Gavindya Jayawardena

Ph.D. Student

E&CS 2100, Computer Science
Old Dominion University
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RESEARCH INTERESTS

Eye-tracking, Data Science, Information Retrieval, HCI, Machine Learning

EDUCATION

Jan. 2019 - Present **Ph.D.,** Computer Science
Old Dominion University, Norfolk, VA
Advisor: Sampath Jayarathna
GPA - 4.0/4.0
Courses: Data Science and Analytics, Machine Learning, Practical Machine Learning and Applications, Information Retrieval, Algorithms and Data Structures, DevOps & Containers, Natural Language Processing, Blockchains and Cryptocurrencies, Deep Learning on Graphs

Jan. 2015 - Dec. 2018 **B.Sc.,** Computer Science and Engineering, First Class Honors
University of Moratuwa, Sri Lanka
GPA - 3.85/4.2
Courses: Human Computer Interaction, Machine Learning, Advanced Algorithms, Data Mining & Information Retrieval, Distributed Systems

EXPERIENCE

Jan. 2019 - Present **Old Dominion University**, Norfolk, VA
Graduate Research/Teaching Assistant in Computer Science

May 2022 – May 2023 **Learning, Innovation, & Technology Lab, Harvard University**, Cambridge, MA
Remote Research Assistant

Jun. – Aug. 2021& 2022 **Los Alamos National Lab,** Los Alamos, NM
Summer Research Intern, Institutional Scientific Content Team

Jan. 2018 - Jun. 2018 **University of Moratuwa**, Sri Lanka
Visiting Instructor in Computer Science

Jun. 2017 - Dec. 2017 **UStocktrade (Pvt) Ltd**. Sri Lanka
Software Engineering Intern

TEACHING EXPERIENCE

Summer 2023 **CARE Summer High School Workshop**, Old Dominion University

Spring 2021 **CS250 - Problem Solving and Programming II,** Old Dominion University
Teaching Assistant for Dr. Ayman El Mesalami

Fall 2020 **CS334 - Computer Architecture**, Old Dominion University
Teaching Assistant for Dr. Danella Zhao

Fall 2020 **CS450 - Database**, Old Dominion University
Teaching Assistant for Dr. Sampath Jayarathna

Summer 2020 **STRS: Student ThinSat Research Summer Camp**, Old Dominion University

Spring 2020 **CS441/541 - App Development for Smart Devices**, Old Dominion University
Teaching Assistant for Dr. Shubham Jain

Spring 2018 **CS2963 - Presentation Skills**, University of Moratuwa
Teaching Assistant for Dr. Rapti De Silva

PUBLICATIONS

BOOK CHAPTERS

1. Anne Michalek, **Gavindya Jayawardena**, Sampath Jayarathna "Predicting ADHD using Eye Gaze Metrics Indexing Working Memory Capacity", In Computational Models for Biomedical Reasoning and Problem Solving, April 2019 p. 66-88

JOURNAL PUBLICATIONS

2. Bhanuka Mahanama, Yasith Jayawardana, Sundararaman Rengarajan, **Gavindya Jayawardena**, Leanne Chukoskie, Joseph Snider, and Sampath Jayarathna. “Eye Movement and Pupil Measures: A Review”, in: Frontiers in Computer Science – Human-Media Interaction. Vol. 3. Frontiers Media, 2022
3. **Gavindya Jayawardena**, and Sampath Jayarathna. "Automated Filtering of Eye Movements using Dynamic AOI in Multiple Granularity Levels", in International Journal of Multimedia Data Engineering and Management (IGI-Global IJMDEM), 2020 [Invited Journal Paper - IEEE IRI 2020]
4. Abeysinghe, Yasasi, Bhanuka Mahanama, **Gavindya Jayawardena**, Mohan Sunkara, Vikas Ashok, and Sampath Jayarathna. "A-DisETrac Advanced Analytic Dashboard for Distributed Eye Tracking." in International Journal of Multimedia Data Engineering and Management (IGI-Global IJMDEM), 2024 [Invited Journal Paper - IEEE IRI 2023]

