIVERSITY OF VIRGINIA

AUGUST 2018 – PRESENT, CHARLOTTESVILLE, VA, USA

- 2020 NSF Graduate Research Fellow, Olive B. and Franklin C. Mac Krell Jefferson Fellow, UVA Distinguished Engineering Fellowship Recipient
- Dissertation Title: "*Trustworthy Clinical Decision Support Systems for Medical Trajectories*"
- Dissertation Committee: Tianhao Wang, PhD (Chair); Lu Feng, PhD (Advisor); Dave Evans, PhD (Advisor); Sula Mazimba MD, MPH (Member); Tingting Zhu, PhD, MSc (External Member)
- Collaborators: Don Detmer, MD, MA; Kenneth Bilchick, MD; Prince Afriyie, PhD

BS in Biomedical Informatics / ARIZONA STATE UNIVERSITY

AUGUST 2014 – MAY 2018, TEMPE, AZ, USA

- Graduated Summa Cum Laude from Barrett, the Honors College at ASU
- Received Outstanding ASU Graduate Award – total of 17 students selected out of a graduating class of 15,000
- Advisors: Edward Shortliffe, MD, PhD, MACP, FACMI; Robert Greenes, MD, PhD; Carlos Rubio Medrano, PhD; Gail-Joon Ahn, PhD, CISSP

WORK EXPERIENCE

DEXCOM / Senior Privacy Engineer (Contractor)

JUNE 2021 – PRESENT, CHARLOTTESVILLE, VA, USA

Analyzing privacy issues surrounding the use of Diabetes data, with a focus on Type I Diabetes time series traces.

Key achievement:

- ✓ Developed GlucoSynth, a privacy-preserving Generative Adversarial Network (GAN) framework to generate synthetic glucose traces. The core intuition behind the approach is to conserve relationships amongst motifs (events) within the traces, in addition to the typical temporal dynamics contained within time series.

ASU CENTER FOR CYBERSECURITY & DIGITAL FORENSICS / Undergraduate Researcher

JANUARY 2015 – JUNE 2018, TEMPE, AZ, USA

Past research includes studying Moving Target Defense in Attribute Based Access Control policies for Electronic Health Records and security and risk evaluation frameworks for Medical Cyber-Physical Systems and Energy Delivery Systems (EDS). I developed an automated OntoEDS tool to intelligently represent, traverse and extract security requirements for EDS, and ExSol, a risk assessment ecosystem that autonomously compares an EDS' possible *Exploits* (attack and threats) to its *Solutions* (security requirements and implementations) to calculate overall system risk.

Key achievement:

- ✓ OntoEDS and ExSol are deployed and currently being used by EDS operators all over the country. The Arizona Corporation Commission (the state public utility commission) used the EDS papers I published and the OntoEDS tool to help provision security mechanisms in Arizona's energy grids.

MAYO CLINIC / Research Affiliate

AUGUST 2017 – MAY 2018, SCOTTSDALE, AZ, USA

Role involved shadowing clinicians in order to identify and improve processes, workflows, integration and use of technology within clinical environments.

Key achievement:

- ✓ Built "Trust Bubble", an autonomous trust-based sharing framework that adapts the level of authentication needed for clinicians over time using diverse metrics and system history to reduce login burdens for inpatient health clinics.

CIGNA / Technology Early Career Development Intern

MAY 2017 – AUGUST 2017, PHOENIX, AZ, USA

Role work involved configuring and implementing technology solutions in outpatient clinics, collaborating with teams across different facets of the business, synthesizing requirements, developing conceptual models to understand processes and developing various mobile applications.

Key achievement:

- ✓ Developed a mobile application for Melanoma prevention now deployed as part of Cigna's wellbeing web portals and applications.

PERFORMANCE SOFTWARE / Engineering Intern

JUNE 2016 – AUGUST 2016, PHOENIX, AZ, USA

Responsibilities included working on teams to design, develop and test software for use in aeronautical and medical device applications.

