

# Seema Gangaiah Aarella

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## PROFESSIONAL STATEMENT

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I am a passionate researcher in the field of security aware Internet-of-Things(IoT) and Cybersecurity, my research involves Secure Authentication systems for Edge Data Centers in Collaborative Edge Computing environment. The goal of my research is to model secure and energy aware authentication system to provide security for the cyberphysical systems in Smart Village environment. Developing hardware assisted security solutions using Physically Unclonable Functions (PUF), Certificate Authority(CA), integrating Machine Learning(ML) and Artificial Intelligence(AI) models in the security systems for secure authentication and monitoring of Edge Data Centers against external attacks. Exploring Federated Learning framework and Natural Language Processing(NLP) for developing and optimizing bit error detection and correcting models for improving reliability of PUF.

## EDUCATION

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<b>Ph.D. Candidate in Computer Science and Engineering</b> <i>University of North Texas</i>	Aug. 2019 – Present <i>Denton, TX</i>
<b>Master of Science, Engineering Systems</b> <i>University of North Texas</i>	Aug. 2012 – May 2014 <i>Denton, TX</i>
<b>Master of Technology, VLSI and Signal Processing</b> <i>Jain University</i>	Aug. 2010 – May 2012 <i>Bangalore, India</i>
<b>Bachelor of Engineering, Electronics and Communication</b> <i>Bangalore University</i>	Jan. 1996 – Sept 2000 <i>Bangalore, India</i>

## RESEARCH INTERESTS

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- Cybersecurity, Hardware-Assisted Security, Security-by-Design(SbD), Secure Authentication System, Collaborative Edge Computing, Machine Learning, Security of Cyberphysical Systems for Smart Village infrastructure, XORArbiter PUF based Secure Authentication System, SRAM PUF based Certificate Authority(CA) for secure authentication of Edge Data Centers during Load Balancing, External Attack Detection and Prevention, Machine Learning models for Intrusion Detection and Anomaly Detection, Security of Cyberphysical Systems

## EXPERIENCE

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<b>Teaching Assistant</b> <i>UNIVERSITY OF NORTH TEXAS</i>	Aug 2024 - Dec 2024 <i>Denton, TX</i>
<ul style="list-style-type: none"><li>• Teaching Assistant (TA) for <b>CSCE 5730 &amp; 4730: Digital CMOS VLSI Design</b></li><li>• Conducting in-class quizzes and tests, grading, holding weekly office hours</li><li>• Delivered lecture session on LTSPICE with software demo</li><li>• Assisting in ABET evaluation and other course-related tasks</li></ul>	
<b>Teaching Assistant</b> <i>UNIVERSITY OF NORTH TEXAS</i>	Jan 2020 – July 2024 <i>Denton, TX</i>
<ul style="list-style-type: none"><li>• Teaching Assistant (TA) for <b>CSCE 1030: Computer Science</b></li><li>• Conducting C and C++ labs for a 3 sections of 30-40 students in each, on weekly basis</li></ul>	

- Coding demonstration and instruction delivery, teaching students to use tools like PuTTY, WinSCP, MinGW, Nano, Vim and Notepad++
- Design and implement programming solutions to problems in C & C++, teach software process model
- Conducting lab exams, grading weekly lab assignments, exams, and C++ projects
- Holding weekly office hours to tutor students, provide extra help with the course and Zybook activities

## **Research Assistant**

May 2023 – July 2023

*UNIVERSITY OF NORTH TEXAS*

*Denton, TX*

- Assisted in organizing NSF-funded Easy-Med: Interdisciplinary Training in Security, Privacy-Assured Internet of Medical Things
- Delivered lectures about the on-going research based on Security of Cyber Physical Systems, Collaborative Edge Computing, Secure Authentication System and other peer research
- Demonstrated the working models of Secure Authentication for Edge Data Centers
- Demonstrated the working of Machine Learning Models for Secure Authentication Monitoring and Intrusion Detection
- Conducted hardware demonstration of peer research related to IoMT