PEER-REVIEWED CONFERENCE PUBLICATIONS

5. Abeysinghe, Yasasi, Bhanuka Mahanama, **Gavindya Jayawardena**, Mohan Sunkara, Vikas Ashok, and Sampath Jayarathna. "Gaze Analytics Dashboard for Distributed Eye Tracking." In 2023 IEEE 24th International Conference on Information Reuse and Integration for Data Science (IRI 2023), IEEE, 2023.
6. **Jayawardena, Gavindya**, Yasith Jayawardana, Sampath Jayarathna, Jonas Högström, Thomas Papa, Deepak Akkil, Andrew T. Duchowski et al. "Toward a Real-Time Index of Pupillary Activity as an Indicator of Cognitive Load." In 26th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems (KES 2022) Procedia Computer Science 207 (2022).
7. Bhanuka Mahanama, **Gavindya Jayawardena**, Yasasi Abeysinghe, Vikas G. Ashok, and Sampath Jayarathna, "Multidisciplinary Reading Patterns of Digital Documents", In Proceedings of the 14th ACM Symposium on Eye Tracking Research and Applications, (ETRA 2022).
8. Mahanama, Bhanuka, **Jayawardena, Gavindya**, and Jayarathna, Sampath. “Analyzing Unconstrained Reading Patterns of Digital Documents Using Eye Tracking”. In: 2021 ACM/IEEE Joint Conference on Digital Libraries (JCDL 2021). IEEE, pp. 282–283. [***Best Poster Award***]
9. Yasith Jayawardana, **Gavindya Jayawardena**, Andrew T. Duchowski, and Sampath Jayarathn). “Metadata-Driven Eye Tracking for Real-Time Applications”. In: Proceedings of the 21st ACM Symposium on Document Engineering. Limerick, Ireland: ACM.
10. **Gavindya Jayawardena**, and Sampath Jayarathna, “Automated Filtering of Eye Gaze Metrics from Dynamic Areas of Interest”, in IEEE 21st International Conference on Information Reuse and Integration for Data Science (IRI), 2020

11. **Gavindya Jayawardena**, Sampath Jayarathna, and Jian Wu. " Analyzing the Effect of Reading Patterns using Eye Tracking Measures". Proceedings of the ACM/IEEE Joint Conference on Digital Libraries (JCDL), August 2-5, 2020, Xi'an, Shaanxi, P. R. China (in press) [***Best Poster Award***]
12. **Gavindya Jayawardena**, Anne Michalek, Andrew Duchowski, and Sampath Jayarathna. "Pilot Study of Audiovisual Speech-In-Noise (SIN) Performance of Young Adults with ADHD". Proceedings of the ACM Symposium on Eye Tracking Research & Applications (ETRA), June 2-5, 2020, Stuttgart, Germany
13. Senuri De Silva, Sanuwani Dayarathna, Gangani Ariyarathne, Dulani Meedeniya, Sampath Jayarathna, Anne Michalek, **Gavindya Jayawardena**, “A Rule-Based System for ADHD Identification using Eye Movement Data”, International Multidisciplinary Engineering Research Conference (MERCon2019), IEEE explorer, Sri Lanka, 2019. pp. 538- 543 [***Best Paper Award***]
14. **Gavindya Jayawardena**, Anne Michalek and Sampath Jayarathna, “Eye Tracking Area of Interest in the Context of Working Memory Capacity Tasks,” in IEEE 20th International Conference on Information Reuse and Integration for Data Science (IRI), 2019, pp. 208–215
15. Yasith Jayawardana, Randil Fernando, **Gavindya Jayawardena**, Dileka Weerasooriya, Indika Perera (2018). "A Full Stack Microservices Framework with Business Modelling". In: 18th International Conference on Advances in ICT for Emerging Regions, ICTer 2018

CONFERENCE POSTERS AND DOCTORAL CONSORTIUMS (not in proceedings)