SUN DEVIL MARKETPLACE, APPLE REPAIR CENTER / Apple Certified Repair Technician

AUGUST 2014 – SEPTEMBER 2016, TEMPE, AZ, USA

Technical duties involved troubleshooting and repairing software and hardware components of Apple products for Arizona State University faculty, staff and students.

TEACHING

CPS: FORMAL METHODS, SAFETY, SECURITY / Teaching Assistant

SPRING 2020 & SPRING 2021, CS 6501-002 / SYS 6582-002

ARTIFICIAL INTELLIGENCE / Head Teaching Assistant

FALL 2019 & FALL 2020, CS 4710

AWARDS & HONORS

FELLOWSHIPS:

- **Dexcom Dissertation Grant**, fellowship grant for the last year of the PhD to complete my dissertation work
- **2020 National Science Foundation Graduate Research Fellowship** (NSF GRF), 2000 fellowships awarded out of ~12,900 applicants (15.5% acceptance rate) [[more info](#)] [[UVA article](#)]
- **Olive B. and Franklin C. Mac Krell Jefferson Fellowship Recipient**, awarded to "individuals of extraordinary intellectual range and depth ... who demonstrate outstanding achievement and the highest promise as scholars, teachers, public servants, and business leaders in the United States and beyond." 33 fellows selected out of 989 admitted PhD students at UVA (3.3% acceptance rate) [[more info](#)] [[fellow bio](#)]
- **UVA Distinguished Engineering Fellowship Recipient**

CHALLENGES:

- **2020 NIH organized NHLBI (National Heart, Lung and Blood Institute) Big Data Analysis Challenge: Creating New Paradigms for Heart Failure Research** for our Solution entitled Intelligently Characterizing Patient Hemodynamic Phenotypes for Advanced Heart Failure in the ESCAPE Trial Using Learned Multi Valued Decision Diagrams. The challenge included a \$50,000 prize. [[more info](#)]

AWARDS:

- **American Society of Echocardiography (ASE) Foundation Top Investigator Grant**, Only 25 selected, 34th Annual ASE Scientific Sessions Symposium, June 2023
- **Best Poster**, UVA CS Fall 2022 Research Symposium, October 2022 [[more info](#)]
- **Best Poster Presentation**, UVA CS Fall 2021 Research Symposium, December 2021 [[more info](#)]
- UVA Raven Society Inductee, February 2021
- Sigma Xi Associate Member, June 2020
- **UVA CS Department Outstanding Graduate Service Award**, April, 2020 [[more info](#)]
- Received a **travel scholarship award** to attend CPS Week in Montreal, Canada, April, 2019 [[more info](#)]
- **Selected to participate** in the CRA-W Grad Cohort for Women Workshop in Chicago, IL, January 2019 [[more info](#)]
- **Student scholarship** to the Women in CyberSecurity (WiCyS) 2019 Conference in Pittsburgh, PA, December 2018 [[more info](#)]
- **Arizona State University Outstanding Graduate Award**, May 2018, an award given to high-impact undergraduate students who are likely to make a difference in the world, and of which only one student from each college is selected (total of 17 students selected out of a graduating class of 15,000) [[more info](#)]
- **National Center for Women in Technology (NCWIT) Collegiate Award Finalist**, March 2018 [[more info](#)]

PUBLICATIONS, PATENTS & TALKS

CONFERENCE / JOURNAL PAPERS:

GlucoSynth: Generating Differentially-Private Synthetic Glucose Traces

Josephine Lamp, Mark Derdzinski, Christopher Hannemann, Joost van der Linden, Lu Feng, Tianhao Wang, David Evans

Under Submission. Arxiv, 2023 [[link](#)]

CARNA: Characterizing Advanced heart failure Risk and hemodyNAMic phenotypes using learned multi-valued decision diagrams

Josephine Lamp, Yuxin Wu, Steven Lamp, Prince Afriyie, Kenneth Bilchick, Lu Feng, Sula Mazimba

Under Submission. Arxiv, 2023 [[link](#)]

