Sathyanarayanan N. Aakur

3101P Shelby Center, 345 W Magnolia Way
Department of Computer Science and Software Engineering
Auburn University, Auburn, Alabama 36849

Mail: san0028@auburn.edu
Website:http://saakur.github.io

RESEARCH INTERESTS

Application of Cognitive Models in Computer Vision
Predictive Learning for Active Event Perception in Videos; Commonsense Reasoning for Visual Understanding; Contextual Models of Memory for Event Perception

TEACHING INTERESTS

Machine Learning, Computer Vision, Introduction to Programming, Data Structures, Pattern Recognition

EDUCATION

University of South Florida, Tampa, FL — Summer 2019
Ph.D., Computer Science and Engineering
Advisor: Dr. Sudeep Sarkar

University of South Florida, Tampa, FL — Fall 2015
Master of Science, Management Information Systems

Anna University, Chennai, India — Spring 2013
Bachelor of Engineering, Electronics & Communications Engineering
Advisor: Prof. Leena Jasmine

PROFESSIONAL EXPERIENCE

Assistant Professor — Auburn University
Aug 2023 - Present — Auburn, AL

Assistant Professor — Oklahoma State University
Aug 2019 - Aug 2023 — Stillwater, OK

Applied Scientist Intern — Amazon Go
May 2018 - Aug 2018 — Boston, MA

Programmer Analyst — CTSI-Global
Oct 2012 - November 2015 — Chennai, India

Programmer Analyst Intern — CTSI-Global
Apr 2012 - Oct 2012 — Chennai, India

ACADEMIC HONORS AND AWARDS

NSF CAREER Award	**2022**
Sigma Xi Full Member	**2021**
Outstanding Reviewer at CVPR 2020 (Top 3.9% of reviewers)	**2020**
Senior Fellow, USF NSF I-Corps	**2019**
Oral Presentation, Conference on Computer Vision and Robotic Vision	**2017**
Outstanding Contribution to the Company, CTSI-Global	**2015**
Best Student Project Award, Velammal Engineering College	**2010**
Best Student in Foreign Language - French, Leo Matriculation School	**2009**

PEER REVIEWED PUBLICATIONS

Note: In Computer Science, conferences are the primary publication venue over journal publications. They use double-blind reviewing and are equally or more selective than journals. CVPR, ECCV, MICCAI, ICPR, PAKDD, ICDM, WACV, VLSID, and ISVLSI are the top conferences in machine learning, computer vision, data mining, and Internet of Things research. Advised/mentored student authors are underlined.

Book Chapters

B1 Ramy Mounir, **Sathyanarayanan N. Aakur**, Sudeep Sarkar. Self-supervised Event Segmentation. Book Chapter in *Advanced Methods and Deep Learning in Computer Vision*. Elsevier Series on Computer Vision and Pattern Recognition.

B2 **Sathyanarayanan N. Aakur**, Fillipe DM de Souza, Sudeep Sarkar. On the Inherent Explainability of Pattern Theory-based Video Event Interpretations. Book Chapter, *Explainable and Interpretable Models in Computer Vision and Machine Learning in the Springer Series on Challenges in Machine Learning*. [pdf].

Journal Papers

J1 **Sathyanarayanan N. Aakur**, Sudeep Sarkar. Leveraging Symbolic Knowledge Bases for Commonsense Natural Language Inference using Pattern Theory. *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2023. (**Impact Factor**: 24.3)

J2 M Suchetha, Snehith Sankineni, Aanchal Saraswat, **Sathyanarayanan N Aakur**, S Sehastrajit, D Edwin Dhas. An Insight on Recent Advancements and Future Perspectives in Detection Techniques of Parkinsons Disease. *Evolutionary Intelligence*, 2023. (**Impact Factor**: 2.9)

J3 **Sathyanarayanan N. Aakur**, Sanjoy Kundu, Nikhil Gunti. Knowledge Guided Learning: Towards Open Domain Egocentric Action Recognition with Zero Supervision. *Pattern Recognition Letters*, 2022. (**Impact Factor**: 5.1)

J4 **Sathyanarayanan N. Aakur**, Fillipe DM de Souza, Sudeep Sarkar. Generating Open World Descriptions of Video using Commonsense Knowledge in a Pattern Theory Framework. *Quarterly of Applied Mathematics*. [pdf].