16. **Gavindya Jayawardena**, Sampath Jayarathna, and Yi He. "ADHD Prediction Through Analysis of Eye Movements With Graph Convolution Network." In 2023 Graduate Research Achievement Day, College of Sciences, ODU (2023).
17. Owens, James, **Gavindya Jayawardena**, Yasasi Abeysinghe, Vikas G. Ashok, and Sampath Jayarathna. "Main Sequence Relationships, Task Load, and Cognitive Load." In Undergraduate Research Symposium, College of Sciences, ODU (2023).
18. Abeysinghe, Yasasi, **Gavindya Jayawardana**, Autumn Woodson, Efe Bozkir, Enkelejda Kasneci, Andrew Duchowski, and Sampath Jayarathna. "Exploring Human Perception while Reading Fake and Real News Articles." In 2023 Graduate Research Achievement Day, College of Sciences, ODU (2023).
19. **Gavindya Jayawardena**. "Introducing a Real-Time Advanced Eye Movements Analysis Pipeline." In 2022 Symposium on Eye Tracking Research and Applications, pp. 1-2. (ETRA 2022) [***Best Doctoral Symposium Presentation Award***]
20. **Gavindya Jayawardena**, Sampath Jayarathna, and Jian Wu. "Analysis of Reading Patterns of Scientific Literature using Eye-Tracking Measures." In 2021 Graduate Research Achievement Day, College of Sciences, ODU (2021).
21. **Gavindya Jayawardena**. “RAEMAP: Real-Time Advanced Eye Movements Analysis Pipeline”. In International Conference on Artificial Intelligence in Medicine (AIME 2020), August 25–28, 2020
22. **Gavindya Jayawardena**, Anne Michalek, and Sampath Jayarathna, "Pilot Study of Audiovisual Speech-In-Noise (SIN) Performance of Adolescence with ADHD Using Eye-Tracking", ACM CAPWIC, Newport News, VA, March 27-28, 2020
23. **Gavindya Jayawardena**. “RAEMAP: Real-Time Advanced Eye Movements Analysis Pipeline”. In Symposium on Eye Tracking Research and Applications (ETRA ’20 Adjunct), June 2–5, 2020, Stuttgart, Germany.

TECHNICAL REPORTS

24. **Gavindya Jayawardena**, Anne Michalek, Andrew Duchowski, and Sampath Jayarathna. "Pilot Study of Audiovisual Speech-In-Noise (SIN) Performance of Young Adults with ADHD". In: arXiv:2004.08390 [q-bio.NC], Apr.2020.
25. **Gavindya Jayawardena**, Anne Michalek, and Sampath Jayarathna, "Eye Gaze Metrics and Analysis of AOI for Indexing Working Memory towards Predicting ADHD". In: arXiv:1906.07183 [cs.HC], Jun.2019.

WORK IN PROGRESS

1. **Jayawardena, Gavindya**, Yasith Jayawardana, Yasasi Abeysinghe, Bhanuka Mahanama, and Sampath Jayarathna. "A Real-Time Approach to Capture Ambient and Focal Attention in Visual Search."
2. Abeysinghe, Yasasi, **Gavindya Jayawardena**, Autumn Woodson, Efe Bozkir, Enkelejda Kasneci, Andrew Duchowski, and Sampath Jayarathna. "Assess Fake News Engagements via Advanced Eye Movement Measures."
3. Owens, James, **Gavindya Jayawardena**, Yasasi Abeysinghe, Vikas Ashok, and Sampath Jayarathna. "Towards an Objective Measure of Working Memory Capacity via Eye Tracking."

