Welcome to the 2019 edition of our Annual Report. Like the years before, last year was just as exciting and greatly productive for our students and faculty, and I am so glad to share a summary of our key activities and accomplishments. I would like to point out some highlights here. Our faculty continued their prolific research work and funded research in the areas of Machine Learning, Big Data, Bioinformatics, IoT, Security, Computer Systems, and Software Engineering. Some of the research work is profiled under Research Highlights. In curriculum revisions, the department made significant changes to the undergraduate degree programs with additional courses in computer security and programming and introduced graduate level certificate programs. Our students had successful internship experiences at leading companies and worked on cool software projects many of which are showcased under Student Accomplishments. Our alums are growing and contributing to the computer industry in various ways. I invite you to read the report fully and share your thoughts with us. Thank you for your time and support.

Chandra N Sekharan
Professor and Chair

I would be remiss if I didn’t say a few words about the pandemic. These are tough times, probably the toughest anyone has ever seen. On behalf of the department, I wish you all the best of health and safety.
Dr. Neil Klingensmith joined the CS Department as an Assistant Professor in Fall, 2019, with a PhD from the University of Wisconsin, to focus on the Internet of Things (IOT) and CyberSecurity.

Dr. Leo Irakliotis joined the CS Department as a Full-Time Instructor in Fall, 2019, having earned a PhD from Colorado State University and spending 17 years in industry and academia, including being associate chair of the University of Chicago Computer Science Department and graduate program director there; his research interests include parallel database system implementation.

Dr. Konstantin Läufer became the Graduate Program Director (GPD) for Computer Science and Software Engineering in the Fall of 2019.

Dr. Andrew Harrington is transitioning out of his long career at Loyola effective fall 2020. See Appendix 3 for some pictures in celebration of his service to the department and Loyola. We wish him well!

Jean Rom transitioned out of 15 years of service to the department as administrative assistant last year. We wish her the very best!

Marina Hart joined the CS Department as Administrative Assistant on October 21, 2019. Welcome Marina!

The CS Department acquired and placed into service two machines (64 cores, 256GB RAM, ~6TB storage) that can host a number of VMs for our new CyberSecurity Lab in Doyle Hall Rooms 314 and 315. The lab also has a number of devices that can be borrowed for class assignments, class projects, independent study, or others. Contact Info: Eric Chan-Tin (chantin@cs.luc.edu) and Miao Ye (mye@luc.edu).

The two rack servers are at the bottom of the rack frame in these pictures:
DR. ERIC CHAN-TIN
CYBERSECURITY

Dr. Chan-Tin’s work “Revisiting Assumptions for Website Fingerprinting Attacks” and “Efficient, Effective, and Realistic Website Fingerprinting Mitigation” look at privacy issues due to website fingerprinting. Website fingerprinting allows an adversary to guess the website a victim is visiting even if the victim uses encryption and anonymity protections. In the first paper the adversary’s accuracy is improved from 22% to 70%. The second paper’s aim is to protect against website fingerprinting attacks, specifically reducing the accuracy of adversaries from 92% down to 16% with only a 20% bandwidth overhead. Dr. Chan-Tin’s related works look at privacy implications of differential privacy and using Tor. In addition, Dr. Chan-Tin’s new NSF grant entitled “Personalized Cybersecurity Education and Training” has a novel approach to Cybersecurity awareness and training using people’s personality types. The goal is to show that a personalized cybersecurity awareness training module has a bigger impact than a generic one.

DR. DMITRIY DLIGACH
DEEP LEARNING, MEDICAL TEMPORAL HISTORIES, AND NLP

Deep Learning for Clinical Texts

This project develops methods for extracting universal patient representations from unstructured text in electronic health records. These methods leverage huge amounts of clinical data to pre-train neural networks and novel training techniques to incorporate information at multiple time scales. The methods are evaluated using public datasets to promote reproducibility, and applied to clinical research tasks that extend the knowledge of patients with pulmonary hypertension and autism spectrum disorder. This project is funded by NIH.

