VIRGIL ORR JUNIOR FACULTY AWARD 2023
Pradeep Chowriappa, Ph.D.
Assistant Professor of Computer Science
College of Engineering and Science

I feel incredibly privileged to have been selected as the nominee from the College of Engineering and Science for the Virgil Orr Junior Faculty Award. As an alumnus of Louisiana Tech University, I have made it my personal responsibility to uphold the principles of "Guidance through service, involvement, and mentoring." Therefore, I am proud to showcase my achievements as an Assistant Professor as proof of my commitment to supporting the mission and objectives of Louisiana Tech University.

1. TEACHING

As a faculty member in the Computer Science program, I am committed to helping students develop a deep understanding of the field. Computer Science is built on sound theoretical concepts, which can be generalized and applied to solve real-world problems. My teaching philosophy reflects these three elements:

- Sound theoretical concepts: I believe that students need a strong foundation in the theoretical concepts of Computer Science. These concepts provide the foundation for understanding how to solve real-world problems.
- Generalization: I believe that students should be able to generalize the theoretical concepts they learn to solve new problems. This ability to generalize is essential for success in Computer Science.
- Application: I believe that students should be able to apply the theoretical concepts they learn to solve real-world problems. This ability to apply their knowledge is essential for success in Computer Science.

At the end of every course I teach, I ask myself the following questions:

- Did I clearly explain the theoretical concepts?
- Did I give students the opportunity to generalize these concepts to new problems?
- Did I give students the opportunity to apply their knowledge to solve real-world problems?

Teaching is my passion, and I am dedicated to ensuring that students achieve success. I firmly believe that a solid grounding in Computer Science can pave the way for a prosperous career in any discipline. Consequently, I have endeavored to create courses that strike a balance between theory, design, and practical applications.

As shown in **Table A**, during my tenure as a Research Assistant Professor from 2014 to 2018, and subsequently as an Assistant Professor from 2018 to the present, I have had the chance to serve through a diverse range of undergraduate and graduate courses.

Table A. List of courses taught at Louisiana Tech.

Term	Course Numbers	Brief Course Titles	Class Size	Summary Evaluation
Sp23	CSC498 /CSC580	Adv. Data Mining, Fusion, and Applications	40	
	CSC576-V84[1]	Data Analytics Tools and Applications	13	
W23	CSC430 /CSC530	Database Management Systems/Database Theory	40	3.9/4.0
F22	CSC493 /CSC579	Data Mining and Knowledge Discovery	40	2.7/3.8
Su22	CSC557	Problem Solving Techniques in Computer Science	13	
Sp22	CSC498 /CSC580	Adv. Data Mining, Fusion and Applications	28	3.8/3.8
W22	CSC430 /CSC530	Database Management Systems/Database Theory	27	3.6/4.0
F21	CSC493 /CSC579	Data Mining and Knowledge Discovery	38	3.8/4.0
Su21	CSC557	Problem Solving Techniques in Computer Science	6	
Sp21	CSC498 /CSC580	Adv. Data Mining, Fusion, and Applications	30	3.9/4.0
W21	CSC430 /CSC530	Database Management Systems/Database Theory	32	3.9/3.5
F20	CSC493 /CSC579	Data Mining and Knowledge Discovery	37	3.7/3.8
Su20	CSC557	Problem Solving Techniques in Computer Science	6	
Sp20	CSC498 /CSC580	Adv. Data Mining, Fusion, and Applications	35	3.8/4.0
W20	CSC430 /CSC530	Database Management Systems/Database Theory	32	3.8/4.0
F19	CSC493 /CSC579	Data Mining and Knowledge Discovery	49	3.6/3.8
Su19	CSC 557	Problem Solving Techniques in Computer Science	11	

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[1] Instructor of record. Lectures presented by my senior Ph.D. student.