BLOG ARTICLES

1. Effect of Reading Patterns of Novice Researchers using Eye Tracking
   https://ws-dl.blogspot.com/2020/04/2020-04-25-effect-of-reading-patterns.html
   This article explains how novice researchers' eye movements change during a research papers reading task.
2. Lab Streaming Layer (LSL) Tutorial for Windows
   https://ws-dl.blogspot.com/2019/07/2019-07-15-lab-streaming-layer-lsl.html
   This article explains how to install open source LSL and stream eye movement data from PupilLabs Core eye tracker to NeuroPype academic edition.
3. Use of Cognitive Memory to Improve the Accessibility of Digital Collections
   https://ws-dl.blogspot.com/2019/06/2019-06-19-use-of-cognitive-memory-to.html
   This article explains a study conducted to investigate eye gaze metrics collected during Reading SPAN task to differentiate the performance of adults with and without ADHD, and how to generalize that study to improve content accessibility for the people with learning disabilities without overloading their cognitive memory.
4. Real-time Header Extraction from Scientific PDF Documents: Summer Research Internship Experience at Los Alamos National Laboratory
   https://ws-dl.blogspot.com/2021/09/2021-09-23-real-time-header-extraction.html
   This article explains my 2021 Summer research internship experience at Los Alamos National Laboratory.
5. PDFServer - Our Summer Internship at LANL
   https://ws-dl.blogspot.com/2022/12/2022-12-21-pdfserver-our-summer.html
   This article explains my 2022 Summer research internship experience at Los Alamos National Laboratory.
6. ADHD Prediction Through Analysis of Eye Movements With Graph Convolution Network
   https://ws-dl.blogspot.com/2022/06/2022-06-18-adhd-prediction-through.html
   This article discusses how I utilized graphs generated using eye-tracking data for the diagnosis of ADHD.
7. ACM Symposium on Eye Tracking Research and Applications Trip Reports
   ETRA 2023: *https://ws-dl.blogspot.com/2023/06/2023-06-20-acm-symposium-on-eye.html*
   ETRA 2022: *https://ws-dl.blogspot.com/2022/07/2022-07-14-acm-symposium-on-eye.html*

8. CARE: Coastal Adaptation and Resilience Education
   https://ws-dl.blogspot.com/2023/08/2023-08-22-care-coastal-adaptation-and.html
   This article summarizes CARE Summer camp 2023, held at Old Dominion University.

INVITED TALKS

1. “Introduction to Numpy and Pandas”. Coastal Adaptation and Resilience Education (CARE) Summer Camp, Computer Science Department, Old Dominion University, 2023
2. “RAEMAP: Real-time Advanced Eye Movements Analysis Pipeline”. Student Presenter at Web Science & Digital Libraries Research Group Expo (WS-DL Expo), Computer Science Department, Old Dominion University, 2023
3. "Eye Tracking for Predicting ADHD". CS Summer Research Workshop, Old Dominion University, 2019
4. “Eye-Tracking for Assessing Speech-In-Noise Performance of Adults with ADHD”. Guest Lecture for CS395 - Research Methods in Data & Web Science, Old Dominion University, 2020
5. “Introduction to Data Wrangling”. Guest Lecture for STRS: Student ThinSat Research Summer Camp, Old Dominion University, 2020

PROJECTS

1. **Real-Time Advanced Eye Movements Analysis Pipeline (RAEMAP)**
   Designed and developed RAEMAP, an advanced pipeline to analyze traditional positional gaze measurements as well as advanced eye gaze measurements. The implementation of RAEMAP includes real-time analysis of fixations, saccades, gaze transition entropy, ambient/focal viewing coefficient, and real-time measure of cognitive load. RAEMAP provides visualizations of generated advanced gaze measures in real-time.
   Technologies - Python, Pandas, NumPy, HvPlot, Web-sockets
2. **Detect Cognitive Load in Real-Time using Pupillary Activity**
   Re-designed and implemented the Low/High Index of Pupillary Activity (LHIPA), an eye-tracked measure of pupil diameter oscillation to function in real-time, in collaboration with Dr. Andrew Duchowski from Clemson University, Clemson, South Carolina. The novel Real-time IPA (RIPA) is shown to discriminate cognitive load in re-streamed eye-tracking data from previous experiments.
   Technologies - Python, Pandas, NumPy, Savitzky-Golay Filter
3. **Table of Contents (TOC) for Blog Posts**
   Developed a browser extension, utilizing article segmentation and extractive summarization to generate Wikipedia-style TOC for blog posts to serve both as an article summary, and as a shortcut to navigate to sections of interest.
   Technologies - Python, HTML, InferSent, NLTK Tokenizer, LexRank
4. **A Blockchain-Based System for Department of Motor Vehicles (DMV) of Virginia**
   Constructed a blockchain-based system for DMV where, drivers, vehicle owners, police departments, and car dealers can all benefit from the DMV's online services, without a customer service representative.
   Technologies - Ganache, Metamask, Web3, Truffle, HTML, CSS, Vue.js
5. **March Madness Prediction - NCAA® tournaments in 2017, 2018, 2019**
   Created ML models to predict which team would win at each possible

game in the next season, as a probability. We trained and evaluated each model using the four feature-sets, and evaluated their performances in terms of classification accuracy, and log loss.
Technologies - Scikit-Learn, Logistic Regression, K-Nearest Neighbors (k=3), Random Forest, FCNN