Temporal Histories of Your Medical Event (THYME) project

The overarching long-term vision of this research is to create novel technologies for processing clinical free text. Such technologies will enable sophisticated and efficient indexing, retrieval and data mining over the ever increasing amounts of electronic clinical data. A key emphasis of this project is on discovering events and their relations on a timeline. Temporal relations are of prime importance in biomedicine as they are intrinsically linked to diseases, signs and symptoms, and treatments. Understanding the timeline of clinically relevant events is key to the next generation of translational research where the importance of generalizing over large amounts of data holds the promise of deciphering biomedical puzzles. This project is also funded by NIH.

NLP for Detecting Substance Misuse in Electronic Health Records

This project focuses on building tools for the detection of substance misuse from electronic health records (EHRs). Development and validation of a substance misuse classifier would enable a standardized approach to perform screening on all patient encounters on a daily basis in health systems.

CONTINUED
DR. GEORGE K. THIRUVATHUKAL (PROFESSOR, DIRECTOR) AND DR. NEIL KLINGENSMITH (ASSISTANT PROFESSOR, CO-DIRECTOR)
SOFTWARE SYSTEMS LABORATORY

The Software Systems Laboratory (SSL), ssl.cs.luc.edu, formed officially in January 2019, conducts research in computer systems and applied software engineering with a strong emphasis on experimentation and collaboration. Core values of the laboratory include openness, open source software development, open access dissemination of research software, reproducible results, and broadening participation. We place great emphasis on undergraduate and graduate research alike and have a strong track record of publication in internationally recognized venues with undergraduate and graduate student co-authors.

CURRENT RESEARCH HIGHLIGHTS INCLUDE:

**FOG Caching** - City-scale IoT devices that are deployed in locations where internet connections are not available often rely on cellular service to provide connections to the cloud. FLIC aims to reduce cellular backhaul traffic (to save operating costs) by caching important data in local storage on IoT devices. We evaluate FLIC on a testbed of real IoT devices using various workloads. This project is under the direction of SSL faculty, Klingensmith and Thiruvathukal.

**Software Metrics and Test Effectiveness** - The Metrics Dashboard is a research and software development project aimed at apply classical in-process and code metrics to observe team progress and project health in open source projects. It also focuses on understanding and measuring effectiveness of best practices in software engineering (e.g. writing high-quality tests). The Metrics Dashboard has been successfully used to understand defect density and issue spoilage in many mathematical/scientific and computer science software projects. This project has received past NSF funding and is continuing under the direction of SSL faculty, Thiruvathukal and Läufer.

**Shape Analysis** - The Shape Analysis project is an NSF-funded effort to explore the performance of machine learning algorithms on the classification of fossil teeth in the Family Bovidae and is a collaboration between SSL faculty (Thiruvathukal and Matthews), Louisiana State University, and the University of Connecticut. Isolated bovid teeth are typically the most common fossils found in southern Africa and they often constitute the basis for paleoenvironmental reconstructions. Taxonomic identification of fossil bovid teeth, however, is often imprecise and subjective. Using modern teeth with known taxons, machine learning algorithms can be trained to classify fossils.

See ssl.cs.luc.edu for additional information about SSL; ecommons.luc.edu/ssl_pubs for publications by faculty and students within our group.
GRANTS WITH NEW FUNDING STARTING IN 2019


ONGOING ACTIVE GRANTS IN 2019


3. Gregory J. Matthews (PI) and George K. Thiruvathukal (co-PI) (collaborative Research) Statistical Analysis of Partially Observed Shapes in Two Dimensions, National Science Foundation, $75,028

4. Lucia Dettori (PI), Ronald Greenberg (co-PI), Dale Reed (co-PI), Don Yanek (co-PI), Alan Mather (co-PI), Brenda Wilkerson (former co-PI). Track 2 CS10K: Accelerate ECS4ALL. National Science Foundation CNS-1542971. 10/15/15–9/30/19. $999,438. REU supplement $16,000.