## **Teaching Assistant**

Jun. 2021 – Aug. 2021

*UNIVERSITY OF NORTH TEXAS*

*Denton, TX*

- Teaching Assistant (TA) for **CSCE 2110: Foundations of Data Structures**
- Design and implement programming solutions to problems in C or C++ in IDEs like XCode, Visual Studio Code, and compilers like MinGW
- Teaching pseudocode and flowcharts, use of abstraction in the design and implementation of algorithms, such as sorting and searching algorithms, use of hash tables in design of software
- Provide instructions and demonstration of unit tests and testing strategies for C/C++ programs, GNU debugger(gdb) for C and C++ codes
- Teaching and supervising the complete implementation of project in GitLab, creating tasks, merging and closing tasks on GitLab Board
- Holding weekly office hours to tutor students, provide extra help with the course and Zybook activities

## **Software Engineer**

Nov 2015 – Oct 2016

*HMSA (BLUE CROSS BLUE SHEILD)*

*Honolulu, HI*

- Worked as lead developer to design, implement ETL solutions on Trizetto process in Agile Scrum environment
- Worked on retrofit, upgrade and maintenance of data for HHIN (Hawaii Healthcare Information Network)
- Worked with tools like TOAD, SQLDeveloper to connect to oracle database to write queries and generate the result
- Performed Unit Testing, Integration testing, Regression testing, troubleshooting and bug fixing in development, IST, QA/UAT environments
- Worked as offshore coordinator for a team of offshore developers delegating ETL development work, providing solutions and support, writing test cases, testing their applications and deploy to TEST and PROD
- Worked on TIDAL job scheduler, creating new jobs, running existing and providing production support and monitoring jobs
- Worked on SQL server 2012 database used for the PROVIDER data, developed applications to extract and load data into HHIN database
- Worked on Retrofit Project, retrofitted the existing applications for a change in the existing table in the SQL server source schema

**Programmer Analyst***PEGASUS INFO TECH*

Jan 2015 – Nov 2015

*Dallas, TX*

- Worked on Data Integration projects to extract, analyze, transform and load data to Operational Data Store
- Developed mappings using ETL tools for sources like Oracle, DB2, SQL Server, flat files to load into BI system
- Worked on complete Extract, transformation and load process (ETL) using Informatica 9.6.1/9.5/9.1.1 application development and upgrades from 9.1 to 9.5 to 9.6.1
- Worked in all phases of SDLC using Agile and Waterfall methodologies for Data Integration, including requirement gathering from business users, analysis, design, creation of business requirement documents, mapping documents, impact/gap analysis document, ETL development, testing, and implementation
- Developed ETL jobs for PreForeClosure applications
- Worked on TIDAL job scheduler/ Control-M scheduler, creating new jobs, running existing and providing production support and monitoring jobs

**Intern***COMPNOVA*

Sep 2014 – Dec 2014

*Plano, TX*

- Worked on application development using ETL Informatica in Agile based environment
- Integration of data sources like Oracle 11g/10g/9i/8i, DB2, MS SQL Server 2005/2000, Flat Files, XML files
- Worked on non-relational sources like Flat files and used secure FTP, SSH, Hummingbird, worked on Oracle PL/SQL programming, Stored procedures
- Performing Unit Testing, Integration testing, Regression testing, troubleshooting and bug fixing in development, IST, QA/UAT environments

**Student Assistant***UNIVERSITY OF NORTH TEXAS*

May 2014 – Mar 2015

*Denton, TX*

- Software and Windows Server maintenance (2008, 2010), management of all the labs in the ETEC department
- Computer hardware assembly and troubleshooting, Cloning, Deployment, Windows Server installation and maintenance
- Coordination and scheduling, system updating and installing necessary applications on demand
- Tech support to all systems across all the labs
- Installation and maintenance of NetSupport school software

**Teaching Assistant***UNIVERSITY OF NORTH TEXAS*

Aug 2013 – May 2014

*Denton, TX*

- Conducted laboratory work for Engineering Undergraduate students
- Teaching Matlab, Simulink, LogixPro, Multisim, Quartus II
- Assisted students and professors in project work in the courses - Digital control of industrial processes, Circuit analysis, Advanced circuit analysis