6. **Specialty Search Engine (SSE) to Explore Sri Lanka (SL)**
   Designed and developed a SSE to explore SL across multiple websites by crawling a set of seed URLs. This SSE provides a collection of results about certain attractions in SL, by ranking the results, and avoiding promotional content such as tours & hotels.
   Technologies – Elasticsearch, Kibana, Scrapy, Python, HTML, CSS, JS, JQuery
7. **Joint Visual Attention and Joint Mental Effort in Collaborative Learning**
   Explored the relationship between joint visual attention and joint mental effort in collaborative learning environments by conducting a data analysis of eye tracking datasets from three studies in collaboration with Dr. Bertrand Schneider from Harvard University, Cambridge, MA. Analyzed joint visual attention and joint mental effort, and how they support collaboration in terms of collaboration quality and learning gains.
   Technologies - Python, Pandas, NumPy
8. **GROBID based Scholarly PDF Header and Full Text Extractor**
   Designed and developed a software to extract header information such as title, abstract, keywords, authors, affiliations, and full text from scholarly PDF documents in real-time and process extracted data. Goal was to populate LANL's Review & Approval System, RASSTI's forms with extracted data.
   Technologies - Python, GROBID, BeautifulSoup, Flask, Sphinx, HTML
9. **Automate Filtering of Eye Movements**
   Designed a study to detect dynamic areas of interest using object detectors and filter eye movement data that falls within the polygonal boundaries of detected dynamic AOIs.
   Technologies - Python, Pandas, OpenCV, Detectron
10. **Analyze Performance of Adolescents with ADHD Using Eye-Tracking**
    Conducted a pilot study to assess audiovisual Speech-In-Noise (SIN) performance of adolescents with ADHD compared to age-matched controls using eye-tracking measures. Found that some signal-to-noise ratios shifts noise to a point where processing of speech becomes less automatic and relies more on increased cognitive load.
    Technologies - Python, Pandas, NumPy, TobiiPro X2-60 eye tracker with Tobii Studio analysis software
11. **Predicting ADHD using Eye Movements**
    Developed a feasibility study to confirm eye movement data as a predictor of a diagnosis of ADHD in adults. Tree-based classifiers performed with 91% accuracy.
    Technologies - Python, Pandas, NumPy, WEKA, TobiiPro X2-60 eye tracker with Tobii Studio analysis software
12. **Focused Crawler for Academic Web**
    Designed a study to determine the next set of crawl URLs using URL update frequencies from crawl history.
    Technologies - Internet Archive, Python, NumPy, Pandas
13. **MSstack**
    Designed a microservices framework for Java, with boilerplate code generation and service orchestration using messaging.

Technologies - Java, Netty, Kafka, Zookeeper, Curator

14. **MedFriend**
    Designed a Web and Mobile application to manage Medical Records of patients which allows authorized Doctors to view and edit.
    Technologies - PHP, Laravel, HTML, CSS, jQuery, Angular2, Ionic2, Typescript, MySQL
15. **Automate API Code Generation**
    Developed a program to automatically generate and update API documentation using the code base.
    Technologies - Java, OpenAPI/Swagger, Maven, Mustache templating, HTML, CSS, JS
16. **DengAI**
    Developed a model to predict Dengue disease spread. The competition is hosted by Drivendata. Rank #1 out of about 4000 entrants.
    Technologies - Python, Scikit-learn, Pandas
17. **Music School**
    Developed a web application to manage information of a medium sized music school. Mainly focused on class scheduling, attendance, salaries of teachers, monitor progress of students and fee payments.
    Technologies - PHP, Laravel, jQuery, HTML, CSS, MySQL
18. **Information System for Goldline Tours and Tyres Centre**
    Designed and developed an Information System for a company. Mainly focused on Inventory Management, Employee Management and day to day transactions.
    Technologies - C#, MySQL
19. **AutoMate**
    Designed and developed a mobile application to report accidents to the insurance company by the owner of the vehicle himself. The app supports sending pictures of the damage along with the insurance policy details.
    Technologies - AngularJS with Ionic framework, HTML, PHP with Laravel
20. **Congress Management Application**
    Developed a web application to manage parallel activities of a congress. Mainly focused on providing feedback to the speaker and asking questions from the speakers.
    Technologies - Node.js, AngularJS, HTML, CSS
21. **Rapidoid Plugin for Swagger Codegen**
    Developed a program to automatically generate the Rapidoid framework's syntax adhered server- side code for Swagger codegen.
    Technologies - Java, Rapidoid, OpenAPI/Swagger, Mustache templating