5. Ronald Greenberg (PI), George K. Thiruvathukal (co-PI). Collaborative Research: Chicago Alliance For Equity in Computer Science CAFECS. National Science Foundation CNS-1738691. 10/15/17–09/30/21. $72,497 Loyola portion of a $2,011,529 collaboration

6. Steven McGee (PI), Ronald Greenberg (co-PI), Alan Mather (co-PI), Brenda Wilkerson (former co-PI). What Features of the Exploring Computer Science Course Equitably Inspire Students to Pursue Further Computer Science Coursework? National Science Foundation CNS-1543217. 10/1/15–9/30/19. $599,986. REU supplement $16,000.


8. Wheeler, HE (PI). NIH R15 HG009569 (05/01/17 – 04/30/20). Predicting gene regulation across populations to understand mechanisms underlying complex traits. $429,000.


www.luc.edu/features/stories/academics/cybersecurityprotection/

Eric Chan-Tin, Yahoo Finance, “Why your debit card is the least secure way to pay for goods”, December 2019

EDITORIAL BOARDS
(Journals, Magazines, Technical Committees)

George K. Thiruvathukal,
Associate Editor in Chief, IEEE Computer Magazine (flagship publication of the IEEE Computer Society)
www.computer.org/csdl/magazine/co

George K. Thiruvathukal, Associate Editor in Chief, IEEE Computer Magazine (flagship publication of the IEEE Computer Society)
www.computer.org/csdl/magazine/co

George K. Thiruvathukal, Reproducible Research Department Editor, IEEE Computing in Science and Engineering
www.computer.org/csdl/magazine/cs

George K. Thiruvathukal, Editor, Journal of Open Source Software
/joss.theoj.org

George K. Thiruvathukal, co-Chair, IEEE Special Technical Community on Broadening Participation
stcbp.org

Catherine Putonti, Senior Editor, Microbiology Resource Announcements, American Society of Microbiology
mra.asm.org/

Eric Chan-Tin, EAI Endorsed Transactions on Security and Safety
eudl.eu/journal/seba
Sammy Gorbett, a Professional Technical Recruiter, is helping our students with preparing for careers by teaching a 1-credit course COMP 395 Professional Development & Career Growth in CS/IT.

Dr. Robert Yacobellis is the CS Department’s Industry Liaison, and actively communicates job and internship opportunities at least monthly to students and alumni; student jobs information can be found on the luc.edu/cs web page in the Jobs, Jobs, Jobs… area

- Representative companies needing full-time positions in 2019 included iD Tech (STEM student outreach), Google, Salesforce, Aptitive (consulting), Northern Trust (cybersecurity), Strata Decision Technologies (healthcare consulting), the US Foreign Service, Belvedere Trading (trading systems support), Kernow Capital Corporation (web development), IL US District Courts (help desk), Green Bay Packers (football tech assistant), Avant/Amount (software developers), PowerReviews (senior software, front-end, and DevOps engineers), the MedPro Group (data scientists/analysts/engineers), IBM & Uncubed (entry-level positions), Motorola Solutions (full-time software positions), and Datacor (various)

- There were also many organizations requesting volunteer help from students and alumni, including those in other LUC departments like the School of Social Work

- Other key events for students included hackathons, fellowships, scholarships, and awards, Illinois Charter School teaching opportunities, cybersecurity conferences, career webinars, job shadowing and office visit opportunities, and academic professorship openings

The CS Department has a Computer Science Program Advisory Committee (CS-PAC) consisting of members from industry and jointly hosted by the CS Department in collaboration with Loyola’s School of Continuing and Professional Studies (SCPS), ITS organization, and Quinlan Business School’s IS programs. The CS-PAC’s 7th meeting was held on September 25, 2019, and was hosted at Optum Rx by one of the CS-PAC members, Andrea Marks.