**Lecturer***KUPPAM COLLEGE OF ENGINEERING*

Nov 2001 – Jul 2003

*Kuppam, India*

- Teaching core Electronics and Communication courses, course organization and scheduling
- Establishing the laboratories for related courses, creating lab syllabus, lab manuals, organizing labs
- Recruiting laboratory assistants and instructors, moderating lab duties and monitoring
- Conducting internal exams, lab exams and grading, conducting tutoring sessions for students needing additional support

- Conducting student seminars, assigning seminar topics to students in current trends in Electronics and Communications Technology, supporting students with projects related to the course
- Working with the college management in conducting and organizing technical events and annual events
- Served as member of College Disciplinary Committee
- **Courses Handled as Lecturer:**
- Semiconductor Devices and circuits, Pulse and Digital Circuits, Analog Communication, Digital communication, Television Engineering and Telecommunication

## PUBLICATIONS

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### Conferences

- **S. G. Aarella**, V. P. Yanambaka, S. P. Mohanty, and E. Kougianos, "Fortified-Edge 5.0: Federated Learning for Secure and Reliable PUF in Authentication Systems", **Submitted to:** IFIP/IEEE International Conference on Very Large Scale Integration, VLSI SoC 2024
- **S. G. Aarella**, V. P. Yanambaka, S. P. Mohanty, and E. Kougianos, "Fortified-Edge 4.0: A ML-Based Error Correction Framework for Secure Authentication in Collaborative Edge Computing", in Proceedings of the ACM Great Lakes Symposium on VLSI (GLSVLSI), 2024, pp. 639–644, DOI: <https://doi.org/10.1145/3649476.3660384>.
- **S. G. Aarella**, Saraju P Mohanty, and Elias Kougianos (2023). "Fortified Edge 3.0: A Lightweight Machine Learning Based Approach for Security in Collaborative Edge Computing", In 21st OITS International Conference on Information Technology (OCIT)(OCIT-2023) (pp. 6).
- **S. G. Aarella**, S. P. Mohanty, E. Kougianos and D. Puthal, "Fortified-Edge 2.0: Machine Learning based Monitoring and Authentication of PUF-Integrated Secure Edge Data Center", in Proceedings of the IEEE Computer Society Annual Symposium on VLSI (ISVLSI), 2023, pp. 1-6, DOI: <https://doi.org/10.1109/ISVLSI59464.2023.10238517>.
- **S. G. Aarella**, S. P. Mohanty, E. Kougianos and D. Puthal, "Fortified-Edge: Secure PUF Certificate Authentication Mechanism for Edge Data Centers in Collaborative Edge Computing", in Proceedings of the ACM Great Lakes Symposium on VLSI (GLSVLSI), 2023, pp. Accepted, DOI: <https://doi.org/10.1145/3583781.3590249>.
- **S. G. Aarella**, S. P. Mohanty, E. Kougianos and D. Puthal, "PUF-based Authentication Scheme for Edge Data Centers in Collaborative Edge Computing", in Proceedings of the IEEE International Symposium on Smart Electronic Systems (iSES), 2022, pp. 433–438, DOI: <https://doi.org/10.1109/iSES54909.2022.00094>.
- **S. G. Aarella**, A. K. Tripathy, S. P. Mohanty, and E. Kougianos, "EasyBand2.0: A Framework with Context-Aware Recommendation Mechanism for Safety-Aware Mobility during Pandemic Outbreaks", in Proceedings of the 23rd International Symposium on Quality Electronic Design (ISQED), 2022, pp. 187–193, DOI: <https://doi.org/10.1109/ISQED54688.2022.9806250>.
- **S. G. Aarella**, A. K. Tripathy, S. P. Mohanty, and E. Kougianos, "iTour2.0: A Smart Tourism Application for Independent Mobility of Tourists", in Proceedings of the OITS International Conference on Information Technology (OCIT), 2021, pp. 472–477, DOI: <https://doi.org/10.1109/OCIT53463.2021.00097>.
- V. Parlapalli, V. Jayaram, **S. G. Aarella**, K. Peddireddy and R. R. Pale, "Enhancing Cybersecurity: A Deep Dive into Augmented Intelligence Through Machine Learning and Image Processing," 2023 International Workshop on Artificial Intelligence and Image Processing (IWAIP), Yogyakarta, Indonesia, 2023, pp. 96-100, doi: [10.1109/IWAIP58158.2023.10462845](https://doi.org/10.1109/IWAIP58158.2023.10462845).
- Akshay Nagpal, Vivekananda Jayaram, Manjunatha Sughaturu Krishnappa, Nikhil Jagdish Bangad, Manoj Jayantilal Kathiriya, Darshan Mohan Bidkar, **S G Aarella**, "Performance Analysis of Greedy and Auction-Based Resource Allocation Algorithms in Ubiquitous Computing Environments" **Submitted to:** IFIP/IEEE International Conference on Very Large Scale Integration, VLSI SoC 2024.
- **Best Presenter Award**, Parlapalli, Vidyasagar and Jayaram, Vivekananda and **S. G. Aarella** and Peddireddy, Kiran and Pale, Ranadeep Reddy, "Enhancing Cybersecurity: A Deep Dive into Augmented Intelligence Through Machine Learning and Image Processing", International Workshop on Artificial Intelligence and Image Processing (IWAIP), 2023

