

Leanne Miller Hirshfield

Leanne.Hirshfield@colorado.edu

Professional Preparation

Hamilton College	Clinton, NY	Computer Science	BA, 2002
Colorado School of Mines	Golden, CO	Computer Science	MS, 2005
Tufts University	Medford, MA	Computer Science	PhD, 2010

Appointments

06/18-present	<i>Associate Research Professor</i> , Institute of Cognitive Science, University of Colorado, Boulder CO.
09/12-08/19	<i>Associate Research Professor</i> , Newhouse School, Syracuse University, Syracuse NY
06/13 – 08/13	<i>Visiting Faculty Researcher</i> , Applied Neurosciences, Air Force Research Lab, Dayton, OH
01/10 – 09/12	<i>Research Associate</i> , Dept of Computer Science, Hamilton College, Clinton, NY

Select Publications

Refereed Conference Proceedings:

Williams, T., **Hirshfield, L.**, Tran, N., Grant, T., Woodward, N., *Using Augmented Reality to Better Study Human-Robot Interaction*. in Proc. of the International Conference of Human Computer Interaction, Copenhagen, Denmark (accepted, 2020).

Costa, M., Bergen-Cico, D., **Hirshfield, L.**, Razza, R., Wang, Q. *Perceived Restorativeness and Meditation Depth for Virtual Reality supported Mindfulness Interventions*. in Proc. of the International Conference of Human Computer Interaction, Copenhagen, Denmark (accepted, 2020).

Neupane, A., Saxena, N., **Hirshfield, L.**, Bratt, S. The Crux of Voice (In)Security: A Brain Study of Speaker Legitimacy Detection. The Network and Distributed System Security Symposium (NDSS). 2019.

Hirshfield, L.M., Williams, T., Sommer, N., Grant, T., Velipisalar, S., Workload-Driven Modulation of Mixed-Reality Robot-Human Communication. Workshop Paper, in Proceedings of the International Conference on Multimodal Interaction (ICMI). Boulder, CO. 2018.

S.W. Hincks, S. Bratt, S. Poudel, V. Phoha, R.J.K. Jacob, D.C. Dennett, and **L.M. Hirshfield**, “Entropic Brain-computer Interfaces - Using fNIRS and EEG to Measure Attentional States in a Bayesian Framework,” Proc. PhyCS 2017 International Conference on Physiological Computing Systems. 2017.

Neupane, A., Saxena, N., **Hirshfield, L.**, *Neural Underpinnings of Website Legitimacy and Familiarity Detection: An fNIRS Study*. In Security and Privacy Track, the World-Wide Web Conference (WWW), 2017.

Neupane, A., Rahman, L., Saxena, N., **Hirshfield, L.M.** *A Multi-Modal Neuro-Physiological Study of Phishing Detection and Malware Warnings*. In ACM Conference on Computer and Communications Security (CCS), October 2015

Serwadda, A., Poudel, S., Phoha, V., **Hirshfield, L.**, Bratt, M., Bandara, D., Costa, M., *Biometric Authentication using Functional Near-Infrared Spectroscopy*. the IEEE Biometrics, Theory, Applications, and Systems (BTAS) conference (2015).

Hirshfield, L., Costa, M., Bratt, S., Bandara, D. *Measuring Situational Awareness Aptitude Using Functional Near-Infrared Spectroscopy*. in Proc. of the International Conference of Human Computer Interaction, Los Angeles, CA (2015).

Solinger, C. **Hirshfield, L.** Hirshfield, S., Friedman, R., Lepre, C. *Beyond Facebook Personality Prediction: A Multidisciplinary Approach in Predicting Social Media Users' Personality*. Proc. of the International Conference of Human Computer Interaction, Crete, Greece. (2014).

Bandara, D., **Hirshfield, L.**, Velipasalar, S., *Insights into User Personality and Learning Styles through Cross Subject fNIRS Classification*. Proceedings of the International Conference of Human Computer Interaction, Crete, Greece. (HCII 2014).

Sommer, N., **Hirshfield, L.**, Velipasalar, S., *Our Emotions as Seen Through a Webcam*. Proc. of the International Conference of Human Computer Interaction, Crete, Greece. (HCII 2014).