Sp19	CSC498 /CSC580	Adv. Data Mining, Fusion, and Applications	37	3.9/4.0
W19	CSC430 /CSC530	Database Management Systems / Database Theory	40	4.0/4.0
F18	CSC 493 /CSC579	Data Mining and Knowledge Discovery	42	3.8/3.8
Su18	CSC 557	Problem Solving Techniques in Computer Science	8	
Sp18	CSC345	Operating Systems	36	4.0
	CSC454 /CSC 554 / CYEN498	Advanced Computer Networks	22	3.9/3.3/4.0
W18	CSC430 /CSC530	Database Management Systems / Database Theory	34	3.6/4.0
	CSC345	Operating Systems	30	3.5
	CSC131 /CYEN131	The Science of Computing II	24	4.0/4.0
F17	CSC325	Adv. Data Structures and Algorithms	40	3.9
	CSC222	Systems Programming	39	4.0
	CSC130 /CYEN131	The Science of Computing I	34	3.9/3.8
Su17	CSC220	Data Structures	10	
	CSC131 /CYEN131	The Science of Computing II	10	
Sp17	CSC454 /CSC554 /CYEN489	Advanced Computer Networks	27	3.7/4.0
	CSC345	Operating Systems	40	3.7
W17	CSC450	Computer Networks	49	3.7/3.8
	CSC430 /530	Database Management Systems/Database Theory	41	3.7/4.0
	CSC345	Operating Systems	17	4.0
F16	CSC499/CSC557	Data Analytics Tools and Applications	20	4.0/4.0
	CSC450	Computer Networks	15	3.9
	CSC325	Adv. Data Structures and Algorithms	40	3.8
	CSC220	Data Structures	39	3.6
Su16	CSC220	Data Structures	10	
Sp16	CSC454/CSC554/CYEN489	Advanced Computer Networks	27	3.9/3.9/4.0
	CSC499	Data Analytics Tools and Applications	4	4.0
	CSC345	Operating Systems	31	3.8
W16	CSC430	Database Management Systems	35	3.8
	CSC450	Computer Networks	56	3.9

Bringing research involvement into senior level and graduate courses

All senior and graduate level classes incorporate a research component, where students are introduced to technical journal articles and are required to assess these articles based on the following criteria:

- An overall evaluation of the manuscript based on its clarity of presentation, accuracy of assumptions, and its contributions to the field.
- As part of their manuscript review, students are expected to identify the proposed idea or hypothesis put forth by the authors to address a specific problem.
- They are also required to enumerate the evidence or theory supporting the idea(s) presented by the authors.
- In addition, students are expected to identify any assumptions made by the authors and highlight any missing references or facts that either support or disprove these assumptions.

Many of the assignments created are designed to make research enjoyable and to inspire graduate students to incorporate an idea from a published research article into their own research projects. In addition, they are encouraged to propose a hypothesis that could further improve upon the published findings. Students have always enjoyed through exploring new applications. To ensure students apply theoretical concepts discussed in class and understand the trade- off in their designs – the students first propose their idea mid-term and their final projects their updated and verified designs. Here typical groups are confined to no more than 2-3 students in a group, and the duration of implementing the project spans four weeks. Every proposal will have student defined milestones and deadlines. Projects and then peer reviewed by every student in the class and feedback/comments are provided to the groups on regular project meetings with the faculty.

Highlights from student evaluation comments

- *I really enjoyed learning about databases in this class - I never knew any of this before, and the explanations/examples were very clear. Thank you!*
- *Dr. Chowriappa was a fantastic professor. He clearly explained all the concepts and was engaging during lectures which helped me learn. He was always willing to help as well!*
- *Dr. Chowriappa is a great teacher that will always work with you. He makes the subject very interesting and keeps his lectures entertaining. Very happy with how this class was ran and feel like I learned a lot. Looking forward to taking Dr. Chowriappa more in the future!*
- *Dr. Chowriappa is an asset to the CS department and this university. His classes are organized, and he truly cares about the success of his students. He is always available to answer any questions students may have and will take time outside of class to make sure students understand the material.*
- *I am glad I was able to learn so much through this course, and I was able to learn much both in the theoretical and the applied portions of the data science field; the only problem I had in this class was a lack of prior knowledge going into the course.*
- *EXCELLENT teacher. He teaches the material as well as lets things open for students to discover as well. He is completely understanding and knows how to teach his class in an effective manner that makes even the "boring" material seem interesting.*
- *Honestly the best teacher I have had a tech so far. Class was very informative and interesting. I never got bored. I did struggle on my first test but pradeep was very willing to help me and I absolutely loved that. My advice is to keep doing what you are doing! This was the first class I truly learned in and it made me remember why I wanted to do computer science in the first place.*
- *Dr. Chowriappa dealt with the unexpected shift to online courses this quarter admirably. He prepared us for the possibility in advance of the official announcement and kept in contact through the transition to keep everyone on the same page. He had our online classroom set up very quickly and handled technological difficulties as they arose. The paper critique elements were challenging but exactly what a graduate student should be learning to do. The online group work was not problematic at all and went smoothly.Thank you Dr. Chowriappa for your hard work during this very strange quarter.*

2. RESEARCH

Decision support systems depends on finding the right balance between effective data modeling and the appropriate choice of artificial intelligence (AI) and/or machine learning (ML) algorithms. With the rise of big data and the need to capture data in real time, there is a growing need for computational frameworks that can scale and evolve at the same rate as data growth. This is especially important for applications such as industrial automation and disease monitoring, which require precision in error estimation and accurate inferences.