## PRESENTATIONS

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- **S. G. Aarella**, S. P. Mohanty, E. Kougianos and D. Puthal, “Fortified-Edge 2.0: Machine Learning based Monitoring and Authentication of PUF-Integrated Secure Edge Data Center”, in Proceedings of the IEEE Computer Society Annual Symposium on VLSI (ISVLSI), 2023, pp. 1-6, DOI: <https://doi.org/10.1109/ISVLSI59464.2023.10238517>.
- **S. G. Aarella**, S. P. Mohanty, E. Kougianos and D. Puthal, “Fortified-Edge: Secure PUF Certificate Authentication Mechanism for Edge Data Centers in Collaborative Edge Computing”, in Proceedings of the ACM Great Lakes Symposium on VLSI (GLSVLSI), 2023, pp. Accepted, DOI: <https://doi.org/10.1145/3583781.3590249>.
- **S. G. Aarella**, S. P. Mohanty, E. Kougianos and D. Puthal, “PUF-based Authentication Scheme for Edge Data Centers in Collaborative Edge Computing”, in Proceedings of the IEEE International Symposium on Smart Electronic Systems (iSES), 2022, pp. 433–438, DOI: <https://doi.org/10.1109/iSES54909.2022.00094>.
- **S. G. Aarella**, A. K. Tripathy, S. P. Mohanty, and E. Kougianos, “EasyBand2.0: A Framework with Context-Aware Recommendation Mechanism for Safety-Aware Mobility during Pandemic Outbreaks”, in Proceedings of the 23rd International Symposium on Quality Electronic Design (ISQED), 2022, pp. 187–193, DOI: <https://doi.org/10.1109/ISQED54688.2022.9806250>.
- **S. G. Aarella**, A. K. Tripathy, S. P. Mohanty, and E. Kougianos, “iTour2.0: A Smart Tourism Application for Independent Mobility of Tourists”, in Proceedings of the OITS International Conference on Information Technology (OCIT), 2021, pp. 472–477, DOI: <https://doi.org/10.1109/OCIT53463.2021.00097>.
- **S. G. Aarella**, V. P. Yanambaka, S. P. Mohanty, and E. Kougianos, “Fortified-Edge 4.0: A ML-Based Error Correction Framework for Secure Authentication in Collaborative Edge Computing”, in Proceedings of the ACM Great Lakes Symposium on VLSI (GLSVLSI), 2024, pp. 639–644, DOI: <https://doi.org/10.1145/3649476.3660384>.
- **S. G. Aarella**, “FPGA Implementation of Floating Point Arithmetic Processor”, Indian Society for Technical Education, Tumkur, India, 14-15 Oct 2011