Peer-reviewed Conference and Archival Workshop Papers

C1 Shubham Trehan, Udhav Ramachandran, Ruth Scimeca, **Sathyanarayanan N. Aakur**. ProtoKD: Learning from Extremely Scarce Data for Parasite Ova Recognition. *IEEE International Conference on Machine Learning and Applications (ICMLA), 2023* ***(Oral)***

C2 Sanjoy Kundu, **Sathyanarayanan N. Aakur**. Iterative Scene Graph Generation with Generative Transformers. *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2023.*

C3 Shengfang Ma, Yuting Zhou, K. Colton Flynn, **Sathyanarayanan N. Aakur**. Peanut Seed Germination Detection from Aerial Images. *IEEE Workshop on Applied Imagery and Pattern Recognition, 2022.*

C4 **Sathyanarayanan N. Aakur**, Sudeep Sarkar. Learning Actor-centered Representations for Action Localization in Streaming Videos using Predictive Learning. *European Conference on Computer Vision (ECCV) 2022.*

C5 Aditi Bal Basu, Ramy Mounir, **Sathyanarayanan N. Aakur**, Sudeep Sarkar, Anuj Srivastava. Time-Series Analysis of Video Graphs Using Joint Kalman Smoothing and Registration. *European Conference on Computer Vision (ECCV) 2022.* ***(Oral)***

C6 Priyadharsini Ramamurthy, **Sathyanarayanan N. Aakur**. ISD-QA: Iterative Distillation of Commonsense Knowledge from General Language Models for Unsupervised Question Answering. *International Conference on Pattern Recognition (ICPR 2022)* ***(Oral)***

C7 Vishal Pallagani, Priyadharsini Ramamurthy, Vedant Khandelwal, Revathy Venkataramanan, Kausik Lakkaraju, **Sathyanarayanan N. Aakur**, Biplav Srivastava. A Rich Recipe Representation as Plan to Support Expressive Multi-Modal Queries on Recipe Content and Preparation Process. ICAPS 2022 Workshop on Knowledge Engineering for Planning and Scheduling (KEPS), 2022

C8 Shubham Trehan, **Sathyanarayanan N. Aakur**. Towards Active Vision for Action Localization with Reactive Control and Predictive Learning. *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2022.*

C9 **Sathyanarayanan N. Aakur**, Sai Narayanan, Vineela Indla, Vennela Indla, Arunkumar Bagavathi, Akhilesh Ramachandran, and Vishalini Laguduva Ramnath. Metagenome2Vec: Building Contextualized Representations for Scalable Metagenome Analysis *International Conference on Data Mining (ICDM) Workshops, 2021.* ***(Oral)***

C10 **Sathyanarayanan N. Aakur**, Arunkumar Bagavathi, Sai Narayanan, Vineela Indla, Akhilesh Ramachandran, Vishalini Laguduva Ramnath. MG-NET: Leveraging Pseudo-Imaging for Multi-Modal Metagenome Analysis. *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2021.*

C11 Thanh Thieu, Ha Do, Thanh Duong, Shi Pu, **Sathyanarayanan N. Aakur**, Saad Khan. LexDivPara: A measure of paraphrase quality with integrated sentential lexical complexity. *Intelligent Systems Conference (IntelliSys) 2021.*

C12 Vineela Indla, Vennela Indla, Sai Narayanan, Akhilesh Ramachandran, Arunkumar Bagavathi, Vishalini Laguduva Ramnath, **Sathyanarayanan N. Aakur**. Sim2Real for Metagenomes: Accelerating Animal Diagnostics with Adversarial Co-Training. *Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD-2021)* ***(Oral)***