My primary research focus is on the design of a computational decision support framework is a complex task that requires careful consideration of many factors, including the type of data being used, the desired level of accuracy constrained by available resources. As shown in **Table B**, at the present time I have four (4) active, competitively awarded research projects serving as the PI. These project total over **$434,000**.

Table B. List of projects, their sources of funding, funding amounts, and periods of activity.

Year	Title	Role	Funding Agency	Total award	Period covered
2022	Rural Telehealth network	PI	HRSA	$10,000.00	2022-2023
2021	Cultivating Data Science Talents in High Schools through Active Teacher Engagement	PI	CIC-DHS	$79,427.00	2021-2023
2021	Louisiana Rural Health Outreach Project-Analytics in Telehealth	PI	HRSA	$211,850.00	2021-2025
2020	Contract: Social Engineering Protection	PI	Protect Our Power	$24,999	2020-2021
2019	A Situationally Aware Tailored Health Communications System for Mobile Health Monitoring	PI	LA-BoR	$132,735	2019-2022
2019	SBIR/STTR NASA-Phase I: Broad Advanced Intelligent Network (BRAIN) System for Sustainable Habitats Health Monitoring	PI	NASA	$28,693	07/19-12/19
2018	Gift: Cyber Research for Empowering Women Experimenters (CREWE)[1]	Co-PI	Google	$25,000	08/18-03/19
2017	Riverstone Software Contract[2]	Co-PI	RiverStone	$360,000	

Selected Scientific contributions:

Peer reviewed journals and conference publications

[1] Morais, V., Chowriappa, P., (2022). Effects of Selection Bias on Online Adversarial Aware SVM when Facing an Evasion Attack, *The 2022 International Conference on Computational Science and Computational Intelligence* (CSCI 2022) – Las Vegas USA, December 14-16, 2022

[2] Mapes Jr, N. J., Rodriguez, C., Chowriappa, P., & Dua, S. (2019). Residue adjacency matrix based feature engineering for predicting cysteine reactivity in proteins. Computational and Structural Biotechnology Journal, 17, 90-100.

[3] Mapes, N. J., Rodriguez, C., Chowriappa, P., & Dua, S. (2019). Local Similarity Matrix for Cysteine Disulfide Connectivity Prediction from Protein Sequences. IEEE/ACM Transactions on Computational Biology and Bioinformatics, 17(4), 1276-1289.

[4] Chowriappa, P., & Rentala, G., (2018), A Semi-supervised Feature Engineering Approach for Mixed Data Outlier Detection, 2nd International Conference in Machine Learning and Data Science (ICMLDS 2018), Hyderabad, India.

[5] Acharya, U. R., Akter, A., Chowriappa, P., Dua, S., Raghavendra, U., Koh, J. E., ... & Ramli, M. T. (2018). Use of Nonlinear Features for Automated Characterization of Suspicious Ovarian Tumors Using Ultrasound Images in Fuzzy Forest Framework. International Journal of Fuzzy Systems, 20(4), 1385-1402.

[6] Acharya, U. R., Chowriappa, P., Fujita, H., Bhat, S., Dua, S., Koh, J. E. W., Ng, K. H. (2016). Thyroid lesion classification in 242 patient population using Gabor transform features from high resolution ultrasound images. Knowledge-Based Systems, 107.

[7] Ibrahim, S., Chowriappa, P., Dua, S., Acharya, U. R., Noronha, K., Bhandary, S., & Mugasa, H. (2015). Classification of diabetes maculopathy images using data-adaptive neuro-fuzzy inference classifier. Medical & biological engineering & computing, 53, 1345-1360.

[8] Chowriappa, P., Dua, S., & Todorov, Y. (2014). Introduction to machine learning in healthcare informatics. Machine Learning in Healthcare Informatics, 1-23.

[9] Chowriappa, P., Dua, S., Acharya, U. R., & Krishnan, M. M. R. (2013). Ensemble selection for feature-based classification of diabetic maculopathy images. Computers in biology and medicine, 43(12), 2156-2162.