Escalante, J. Butcher, S. **Hirshfield, L.M.** *Using the EEG Error Potential to Identify User Interface Design Flaws*. the International Conference of Human Computer Interaction (HCII 2013).

Hirshfield, L.M., Gulotta, B., Hincks, S., Hirshfield, S., Russel, M., Ward, R., Williams, T., Jacob, R. "This is Your Brain on Interfaces: Enhancing Usability Testing with Functional-Near Infrared Spectroscopy". In the Proceedings of ACM CHI 2011 Human Factors in Computing Systems Conference, ACM Press.

Girouard, E. Solovey, **L. Hirshfield**, E. Peck, K. Chauncey, A. Sassaroli, S. Fantini, and R. Jacob, "From Brain Signals to Adaptive Interfaces: Using fNIRS in HCI," in *Brain-Computer Interfaces: Applying our Minds to Human-Computer Interaction*, ed. A. Nijholt, pp. 221-237, Springer (2010).

Hirshfield, L.M. Solovey, E.T, Girouard, A. Kebinger, J. Jacob, R.J.K., Sassaroli, A. Fantini, S. *Brain Measurement for Usability Testing and Adaptive Interfaces: An Example of Uncovering Syntactic Workload in the Brain Using Functional Near Infrared Spectroscopy*. *Proc. ACM CHI 2009 Human Factors in Computing Systems Conference*, (2009), ACM Press.

Hirshfield, L.M., Chauncey, K. Solovey, E.T., Girouard, A. Gulotta, R., Jacob, R.J.K, Sassaroli, A., Fantini, S., *Combining Electroencephalograph and Functional Near Infrared Spectroscopy to Explore Users' Instantaneous and Continuous Mental Workload States*.

International Conference on Human Computer Interaction, 2009.

Sassaroli, A., Tong, Y, Fantini, S. **Hirshfield, L.M**, Girouard, A., Solovey E.T., Jacob, R.J.K., *Discrimination of mental workload levels in human subjects with functional near-infrared spectroscopy.* in the Journal of Innovative Optical Health Sciences, 2009.

E.T. Solovey, A. Girouard, K. Chauncey, **L.M. Hirshfield**, A. Sassaroli, F. Zheng, S. Fantini, and R.J.K. Jacob, “*Using fNIRS Brain Sensing in Realistic HCI Settings: Experiments and Guidelines,*” ACM UIST 2009 Symposium on User Interface Software and Technology, ACM Press (2009).

Journal Articles:

Sommer, N., Velipasalar, S., **Hirshfield, L.**, Simultaneous and Spatiotemporal Detection of Different Levels of Activity in Multidimensional Data. IEEE Access (submitted, 2020)

Bergen-Cico, D., Grant, T., **Hirshfield, L.M.**, Razza, R., Costa, M., Kilaru, P. *Understanding Mechanisms of Change Associated with Mindfulness-based Interventions Through the Use of fNIRS to Measure Changes in Neural Correlates of Attention, Working Memory and Emotional Regulation* in the Journal of Psychosomatic Medicine, Special Issue on Mindfulness and Health (submitted, 2020)

Bandara, D., Grant, T., **Hirshfield, L.**, Velipasalar, S. *Identification of Potential Task Shedding Events Using Brain Activity Data.* Journal of Augmented Human Research. (accepted, 2020).

Bandara, D., Velipasalar, S., and **Hirshfield, L.**, *Classification of Affect Using Deep Learning on Brain Blood Flow Data.* Journal of Near Infrared Spectroscopy, 2019.

Hirshfield, L.M. Bobko, P., Barelka, A., *Toward Interfaces that Help Users Identify Disinformation Online: Using fNIRS to Measure Suspicion.* Journal of Augmented Human Research. 4(1), 2019.

Bandara, D., **Hirshfield, L.**, Velipasalar, S. *Building Predictive Models of Emotion with Functional Near-Infrared Spectroscopy.* Vol 110. International Journal of Human-Computer Studies (2017).

Bobko, P., Barelka, A., **Hirshfield, L.**, Lyons, J. How the Study of the Construct of Suspicion Can Benefit Theories and Models in Organizational Science. Journal of Business and Psychology. 2014.