- John Frendreis, Special Assistant to the Provost and Coordinator of the Loyola Tech Initiative, gave a presentation about the initiative and its progress, including developing the curriculum, creating the needed infrastructure, and conducting a marketing campaign. John described the various curricular initiatives and infrastructure developments; he also mentioned rolling out a new web presence and the Tech Initiative landing site.
Susan Malisch, VP and LUC Chief Information Officer, described the CS-PAC mentoring program pilot where we have identified several students and matched them with CS-PAC members to mentor them during the 2019-2020 Academic Year. The mentors and mentees met for 30 minutes during the CS-PAC meeting to kick off their relationship.

During the mentor-mentee meeting other CS-PAC members provided input on other key topics such as the needed lead time for marketing and enrollment for the Tech Initiative, marketing strategies, delivery formats (online is preferred), topics that need to be covered like data analytics, but also business skills for tech professionals.

Members of the CS Student Advisory Council (CS-STAC) gave a very well-received presentation about their group and its mission. This was followed by a presentation by the student Girls Who Code chapter at Loyola, which mentors female students in junior high and high school in a safe environment to encourage them to get into computing and STEM.

Jay Wengrow, an LUC CS Alum, presented the work he has done to create the Actualize coding bootcamp to teach adult learners about CS and help them transition to new jobs.

The meeting closed with presentations by Chandra Sekharan, Chair of the CS Department, and Udayan Das, instructor in SCPS, about updates to these organizations, including new courses and programs as well as hiring and future plans.

The CS Department and the Department of Mathematics launched the new BS Data Science degree program in Fall, 2019. This interdisciplinary degree provides students with a solid undergraduate background in programming and data manipulation, applied statistics and inference, and practical domain experience.
Xin Su spent the summer of 2019 working on Track 1 of the N2C2 shared task (n2c2.dbmi.hms.harvard.edu; clinical sentence similarity). His system (BERT/XLNet-based ensemble) ranked 4th. With over 30 teams from all over the world participating and only IBM, NIH, and University of Florida teams performing better than Xin’s system, this is a significant achievement; Xin’s system also did better than many heavyweights including Yale and Johns Hopkins and was selected for presentation at the N2C2 workshop which was held in conjunction with AMIA 2019 this November.

A team from Loyola University Chicago participates in the DoE CyberForce competition. The team scored over 5,300 points and ranked 2nd (out of 104 teams) in “Operational Support”. Students participating were Marcell Gyongy, Claudia Holtsclaw, Hans Johnson, Jessica Medintz, Abdul Salam, and Michael White.

In Summer, 2019, Sam Siner and Tyler Arndt created a highly publicized Android app called Elevate Chicago, which tracks elevators going out of service at CTA stations to help the handicapped, those with strollers, and others with luggage or other items to difficult to bring up CTA stairs determine when a given CTA station may not have elevators available to use. Sam and Tyler presented Elevate Chicago at the December, 2019, CS Project Review and won first prize. Media highlights of the Elevate app are available at ABC News, WGN, Block Club Chicago, Streetsblog Chicago.

John Mikos won a 2019 LUROP Provost Fellowship; his faculty Mentor was Dr. Eric Chan-Tin.

STUDENT CLUBS AND ACTIVITIES

With funding obtained by Ronald Greenberg through the STARS IGNITE program, Eric Chan-Tin led a group of eight students who traveled to San Diego to attend the Richard Tapia Celebration of Diversity in Computing. Here is a picture of some of the students with Richard Tapia himself.
Summer Research Program: Under Mark V. Albert, the computer science department combined a number of research efforts in the summer of 2019 to bring 30 students together in pursuit of 9 independent projects. Seventeen students were funded through the FYRE program (First Year Research Experience through Linda Brazdil’s HHMI grant) while 10 undergraduate students chose to use this experience as a stepping stone for their research efforts as part of independent study courses, with three other students actively participating to forward individual projects.