Change in Systemic Arterial Pulsatility index (SAPi) during heart failure hospitalization is associated with improved outcomes

Emily Lin, Akua Boadu, Natalie Skeiky, Nishaki Mehta, Younghoon Kwon, Khadijah Breathett, Onyedika Ilonze, **Josephine Lamp**, Kenneth C. Bilchick, Sula Mazimba

American Heart Journal Plus: Cardiology Research and Practice 27: 100275, 2023 [[link](#)]

Towards Developing Safety Assurance Cases for Learning-Enabled Medical Cyber-Physical Systems

Maryam Bagheri, **Josephine Lamp**, Xugui Zhou, Lu Feng, Homa Alemzadeh
SafeAI, 2023 [[link](#)]

Systemic arterial pulsatility index (SAPi) predicts adverse outcomes in advanced heart failure patients

Sula Mazimba, Hunter Mwansa , Khadijah Breathett, Jarred E Strickling, Kajal Shah, Coleen McNamara, Nishaki Mehta, Younghoon Kwon, **Josephine Lamp**, Lu Feng, Jose Tallaj, Salpy Pamboukian, Mwenya Mubanga, Jashanjeet Matharoo, Scott Lim, Michael Salerno, Victor Mwansa, Kenneth C Bilchick
Heart and Vessels Journal, 37 (10), 1719-1727, 2022 [[link](#)]

ExSol: Collaboratively Assessing Cybersecurity Risks for Protecting Energy Delivery Systems

Josephine Lamp, Carlos E. Rubio-Medrano, Ziming Zhao and Gail-Joon Ahn
ACM Digital Threats: Research and Practice, 2(3), 1-23, 2021 [[link](#)]

A Logic-Based Learning Approach to Explore Diabetes Patient Behaviors

Josephine Lamp, Simone Silveti, Marc Breton, Laura Nenzi, and Lu Feng
In: Bortolussi L., Sanguinetti G. (eds) Computational Methods in Systems Biology. CMSB 2019. Lecture Notes in Computer Science, vol 11773. Springer, Cham [[link](#)]

ExSol: Collaboratively Assessing Cybersecurity Risks for Protecting Energy Delivery Systems

Josephine Lamp, Carlos E. Rubio-Medrano, Ziming Zhao and Gail-Joon Ahn
2019 Workshop on Modeling and Simulation of Cyber-Physical Energy Systems (MSCPES), Montreal, Canada, April 15-18, 2019 [[link](#)]

The Danger of Missing Instructions: A Systematic Analysis of Security Requirements for MCPS

Josephine Lamp, Carlos E. Rubio-Medrano, Ziming Zhao and Gail-Joon Ahn
3rd International IEEE/ACM Conference on Connected Health: Applications, Systems and Engineering Technologies: CHASE-MedSPT 2018, Washington, DC, USA, September 26-28, 2018 [[link](#)]

Ardent Health Aegis: Security Analysis and Monitoring for Medical Cyber-Physical Systems

Josephine Lamp
Barrett Honors Thesis [[link](#)]

Mutated Policies: Towards Proactive Attribute-based Defenses for Access Control

Carlos E. Rubio-Medrano, **Josephine Lamp**, Adam Doupé, Ziming Zhao and Gail-Joon Ahn
2017 Workshop on Moving Target Defense, in conjunction with CCS 2017, Dallas, TX, USA, October 30, 2017 [[link](#)]

OntoEDS: Protecting Energy Delivery Systems by Collaboratively Analyzing Security Requirements

Josephine Lamp, Carlos E. Rubio-Medrano, Ziming Zhao and Gail-Joon Ahn

3rd IEEE International Conference on Collaboration and Internet Computing, San Jose, CA, USA, October 15-17, 2017 [\[link\]](#)

Towards Adaptive and Proactive Security Assessment for Energy Delivery Systems

Josephine Lamp, Carlos E. Rubio-Medrano, Ziming Zhao and Gail-Joon Ahn

2017 Workshop on Modeling and Simulation of Cyber-Physical Energy Systems (MSCPES), Pittsburgh, PA, USA, April 21, 2017 [\[link\]](#)