C13 **Sathyanarayanan N. Aakur**, Arunkumar Bagavathi. Unsupervised Gaze Prediction in Egocentric Videos by Energy-based Surprise Modeling. *International Conference on Computer Vision Theory and Applications (VISAPP), 2021*

C14 Sai Narayanan, Akhilesh Ramachandran, **Sathyanarayanan N. Aakur**, Arunkumar Bagavathi. GRaDL: A Framework for Animal Genome Sequence Classification with Graph Representations and Deep Learning. *International Conference on Machine Learning Applications (ICMLA'20), 2020* ***(Oral)***

C15 Sanjoy Kundu, Nikhil Gunti, Bailey Hendrickson, Sunil More, **Sathyanarayanan N. Aakur**. Benchmark and Evaluation of Low Resource Object Detection in Biomedical Images. *IEEE Workshop on Applied Imagery and Pattern Recognition, 2020*

C16 **Sathyanarayanan N. Aakur**, Sudeep Sarkar. Action Localization through Continual Predictive Learning. *European Conference on Computer Vision (ECCV) 2020.*

C17 Vishalini R. Laguduva, Shakil Mahmud, **Sathyanarayanan N. Aakur**, Robert Karam, Srinivas Katkoori. Dissecting Convolutional Neural Networks for Efficient Implementation on Constrained Platforms. *IEEE International Conference on VLSI Design (VLSID), 2020.* ***(Oral)***

C18 Vishalini R. Laguduva, **Sathyanarayanan N. Aakur**, Srinivas Katkoori. Latent Space Modeling for Cloning Encrypted PUF-based Authentication. *IFIP International Internet of Things (IoT) Conference, 2019.* ***(Oral)***

C19 Vishalini R. Laguduva, Sheikh Ariful Islam, **Sathyanarayanan N. Aakur**, Srinivas Katkoori and Robert Karam. Machine Learning based IoT Edge Node Security Attack and Countermeasures *IEEE Computer Society Annual Symposium on VLSI (ISVLSI), 2019.* ***(Oral)***.

C20 **Sathyanarayanan N. Aakur**, Sudeep Sarkar. A Perceptual Prediction Framework for Self Supervised Event Segmentation. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2019.* [pdf].

C21 **Sathyanarayanan N. Aakur**, Fillipe DM de Souza, Sudeep Sarkar. Going Deeper with Semantics: Exploiting Semantic Contextualization for Interpretation of Human Activity in Videos. *Winter Conference on Applications of Computer Vision (WACV), 2019.* [pdf].

C22 **Sathyanarayanan Aakur***, Daniel Sawyer*, Sudeep Sarkar. Fine-grained Action Detection in Untrimmed Surveillance Videos *Winter Conference on Applications of Computer Vision (WACV) Workshops, 2019*.

C23 **Sathyanarayanan N. Aakur**, Fillipe DM de Souza, Sudeep Sarkar. Inherently Explainable Model for Video Activity Recognition *AAAI Workshop On Reasoning and Learning for Human-Machine Dialogues, 2018* ***(Oral)***. [pdf]

C24 Gilbert Rotich*, **Sathyanarayanan Aakur***, Rodrigo Minetto, Mauricio Segundo, Sudeep Sarkar. Using semantic relationships among objects for geospatial land use classification. *IEEE Applied Imagery Pattern Recognition Workshop, 2018*.

C25 **Sathyanarayanan N. Aakur**, Fillipe DM de Souza, Sudeep Sarkar. Towards a Knowledge-based Approach to Video Comprehension. In *Conference on Computer and Robot Vision (CRV), 2017* ***(Oral)***. [pdf]

MENTORING

Current

1. Sanjoy Kundu (Ph.D., Spring 2020 - Present)
2. Shubham Trehan (Ph.D., Fall 2020 - Present)
3. Shengfang Ma (M.S. Summer 2021 - Present)
4. Udhav Ramachandran (B.S. Fall 2022 - Present)
5. Venkata Ragavendra Vavilthota (M.S. Fall 2022 - Present)