This 3-week intense session consisted of twice-daily full program “huddles” to discuss daily plans and progress; this is in addition to separate project group meetings and individual career advising. Not only are the projects a fun learning experience, but also a chance for each group to forward valuable research contributions in the process.

Paul Edlund, Chief Technologist at Microsoft, gave a talk to the cybersecurity group at Loyola University Chicago.

Paul Edlund and other key Microsoft personnel provided an overview of the MS Azure technology strategy and also details about Azure/ML (Machine Learning) on November 22, 2019.

The Loyola Cybersecurity Club participated in various online CTFs, such as MITRE Cyber challenge (rank 55 out of 539), TAMU CTF, Securinets Prequals (rank 218 out of 436), Spring NCL (rank 488 out of 1263 in the individual game and rank 144 out of 275 in the team game). Students participating across all the competitions for 2019 include Taryn Chovan, Andrew Wolke, Jessica Medintz, Brian Nguyen, Devin Zayas, Morgan Richardson, Michael Collins, Gabriel Huerta, Nick Kolansinski, Michael White, and Job Coritana.
END OF SEMESTER AWARDS AND PROJECT COMPETITION WINNERS

MAY 2019

Undergraduate Departmental Awards, 2018-2019

Maximilian Dabek | Dijkstra Award for Outstanding Academic Achievement

Devin Zayas | Turing High Achievement Award (Communication Networks and Security)

Zhihao Zhou | Turing High Achievement Award (Computer Science)

Enlil Adam | Turing High Achievement Award (Information Technology)

Luke Dosen | Turing High Achievement Award (Software Engineering)

Keyti Toromanova | Turing High Achievement Award (Software Engineering)

Taryn Chovan | Grace Murray Hopper Service and Leadership Award, Departmental Honors

Eunice Montenegro | Grace Murray Hopper Service and Leadership Award

Megan O’Toole | Departmental Honors

Nicholas Predey | Departmental Honors

Graduate Departmental Awards, 2018-2019

Juliana Reider | Dijkstra Award for Outstanding Academic Achievement

Sameep Shah | Turing High Achievement Award (Computer Science)

Yuyang Zhao | Turing High Achievement Award (Computer Science)

Darya Kiktenko | Turing High Achievement Award (Information Technology)

Albert Sugianto | Turing High Achievement Award (Software Engineering)

DECEMBER 2019

Project Presentation Winners, December, 2019

Tyler Arndt & Sam Siner | Elevate Chicago (Android app of CTA elevator status)

Nicholas Synovic | Accessing Legislative Data with Python

Haris Qazi | Raspberry Pi Robot

Martin Zugschwert, Don’t Panic club president

Morgan Richardson, CS-STAC president about to take the stage.
Loyola Computer Science has an active CS Alumni LinkedIn Group [here](#), co-managed by Dr. Robert Yacobellis

**Andrew Block** was promoted to Senior Principal Consultant at Red Hat in January, 2019

**Adish Abnave** joined Pinterest as Engineering Manager, Growth, in March, 2019

**Guy Bevente** became Founder and Principal of BevTek in April, 2019

**Chris Peri** became Founder and CIO of Granthium Corporation in April, 2019

**Emily Brand** was promoted to Chief Architect at Red Hat in June, 2019

**Bhavana Shanbhag** joined Reddit, Inc, as Senior Director of Engineering in June, 2019

**Dhara Desai** joined Simplify Healthcare as Product Solution Lead and Senior BA in July, 2019

**Frank Liberio** became Global CIO at Restaurant Brands International in October, 2019

**Chukwuebuka Udeogu** became Chief Technology Officer, part-time, at C2C Solutions, LLC, in October, 2019

**Maria Fernanda Avelino** was promoted to Software Engineering Manager at iFood in October, 2019

**Savio Thattil** joined Capital One as CIO of Commercial Bank Technology and SVP in November, 2019

**Mohammad Aslam** joined BMO Financial Group as a Software Developer in February, 2019

**Rahul Pandey** joined Grainger as Portfolio Manager in March, 2019

**Robert David Hernandez** joined JP Morgan Chase as a Software Engineer in the Corporate and Investment Bank Division in April, 2019