## AWARDS AND HONORS

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- **CENG/DT Award(85%)** University of North Texas, 2021-2024 - \$540
- **NSF Student Travel Grant** for 2023 IEEE Computer Society International Symposium on VLSI (IEEE ISVLSI), 2023 - \$500
- **NSF Student Travel Grant** for 2022 IEEE International Conference on Communications (IEEE ICC), 2022 - \$300
- **Tuition Benefit Scholarship** Toulouse Graduate School, University of North Texas, 2024-2025
- **Tuition Benefit Scholarship** Toulouse Graduate School, University of North Texas, 2020-2024
- **Tuition Benefit Scholarship** Toulouse Graduate School, University of North Texas, 2023-2024
- **TGS Academic Achievement Award**, University of North Texas, 2020-2021 - \$1000
- **TGS Academic Achievement Award**, University of North Texas, 2019-2020 - \$1000

## ACADEMIC PROJECTS

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### NSF AWARD OAC-1924112:EASY-MED (Student Volunteer)

May 2023

- Training STEM students with sensing, security, and privacy-aspects of smart healthcare and provide them a career path in smart healthcare
- Participated in student enrollment request screening and selecting candidates for the project
- Participated in organizing the training through the course

- Delivered lectures about the on-going research based on Security of Cyber Physical Systems, Collaborative Edge Computing, Secure Authentication System and other peer research
- Demonstrated the working models of Secure Authentication for Edge Data Centers
- Demonstrated the working of Machine Learning Models for Secure Authentication Monitoring and Intrusion Detection

## **JACOBSTHAL NUMBER CALCULATOR**

May 2014

- Tools - C, Verilog, Matlab, ModelSim, Quartus II, Altera DE 115 FPGA
- In mathematics, the Jacobsthal numbers are an integer sequence named after the German mathematician Ernst Jacobsthal. Like the related Fibonacci numbers, they are a specific type of Lucas sequence defined by a similar recurrence relation
- Software realization of Jacobsthal Number Calculator was coded by using C and Matlab which displayed the output for a given input - n
- Hardware realization of the same was written in Verilog and simulated in ModelSim and implemented into the Altera FPGA

## **IMPLEMENTATION OF 4-BIT FLOATING POINT ARITHMETIC PROCESSOR**

May 2012

- Tools - VHDL, ModelSim, Leonardo Spectrum, Xilinx Virtex II pro
- Floating point numbers have sign, mantissa and exponent. 4-bit processor was designed using state machines to add, subtract, multiply and divide floating point numbers
- Code was written in VHDL, simulated in ModelSim and implemented in Xilinx Virtex II Pro FPGA

## **IMPLEMENTATION OF DWT FOR IMAGE COMPRESSION**

May 2011

- Tools - VHDL, ModelSim
- This Project describes principles of Discrete Wavelet Transformation (DWT) and provides VHDL implementation of it applied to Image compression
- Standard JPEG2000 for picture compression is based on this process
- DWT using Le Gall 5/3 filter bank was designed and implemented in VHDL into two parts - DWT2D and IDWT2D
- The modules were simulated in ModelSim for direct transformation and for inverse transformation to perform one-dimensional DWT and IDWT of the signal

## **TELECARD**

OCT 2000

- Tools - Smart Card, C, JAVA
- A Tele card is a smart card based electronic card used to make local and long distance phone calls over a telephone line. The telecard contains user information and the cash amount that is due
- The Tele card is inserted to the interface slots that form a connection loop with the phone. once the call is connected the pulse is counted and after the call the cost of the call gets deducted from the card memory and new balance is written
- The hardware comprised of the fabricated Tele card having EEPROM chip for PC interface. Software for the interface was developed using C and JAVA

## **PEER REVIEWER - JOURNALS & CONFERENCES**

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- SNCS (Springer Nature Computer Science)
- ACM JETC(ACM Journal on Emerging Technologies in Computing Systems)
- IEEE OJCOM (Open Journal of the Communications Society)