SERVICES

Undergraduate Mentoring	NIRDS Lab, Old Dominion University, 2021-2024 NSF Research Experiences for Undergraduates (REU 2023), Computer Science Department, Old Dominion University, 2023
Reviewing	(CHI) Conference on Human Factors in Computing Systems, 2024 (IUI) Intelligent User Interfaces, 2020, 2021, 2022 (JCDL) ACM/IEEE-CS Joint Conference on Digital Libraries, 2020, 2022 (ETRA) Eye Tracking Research & Applications Symposium, 2020, 2024 (AH) Augmented Human, 2020 (CIKM) Conference on Information and Knowledge Management, 2022 (CHIIR) ACM Conference on Human Information Interaction & Retrieval, 2021

IEEE BigData, 2021, 2023

Leadership
President of ACM Student Chapter-Women, Old Dominion University, 2022-2023
President of ACM Student Chapter, University of Moratuwa, 2018

Volunteering
2nd Annual JRMF Math & Computer Science Festival, Old Dominion University
34th Great Computer Challenge (Grades 6-12), Old Dominion University
STEAM on Spectrum event, VMASC, VA, 2019
Trick-or-Research Event, Computer Science Department, Old Dominion University, 2023, 2022, 2021, 2020, 2019

AWARDS, HONORS, & SCHOLARSHIPS

Best Doctoral Symposium Presentation Award, 2022 Symposium on Eye Tracking Research and Applications (ETRA 2022)
Best Poster Award, 2021 ACM/IEEE Joint Conference on Digital Libraries (JCDL 2021)
Best Poster Award, 2020 ACM/IEEE Joint Conference on Digital Libraries (JCDL 2020)
Computer Science, Irwin B. Levinstein Scholarship, 2020-2021, Old Dominion University ($2500)
Best Paper Award, 2019 International Multidisciplinary Engineering Research Conference (MERCon2019)
Computer Science Outstanding Researcher Award, 2019-2020, Old Dominion University
Dominion Graduate Scholar, 2019, Old Dominion University
Dean's List - Semester 1, 6, 7, 8, University of Moratuwa, Sri Lanka
Mahapola Higher Education Scholarship (4 academic years) - 20014/2018 University of Moratuwa, Sri Lanka

SKILLS

Programming Languages - Python, Java, C#, HTML, JS, CSS, PHP
Databases – MySQL, NoSQL, MongoDB
Data Science - Data Exploration, shaping, cleansing, augmentating
Version Control – Git, Apache Subversion
IDEs - PyCharm, IntelliJ, Netbeans, PHPStorm, Visual Studio, WebStorm, Spyder
Frameworks/Libraries - Tensorflow, Keras, Pandas, NumPy, scikit-learn, matplotlib, OpenCV, Laravel, Ionic, Flask
Operating Systems - Windows, Android, MacOS, Ubuntu
Eye Trackers - PupilLabs Core, PupilLabs Invisible, Tobii Pro Glasses 3, GazePoint GP3
Software - WEKA, Neuropype, Lab Streaming Layer, Tobii Studio Analysis, Pupil Capture, GROBID
Creative Tools - SmartDraw, draw.io, Creately, MS Visio
Game Engines - Unity

MEMBERSHIPS

Member, The Honor Society of Phi Kappa Phi
Student member, Association for Computing Machinery (ACM)
Student member, IEEE Computer Society
Student member, IESL, Sri Lanka