**Saloni Shah** joined Paylocity as a Software Engineer in July, 2019

**Rohit Jagannath** joined Infosys as a Technology Lead in August, 2019

**Juan Vaca** joined Planned Property Management as a Senior Data Scientist in August, 2019

**Larisa Kreismanis** joined Avanade as a Software Engineer in October, 2019

**Alzahrra Almajid** joined Apple as a Technical Specialist in October, 2019

**John O’Sullivan** was promoted to Senior Software Engineer at imbrex in December, 2019; John is also a part-time instructor in the CS Department

**Krunal Cho** joined Underwriters Laboratories as a Technical Project Manager (Cybersecurity) in December, 2019

**Jessica Brennan** joined Trunk Club as a Data Engineer II in December, 2019

**Morgan Richardson** joined Oranj as a Software Developer in December, 2019

**Manmeet Kaur** joined Blackbuck Insights as a Principal Consultant in December, 2019

**Dominique Allen** became Chief Technology Office at ELEVATOR Media, Chicago
FULL-TIME FACULTY

Eric Chan-Tin
Dmitriy Dligach
Peter Lars Dordal
Stephen Doty
Ronald I. Greenberg
Andrew N. Harrington
Nicholas J. Hayward
William L. Honig
Leo Irakliotis
Neil Klingensmith
Konstantin Läufer
Channah Naiman
Catherine Putonti
Chandra N. Sekharan
George K. Thiruvathukal
Heather E. Wheeler
Robert Yacobellis
PEER-REVIEWED JOURNALS

2. #Fiorica PN and **Wheeler HE**. (2019) Transcriptome association studies of neuropsychiatric traits in African Americans implicate PRMT7 in schizophrenia. PeerJ 7:e7778. PMID31579629 DOI


CONTINUED


PEER-REVIEWED CONFERENCES (INCLUDES PRESENTATION)


CONTINUED


22. Weiqi Cui, Tao Chen, Christian Fields (Undergraduate), Julianna Chen (Undergraduate), Luis Sierra (Undergraduate), and Eric Chan-Tin. “Revisiting Assumptions for Website Fingerprinting Attacks”, ACM ASIA Conference on Computer and Communications Security (ASIACC), Auckland, New Zealand, 2019.


27. Wheeler, HE. “Integrating gene expression regulatory variation across populations and tissues to understand complex traits. Northwestern University, Biostatistics Division, Department of Preventative Medicine, Chicago, IL. February 4, 2019.


**INVITED TALKS**


6. Wheeler, HE. Integrating gene expression regulatory variation across populations and tissues to understand complex traits. Northwestern University, Biostatistics Division, Department of Preventative Medicine, Chicago, IL. February 4, 2019.


**POSTERS**


15. Lu, Yung-Hsiang; Thiruvathukal, George K.; Kaseb, Ahmed S.; Gauen, Kent; Rijhwani, Damini; Dailey, Ryan; Malik, Deepanshu; Huang, Yutong; Aghajanazadeh, Sarah; and Guo, Minghao. See the World through Network Cameras. IEEE Computer, September 2019, doi.org/10.1109/MC.2019.2906841.

16. Hayward, N. ‘An extensible framework for publication with software metrics and analysis’ - EADH 2018 Conference, National University of Ireland, Galway, Ireland - December 2018 (poster)

17. Hayward, N. ‘An extensible framework for publication with software metrics and analysis’ - JADH 2019 Conference, Kansai University, Osaka, Japan - August 2019 (poster)