Pujitha Mannaru

Pujithamannaru.com | pujitha.mannaru@uconn.edu | Storrs, CT 06268

Education

Ph.D., Electrical and Computer Engineering   May 2020 (expected)

University of Connecticut, Storrs, CT

Thesis: *Cognitive Workload Monitoring using Ocular Measures in UAV Operators*

M.S., Electrical and Computer Engineering   June 2017

University of Connecticut, Storrs, CT

B.E., Electronics and Communications Engineering   May 2013

PES Institute of Technology South Campus, Bangalore, India

Research Experience

Graduate Student Researcher at Cyber Systems and Optimization Laboratory, UCONN

· **UAV Operator Workload Modeling for a Robust Human-Machine Interface**

In collaboration with the US Naval Research Laboratory (NRL-DC)   Sept 2014 – Present

Developed a cognitive context classification system to classify and monitor the workload levels in UAV operators working on a simulated UAV mission, using eye tracking data.

- **Pupil Dilation Based Models**:
  - Devised and verified three statistical pupillary features in characterizing cognitive workload in UAV operators in a simulated testbed
  - Achieved ~80% accuracy in classifying cognitive workloads into too low/too high
  - Developed a real-time workload change detection and tracking algorithm, based on continuous changes in pupil dilation alone
  - Achieved real time change detection within ~10s of switching from low to high workload and vice versa.
- **Gaze Direction Based Models**:
  - Engineered several spatial features computed from gaze data based on dwells and fixations
  - Developed a Markov chain framework to classify workload based on raw gaze data for both offline and online/real-time purposes
  - Achieved ~75% accuracy in classifying sequences as small as 30s intervals.
- **Pupil and Gaze Information Fusion:**
  - Fused above two pupillary and gaze metrics and obtained ~87% accuracy in classifying three workload levels.
- **Methods**: Machine Learning (SVM, PCA, LDA, QDA), Markov Models, n-gram Smoothing, CUSUM test
- **Programming Languages**: MATLAB, Python.

· **Performance Evaluation of cost-effective eye trackers**

In collaboration with the US Naval Research Laboratory (NRL-DC)   Sept 2016 – July 2017

- Evaluated the performance of low cost eye trackers, the Gazepoint GP3 and EyeTribe in pupillometry studies, using a digit span experiment under three background luminance levels.

· **Cognitive Video Streaming**
   In collaboration with Comcast corporation   Jan 2014 – Sept 2014
   - o Developed a Quality of Experience (QoE) measure from video on demand services data provided by Comcast Corporation, achieved an R^2 of 0.7
   - o **Methods**: Regression, Neural Networks, Survival Models, Feature Selection
   - o **Programming Languages**: MATLAB

Journal Publications

J1.   **Mannaru, P**., Pattipati, K., Palmieri, F.A.N., Sibley, C., & Coyne, J., "Robust Cognitive Workload Classifier by Fusing Eye-tracking measures" in preparation*.*

J2.   **Mannaru, P**., Pattipati, K., Palmieri, F.A.N., Sibley, C., Coyne, J. & Devlin, S.P. (submitted, 2019), "Markov Chain Modeling of Gaze Data as Indices of Cognitive Workload," under review, *IEEE Access.*

J3.   **Mannaru, P**., Balasingam, B., Pattipati, K., Sibley, C., & Coyne, J. (submitted, 2019), "Real-time Cognitive Context Detection and Tracking based on Pupil Dilation," under review, *IEEE Transactions on Human Machine Systems.*

J4.   Mishra, M., **Mannaru, P.,** Sidoti, D., Bienkowski, A., Zhang, L. and Pattipati, K., (2019, July). Context-Driven Proactive Decision Support for Hybrid Teams. *AI Magazine*, *40*(3), pp.41-57.

J5.   Mishra, M., Sidoti, D., Avvari, G. V., **Mannaru, P.,** & Ayala, D. F. M. (2017, May) "A Context-Driven Framework for Proactive Decision Support with Applications", in *IEEE Access*, vol. 5, pp. 12475-12495.

J6.   Pasupuleti, D., **Mannaru, P.,** Balasingam, B., Baum, M., Pattipati, K., Willett, P., Lintz, C., Commeau, G., Dorigo, F., & Fahrny, J. (2017, June), "Cognitive Video Streaming," *Journal of Advancements in Information Fusion*, 12(1), 41-57.