Towards a Moving Target Defense Approach for Attribute-based Access Control

Carlos E. Rubio-Medrano, **Josephine Lamp**, Marthony Taguinod, Adam Doupé, Ziming Zhao, Gail-Joon Ahn

1st ACM Workshop on Attribute-based Access Control (ABAC), New Orleans, LA, USA, March 11, 2016 [\[link\]](#)

ABSTRACTS / POSTERS:

Enhancement of Left Ventricular Ejection Fraction with Endocardial Viability Ratio Trajectories Using Machine Learning Improves Prediction of Clinical Outcomes in Heart Failure

Josephine Lamp, Joseph Dan Khoa Nguyen, Joseph Attia, Noora Batrash, Natalie Skeiky, Akua Boadu, Nina Gu, Garrison Paul Wright, Lu Feng, Amit R. Patel, Nishaki Mehta, Khadijah Breathett, Younghoon Kwon, Cherrisse Baldeo, Kenneth Bilchick, Sula Mazimba

To appear in: Journal of the American Society of Echocardiography (JASE) 2023

Association of Left Ventricular Ejection Fraction and Endocardial Viability Ratio with Clinical Outcomes in Heart Failure with Reduced Ejection Fraction

Josephine Lamp, Joseph Dan Khoa Nguyen, Joseph Attia, Noora Batrash, Natalie Skeiky, Akua Boadu, Nina Gu, Garrison Paul Wright, Lu Feng, Amit R. Patel, Nishaki Mehta, Khadijah Breathett, Younghoon Kwon, Cherrisse Baldeo, Kenneth Bilchick, Sula Mazimba

To appear in: Journal of the American Society of Echocardiography (JASE) 2023

Association of Estimated Pulse Wave Velocity to Mortality in Heart Failure With Reduced Ejection Fraction. Insights From the HF-Action Trial

Sula Mazimba, Rebecca Woodhouse, Tolu P Oyinloye, **Josephine Lamp**, Nicholas Ashur, David Shisler, Lauren Taylor, Mohammad Abuannadi, Steven Phillips, Sami Ibrahim, John A Hossack, Nishaki M Mehta, Khadijah Breathett, Akua Boadu, James Bergin, Younghoon Kwon, Kenneth C Bilchick
Circulation. 2022;146:A15226 [\[link\]](#)

Glucosynth: Generating Synthetic Glucose Traces Using Differentially-Private Generative Adversarial Networks

Josephine Lamp, Mark Derdzinski, Lu Feng, Dave Evans, Nathaneal Paul

15th International Conference on Advanced Technologies & Treatments for Diabetes (ATTD '22), 2022 [\[link\]](#)

Kidney Transplantation Management and Decision Support System

Alp Demirag, Yuxin Wu, **Josephine Lamp**, S. Holland, Autumn Routt, Lu Feng
American Journal of Transplantation, vol. 21 pp. 827-827, 2021 [\[link\]](#)

Trust Bubble: A Privacy-Preserving Framework for Data and Personnel Sharing in Diverse Health Networks.

Josephine Lamp, Robert Greenes, Edward Shortliffe
AMIA Annual Symposium 2018, San Francisco, CA, USA, September 26-28, 2018 [\[link\]](#)

PATENTS:

Private Synthetic Time Series Data Generation

Inventors: **Josephine Lamp**, Dexcom Inc.
US Patent Pending

TALKS:

Clinical Decision Support in the Era of Big Data and Machine Learning

Expert Reactor Panelist with Don Detmer, MD, MA, University of Virginia, Christopher Longhurst, MD, MS, FACMI, UC San Diego Health and Gretchen Purcell Jackson, MD, PhD, FACMI, IBM Watson Health
AMIA 2019 Health Informatics Policy Forum, National Press Club, Washington DC, USA December 5th, 2019 [\[link\]](#)

SERVICE

PROFESSIONAL:

UVA / **Student Mentor**

FALL 2018 – PRESENT

- Since my first semester at UVA, I have mentored a variety of students including high schoolers, undergraduates and graduate students at all levels. As a result of working together (in addition to all the other awesome things they do!) my students have had tangible successes: they have published posters and publications, been accepted to top tier universities for graduate programs, and have won competitive scholarships and national fellowships.