- International Journal of Advanced Computer Science and Applications
- Integration
- Internet of Things
- Machine Learning with Applications
- Software Impacts
- IEEE International Symposium on Smart Electronics (IEEE iSES) 2023
- IEEE International Conference on Digital Health (IEEE ICDH) 2023
- IEEE International Symposium on Smart Electronics (IEEE iSES) 2022
- IEEE ICC WS-04 2ND Workshop on Metaverse-based Networking, Computing and Security (METANCS) 2024
- International Conference on Mathematical Modelling & Computer Simulation in Artificial Intelligence (UKSim) 2024
- IEEE SILCHAR Subsection Conference, IEEE SILCON 2024

## JUDGE

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- **16th Annual 2023 Globee Awards for Women in Business**, Globee Business Awards
- **11th Annual 2023 Leadership Awards**, Globee Business Awards
- Expert Education Judge **CODiE Awards 2024**
- Industry Judge for **Globee Awards for Cybersecurity 2024**
- Industry Judge for **Globee Awards for Technology 2024**
- Industry Judge for **Golden Bridge Awards 2024**
- Industry Judge for **Globee Awards for American Business 2024**

## CERTIFICATIONS

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- Course Completion Certificate, **Introduction to Generative Adversarial Networks (GANs)**, LinkedIn Learning, Nov 2023
- Certificate of Excellence **"Technical Writing Skills"**, Researcher Academy, Oct 2023
- Certificate of Excellence **"Fundamentals of Peer Review"**, Researcher Academy, Oct 2023
- Certificate of Excellence **"Certified Peer Reviewer Course"**, Researcher Academy, July 2023
- Certificate of Attendance **"2022 IEEE ICC Conference Seoul, South Korea"** (virtual), May 2022
- Course Completion Certificate, **"Create Smart Maps in Python and Leaflet"**, Udemy, May 2021
- Course Completion Certificate, **"Web Development in Java and Advanced Java"**, Sun Microsystems, April 2000

## PROFESSIONAL DEVELOPMENT ACTIVITIES

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- Completed the Graduate Student Teaching Excellence Program (GSTEP) course, to develop and refine teaching skills, Spring 2023

## PROFESSIONAL ORGANIZATION MEMBER

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- IEEE Student
- IEEE Young Professionals
- IEEE Computer Society
- IEEE Computer Society's Technical Community on Security and Privacy
- ACM Professional
- IAENG (International Association of Engineers)

## TECHNICAL SKILLS

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**Languages:** Python, C, C++, Java, Assembly, Shell Scripting, VHDL, Verilog, SQL, PL/Sql

**Databases:** Oracle 11g/10g/9i/8i/7.x, IBM DB2, MS SQL Server 2005/2008/2012, SQLite3

**Developer Tools:** Git, VS Code, PyCharm, MCUXpresso IDE, Arduino IDE, Raspbian, Mu Editor

**EDA Tools:** Mentor Graphics ModelSim, Leonardo Spectrum, Precision RTL, IC Flow, AMS, Xilinx EDK, ISE, CodeWarrior, LogixPro, Quartus II, LabView, Multisim, NIOS II, iMPACT, ChipScope Pro, Matlab

**ETL Tools:** Informatica Power Center 9.x/8.x/7.x, PowerExchange

**HDLs:** VHDL, Verilog

**FPGAs:** Xilinx Virtex II Pro, Altera DE2

## REFERENCES

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- **Name:** Dr. Saraju P. Mohanty  
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**Address:** Department of Computer Science and Engineering, University of North Texas Discovery Park, 3940 N. Elm, Room F201, Denton, TX 76207-7102.  
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**Phone:** 940-565-3276 (Office)  
**Relationship:** Major Advisor
- **Name:** Dr. Elias Kougianos  
**Title:** Professor  
**Address:** Department of Electrical Engineering, University of North Texas Discovery Park, 3940 N. Elm, Room F140, Denton, TX 76207-7102.  
**Email ID:** elias.kougianos@unt.edu  
**Phone:** 970-891-6708 (Office)  
**Relationship:** Co-Major Advisor