Conference Presentations

C1.   **Mannaru, P**., Balasingam, B., Pattipati, K., Sibley, C., & Coyne, J. T. (2017, July). Performance Evaluation of the Gazepoint GP3 Eye Tracking Device Based on Pupil Dilation. In *International Conference on Augmented Cognition* (pp. 166-175). Springer, Cham

C2.   **Mannaru, P**., Balasingam, B., Pattipati, K., Sibley, C., & Coyne, J. (2017, March), "Heterogeneous Hidden Markov Models for Context Modeling through Eye Gaze Observations," In *AAA*I Spring Symposia, AAAI Publications.

C3.   Mishra, M., Sidoti, D., Avvari, G.V., **Mannaru, P.,** Ayala, D.F.M. and Pattipati, K.R., (2017, March), "Context-Driven Proactive Decision Support: Challenges and Applications", AAAI Publications.

C4.   **Mannaru, P**., Balasingam, B., Pattipati, K., Sibley, C., & Coyne, J. (2016, September), "Cognitive Context Detection for Adaptive Automation," In *Proceedings of the Human Factors and Ergonomics Society (HFES) Annual Meeting*. SAGE Publications.

C5.   **Mannaru, P**., Balasingam, B., Pattipati, K., Sibley, C., & Coyne, J. (2016, May), "Cognitive context detection in UAS operators using eye-gaze patterns on computer screens," In *SPIE Defense+ Security*. International Society for Optics and Photonics.

C6.   **Mannaru, P.,** Balasingam, B., Pattipati, K., Sibley, C., & Coyne, J. (2016, May), "Cognitive context detection using pupillary measurements," In *SPIE Defense+ Security*. International Society for Optics and Photonics.

C7.   **Mannaru, P**., Balasingam, B., Pattipati, K., Sibley, C., & Coyne, J. (2016, May), "On the use of hidden Markov models for eye-gaze pattern modeling," In *SPIE Defense+ Security*. International Society for Optics and Photonics.

C8. Pasupuleti, D., **Mannaru, P.,** Balasingam, B., Baum, M., Pattipati, K., Willett, P., Lintz, C., Commeau, G., Dorigo, F., & Fahrny, J. (2015, July), "Online playtime prediction for cognitive video streaming," In *Information Fusion (Fusion), 2015 18th International Conference on* (pp. 1886-1891). IEEE.

C9. Pasupuleti, D., **Mannaru, P.,** Balasingam, B., Baum, M., Pattipati, K., and Willett, P.,(2015 March) "Cognitive Video Streaming," *IEEE International Conference EEECOS.*

Book Chapters

B1. Mishra, M., Sidoti, D., Avvari, G. V., **Mannaru, P.,** & Ayala, D. F. M. and Pattipati, K.R.,(2018, May) "Context-Driven Proactive Decision Support: Challenges and Applications," Chapter 9 in W.F. Lawless, R. Mittu, D. Sofge and J.G. Morrison, *Computational Context: The Value, Theory and Application of Context in AI*, CRC Press.

B2. Balasingam, B., **Mannaru, P.,** Sidoti, D., Pattipati, K., & Willett, P. (2017, January). Online Anomaly Detection in Big Data: The First Line of Defense against Intruders. In *Data Science and Big Data: An Environment of Computational Intelligence* (pp. 83-107). Springer, Cham.

Honors and Awards

· **UCONN pre-doctoral summer fellowship** (2017). Awarded in recognition of doctoral research conducted in summer of 2017.
· **AAAI doctoral student travel award** (2017). Awarded to present the paper "Heterogeneous Hidden Markov Models for Context Modeling through Eye Gaze Observations" at AAAI Spring Symposium.
· **UCONN graduate student travel award** (2016). Awarded to present the paper "Cognitive Context Detection for Adaptive Automation" at the Human Factors and Ergonomics Society (HFES) Annual Meeting.

Invited Talks

· "Cognitive Context Detection Using Eye tracking Measures**",** NRL-GaTech Collaboration Meeting, **Naval Aerospace Medical Institute (NAMI),** Pensacola, Florida, USA (2018).

Professional Development

Coursera
· Machine Learning by Stanford University (2019).
· Neural Networks and Deep Learning by deeplearning.ai (2019).
· Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization by deeplearning.ai (2019).
· Structuring Machine Learning Projects by deeplearning.ai (2019).
· Convolutional Neural Networks by deeplearning.ai (2019).
· Sequence Models by deeplearning.ai (2020).

Volunteering and Other interests

· Volunteered at RASS, an NGO welfare organization in India   June 2013 – Oct 2013
· Certified Zumba Professional   Since 2019