Past

1. Priyadarshini Ramamurthy (Ph.D., Fall 2020 - Summer 2023)[*Ph.D. at OK State*]
2. Devyn Hubbard (B.S. Spring 2022 - Spring 2023; [*B.S. at OK State.*])
3. Udhav Ramachandran (High School Intern Summer 2022; [*B.S. at OK State.*])
4. Deepthi Mikkilineni (M.S. Fall 2022)
5. Sriram Madepalli (M.S. Summer 2022; [*First Job: SDE, Amazon*])
6. Swapna Darsi (M.S. Summer 2022; [*First Job: Quality Assurance Analyst, Atlantic Casualty Insurance Co.*])
7. Ramya Mikkilineni (M.S. Summer 2022; [*First Job: SDE, Samsung*])
8. Vineela Indla (M.S. Fall 2021; [*First Job: SDE, Amazon*])
9. Yashwanth Peddaboina (M.S. Summer 2022; [*First Job: SDE, Amazon*])
10. Trae Primm (B.S. REU Summer 2021)
11. Madison Rushing (B.S. REU Summer 2021)
12. Nikhil Gunti (M.S., 2019 - 2021; [*First Job: Data Scientst, Concat Systems*])
13. Makenzie Terrell (B.S., Fall 2020 - Fall 2021)
14. Gilbert Rotich (Ph.D. (USF), 2017-2019)
15. Daniel Sawyer (B.S. (USF), 2016 - 2018) [*Next: Ph.D. at USF, Tampa*]
16. Subramanian Viswanathan (M.S. (USF), 2016 - 2017)[*First Job: Goldman Sachs*]

TEACHING EXPERIENCE

Instructor — Auburn University
Apr 2012 - Oct 2012 — Auburn, AL
Fall 2023: COMP 5600/6600 Artificial Intelligence

Instructor — Oklahoma State University
Apr 2012 - Oct 2012 — Stillwater, OK
Spring 2020-2023: CS 5323 Design and Implementation of Operating Systems II
Fall 2020-2022: CS 4783/5783 Machine Learning

Instructor — University of South Florida
Summer 2017, Summer 2019 — Tampa, FL
Undergraduate Course: IT Programming Fundamentals

Graduate Teaching Assistant — University of South Florida
Summer 2017, Summer 2019 — Tampa, FL
Spring 2019: Computer Vision (Graduate)
Spring 2017 - Summer 2019: USF I-Corps Sessions (NSF Lean Business Canvas Course)
Spring 2017: Biometrics (Graduate), IT Data Structures/Algorithms (Undergraduate)
Fall 2016: IT Data Structures (Undergraduate), Computational Geometry (Undergraduate)
Spring 2016: Automata Theory/Formal Languages (Undergraduate)

PROFESSIONAL SERVICE

Demo Chair. IEEE/CVF CVPR 2024.
Associate Editor: IEEE Robotics and Automation Letters (RA-L, 2021-Present)
Area Chair/Senior Program Committee: ACM Multimedia 2021, IEEE/CVF CVPR 2022-2024, NeurIPS 2023, CODS-COMAD 2024, IEEE/CVF WACV 2024
NSF Panels: IIS CHS (2020)
Track Chair: DEEP-DIAL (AAAI-2021), Machine Learning for Graphs (ICMLA 2020), ICMLA 2020 (Computer Vision), Vision for Robotics (VISAPP 2021)
Organizer: DEEP-DIAL Workshop (AAAI-2021), Special Session on Machine Learning for Graphs (ICMLA 2020-2023), CS Colloquium (OK State, 2019-2023), AI Seminar (University of South Florida. Fall 2016 - Spring 2019)
Program Committee: AAAI 2020, AAAI 2021, AAAI 2022
Reviewer: IET Computer Vision, IEEE Access, Springer KAIS, WACV 2020, ICCV 2019, CVPR 2019, CVPR 2020, CRV 2020, ECCV 2020, WACV 2021, NeurIPS 2020, ACCV 2020, ICLR2021, CVPR2021, ICML 2021, NeurIPS 2021, ICCV 2021, WACV 2022, ICLR 2022, WACV 2023, WACV 2024
External Reviewer: PLOS ONE, IROS 2017, CAIP 2017