[10] Dua, S., Acharya, U. R., Chowriappa, P., & Sree, S. V. (2012). Wavelet-based energy features for glaucomatous image classification. IEEE Transactions on Information Technology in Biomedicine, 16(1), 80-87.

Technical reports and book chapters

[1] Best Practices in Social Engineering Protection for Utility Companies, Submitted to Protect 2020 Our Power (POP), Dec 2020.

[2] Dua, S., Chowriappa, P. (2014) *Characterizing Dynamic Group Behavior in Social Networks for* 2014 *Cybernetics*. In DATA ANALYSIS FOR NETWORK CYBER-SECURITY (pp. 105-128). Ed. Niall Adams and Nicholas Heard, World Scientific. DOI: http://dx.doi.org/10.1142/9781783263752_0004

[3] Chowriappa, P., Dua, S., Todorov, Y. (2014) *Introduction to machine learning in healthcare* 2014 *informatics*. In MACHINE LEARNING IN HEALTHCARE INFORMATICS (pp. 1-23).Springer, Berlin, Heidelberg. Ed. S Dua, R Acharya, P Dua, Springer, ISBN 978-3-642-40017-9

Published Books

[1] Dua, S., Chowriappa, P. (2012) DATA MINING FOR BIOINFORMATICS. CRC Press. ISBN: 2012 0849328012.

[2] **P. Chowriappa**, *Integrated Mining of Feature Spaces for Bioinformatics Domain* 2008 *Discovery,* Dissertation, Digital Commons 467.

Undergraduate Student Research Advising

I am committed to encouraging research at the undergraduate level, and I have worked with many undergraduate students to publish research articles and work on funded projects. The following highlights of undergraduate students who have worked within my lab and their accomplishments:

- 2018: Christopher Rodriguez (published two journal articles in projects while working under my supervision), he attended two REUs at CCT@ LSU and the University of Maryland, and now pursuing his PhD at MIT.
- 2019: Alyse Jones (Dual major in Electrical and Cyber Engineering), she attended an REU at the University of Berkely and now pursuing a PhD at Berkley's Electrical Engineering and Science.
- 2020: Zachary Brasseux (presented at the Louisiana Academy of Science Annual conference and was awarded the best undergraduate presentation - for his research work on a NASA funded project he worked on), he is now pursuing his MS in CS at Louisiana Tech.

Graduate Student Research Advising

Over the past year, I have served as the Chair of six (6) Ph.D. committees and one (1) MS committee. I graduated one of these Ph.D. students and three MS student thus far.

Name	Degree	Year of Grad.	Thesis Title
Sree Vidhya Mudundi	MSCS	2017	Structural Learning and Information Theory: A Data Driven Approach
Girish Rentala	MSCS	2018	A Semi-Supervised Feature Engineering Method for Effective Outlier Detection in Mixed Attribute Data Sets
Victor Barboza	MSCS	2022	Analysis Of Selection Bias in Online Adversarial Aware Machine Learning Systems
Yogesh Kale	PhD/CYEN	2022	An Enhanced Adversarial Resilience Classifier for Network Intrusion Detection System (NIDS) By Using Supervised Machine Learning Models

3. SERVICE

Service to profession

2021   **Program Co-Chair:** International Conference on Informatics (ICI 2021), Noida, India. Track on Artificial Intelligence and Machine Learning.

2020   **Publicity Chair:** Urban Data Science (UDS 2020), IIT Chennai, India.

2012-present   **Reviewer of Professional Journals:** Oxford Bioinformatics, Social Network Analysis and Mining, Journal of Medical Imaging and Health Informatics, Journal of Parallel and Distributed Computing.

2012   **Publications Chair:** 6th International Conference on Information Systems, Technology and Management, ICISTM 2012, Grenoble Ecole de Management, France.

2011   **Program Committee:** 5th International Conference on Information Systems, Technology and Management, ICISTM 2011, MDI, Gurgaon, India

2009   **Technical Program Committee:** International Conference on Contemporary Computing, IC3-2009.

Service to Academic Program and College

2018-present   **Graduate Coordinator,** Program of Computer Science, Louisiana Tech University.

2017-present   **Faculty Advisor to Course Work students –** Keeping track of plan of studies and quarterly advising.

2018-present   **Data Mining and Machine Learning (DMML) Laboratory:** Manager of Laboratory

2020-present   **TechX Laboratory:** Manager of Laboratory and undergraduate student activities in the laboratory.

Service to University

2022   Institutional Review Board (IRB) – Associate member.