UVA GRADUATE WRITING LAB / **NSF GRF Application Mentor**

SUMMER 2020 – PRESENT

- I provide feedback and help to students applying to the NSF Graduate Research Fellowship, including helping with brainstorming, content and flow, reviewing drafts and editing application essays. Of the 6 students I have closely mentored throughout their entire application process, 4 won the fellowship. [\[More Info\]](#)

COMPUTER SCIENCE GRADUATE STUDENT GROUP (CSGSG) / **Graduate Program Rep (2021),
Council Chair (2020), Diversity Representative (2019)**

2019 – 2021

- Equivalent to a graduate student council, CSGSG acts as the liaison between faculty and students. During my tenure, I revamped the organizational structure (added defined council positions), improved council efficiency and communication methods, helped pass instrumental changes to the graduate program requirements, started a Graduate Women in Computer Science group and hosted two departmental research symposiums. I received an outstanding service award for my work on the council in April 2020. [[More Info](#)]

CONFERENCE AND WORKSHOP ORGANIZATION

- **Web Chair**, International Conference on Runtime Verification, 2021 [[More Info](#)]
- **Co-Chair**, Medical Cyber Physical Systems and Internet of Medical Things Workshop, as part of the CPS-IoT Week 2021 [[More Info](#)]

JEFFERSON JOURNAL OF SCIENCE AND CULTURE / **Co Editor-in-Chief**

SPRING 2019 – SPRING 2020

- The Jefferson Journal of Science and Culture is an interdisciplinary journal which serves to provide a venue where scholars who are doing cross-discipline work can publish articles related to specific topics. The journal is part of the Jefferson Scholars Foundation, and I helped set up the journal website, planned our call for submissions, wrote submission guidelines, picked the journal theme, edited accepted publications and published the final journal. We also planned and hosted a conference for the accepted publications in November 2019. [[More Info](#)]

COMMUNITY:

HEALTH & PRIVACY POLICY (WASHINGTON D.C. AND LOCALLY) / **Volunteer Consultant**

FALL 2018 – PRESENT

- I am involved with health policy, as I believe that change can only be affected through multiple facets, and that it is important to collaborate and communicate with other entities (i.e. the government). Specifically, I am working with Dr. Don Detmer and have made multiple trips to Washington DC to meet with Senate staffers and health-related committees (e.g. the US senate HELP committee) to provide input on current privacy and healthcare bills, including the “Protecting Personal Health Data Act,” proposed to the Senate in June 2019.

COMPUTERS4KIDS / **Workshop Mentor**

FALL 2018 – SPRING 2020, CHARLOTTESVILLE, VA

- A fellow CS PhD student and I hosted weekly workshops at Computers4Kids, a local non-profit serving low-income 6th-12th graders that provides free mentoring and access to technology and STEAM projects. Each week we guided students through diverse hands-on projects, including cybersecurity and basic hacking, wearable tech, digital design, and hardware, in order to expose students to different areas and encourage collaboration. Example projects include

temperature-changing lamps (using Arduinos), building remote control cars from scratch, fun coding projects, and recording and editing mini-movies. [[More Info](#)]

MEDIA COVERAGE

- UVA Engineering News, “Creative at Heart”, August 2020, [[article link](#)]
- UVA Link Lab spotlight, “Humans of the Link Lab”, July 2020, [[article link](#)] [[Instagram link](#)]
- Jefferson Scholars Foundation News, “The Foundation publishes 5th edition of peer-reviewed, student-run academic journal”, [[article link](#)]
- ASU College of Health Solutions YouTube, “ASU Outstanding Graduate”, [[video link](#)]

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Google Scholar: [[link](#)]