TALKS

Invited Talk. *Towards Multimodal Open World Event Understanding with Neuro Symbolic Reasoning.* 7th Summer School on AI, IIT-Hyderabad. Summer 2023.
Invited Talk. *Representation Learning for Metagenomics: An Explorative Study.* INTERACT Symposium on One Health and One Medicine. Summer 2023.
Invited Talk. *Towards Open World Event Understanding with Neuro Symbolic Reasoning.* The University of Iowa. Spring 2023
Invited Talk. *Towards Multimodal Open World Event Understanding with Neuro Symbolic Reasoning.* Auburn University. Spring 2023
Invited Talk. *Towards Open World Event Understanding with Neuro Symbolic Reasoning.* The Washington University at St. Louis. Fall 2022
Invited Talk *Towards Open World Visual Understanding with Neuro Symbolic Reasoning.* Mega AI series, Pacific Northwest National Lab (PNNL). Fall 2022
Invited Talk *Towards Intelligent Agents with Open World Visual Understanding* . Collaborative Assistants for the Society (CASY 2020). Fall 2020
Invited Talk *The Role of Commonsense Knowledge in Visual Understanding.* Oklahoma State University. Fall 2018
Invited Talk with *Dr. Sudeep Sarkar. Going Deeper with Semantics: Exploiting Se-*

mantic Contextualization for Interpretation of Human Activity in Videos. Technical Seminar Series, Statistical Shape Analysis & Modeling Group, Florida State University. Fall 2018

Invited Talk with *Dr. Sudeep Sarkar*. *Video Event Understanding with Pattern Theory*. Robotics Technical Seminar Series, Department of Mechanical Engineering, University of South Florida. Spring 2018

Invited Talk *Leveraging ConceptNet to Reduce Training Requirements for Video Descriptions*, Seminar in AI, University of South Florida, Spring 2017.

FUNDING

Total Funding: $3,034,577 **(External),** $187,000 **(Internal). Aakur share:** $1,084,402**, As PI:** $844,232

Current

1. *Collaborative Research: RI: Medium: Understanding Events from Streaming Video - Joint Deep and Graph Representations, Commonsense Priors, and Predictive Learning*, NSF CISE Core Program, $285,126, **PI**.
2. *CAREER: Towards Causal Multi-Modal Understanding with Event Partonomy and Active Perception*, National Science Foundation (NSF), $514,186, **PI**
3. *AI-based approach to understand stress in low and high growth rate cattle*. US Department of Agriculture, $999,078, **Co-PI**.

Past

1. *Identification of pile-up jets in the ATLAS experiment on an event-by-event basis*. US Department of Energy (DOE), $224,547, **Co-PI**.
2. *Deep Learning Computational Algorithms for Disease Diagnosis by Genome Sequence*, USDA National Animal Health Laboratory Network, $158,136, **Co-PI**.
3. *REU Supplement: Collaborative Research: RI: Medium: Understanding Events from Streaming Video - Joint Deep and Graph Representations, Commonsense Priors, and Predictive Learning*, NSF CISE Core Program, $7,920, **PI**
4. *GPU Server for Improving AI and Data Science Education*, OSU College of Arts and Sciences (CAS) Student Technology Fee Request, $25,000, **PI**
5. OSU College of Arts and Sciences Research (ASR) Program, $12,000, **PI**
6. *Next Generation User Interfaces for Gateway Autonomous Operations*, NASA X-Hab Project, $30,000, **Co-PI**
7. *Accelerating Research Discoveries with GPU-enabled Computing*, Oklahoma State University Core Facility Support Program, $150,000, **Co-PI**.

PROFESSIONAL REFERENCES

Available upon request.