Bobko, P., Barelka, A, **Hirshfield, L.M.** A Review of the Construct of “Suspicion” with Applications to Automated and Information Technology (IT) Contexts: A Research Agenda. the Human Factors and Engineering Society Journal (HFES 2014).

Hirshfield, L.M., Barelka, A. Bobko, P. Paverman, D., Hirshfield, S., Using Non-Invasive Brain Measurement to Explore the Psychological Effects of Computer Malfunctions On Users During Human-Computer Interactions. Journal of Advances in Human-Computer Interaction , 2014.

Hirshfield, L., Bobko, P., Barelka, A., Costa, M., Funke, G., Mancuso, V., Finomore, V., Knott, B. *The Role of Human Operators' Suspicion in the Detection of Cyber Attacks*. Int. J. Cyber Warf. Terror. 5, 3 (July 2015), 28-44.

Haas, M., **Hirshfield, L.**, Ponangi, P. , Kidambi,P., Rao, D., Edala, N., Armbrust, E., Fendley, F., Narayanan. S.. Decision-making and emotions in the contested information environment. ICST Journal Transactions (2013).

Book Chapters:

Hirshfield, L.M., Bergen-Cico, D., Costa, M., Jacob, R., Hincks, S., Russell, M. *Measuring the Neural Correlates of Mindfulness with Functional Near-Infrared Spectroscopy*. In Empirical Studies of Contemplative Practices. NOVA. 2018.

A. Girouard, E. Solovey, **L. Hirshfield**, E. Peck, K. Chauncey, A. Sassaroli, S. Fantini, and R. Jacob, "From Brain Signals to Adaptive Interfaces: Using fNIRS in HCI," in *Brain-Computer Interfaces: Applying our Minds to Human-Computer Interaction*, ed. by D.S. Tan and A. Nijholt, pp. 221-237, Springer (2010).

Other Publications:

Tran, N., Mizuno, K., Grant, T., **Hirshfield, L.**, Williams, T. *Adapting Mixed Reality Robot Communication to Mental Workload. Virtual and Augmented Reality*. Workshop paper. ACM/IEEE International Conference on Human-Robot Interaction. (submitted, 2020).

A. Sassaroli, F. Zheng, A. Girouard, E.T. Solovey, K. Chauncey, **L.M. Hirshfield**, E. Peck, R.J.K. Jacob, and S. Fantini, "Application of correlation analysis tools for the classification of mental workloads in functional near-infrared spectroscopy," *BIOMED OSA Topical Meeting*, Poster presentation (2010).

E.T. Solovey, O. Shaer, A. Girouard, **L.M. Hirshfield**, M.S. Horn, J. Zigelbaum, and R.J.K. Jacob, "Programming Reality within the Reality-Based Interaction Framework," *Proc. ACM CHI 2009 Workshop on Programming Reality: From Transitive Materials to Organic User Interfaces* (2009).

L.M. Hirshfield, E.T. Solovey, A. Girouard, J. Kebinger, M.S. Horn, O. Shaer, J. Zigelbaum, and R.J.K. Jacob, "Using Brain Measurement to Evaluate Reality Based Interactions," *Proc. ACM CHI 2009 Workshop on Challenges in Evaluating Usability and User Experience of Reality-Based Interaction* (2009).

A. Sassaroli, Y. Tong, **L.M. Hirshfield**, A. Girouard, E.T. Solovey, R.J.K. Jacob, and S. Fantini, "Real-time assessment of mental workload with near infrared spectroscopy: potential for human-computer interaction," *BIOMED OSA Topical Meeting*, Poster presentation (2008).

A. Girouard, **L.M. Hirshfield**, E. Solovey, and R.J.K. Jacob, "Using functional Near-Infrared Spectroscopy in HCI: Toward evaluation methods and adaptive interfaces," *Proc. ACM CHI*

2008 Workshop on Brain-Computer Interfaces for HCI and Games (2008).

R.J.K. Jacob, A. Girouard, **L.M. Hirshfield**, M. Horn, O. Shaer, E.T. Solovey, and J. Zigelbaum, "What Is the Next Generation of Human-Computer Interaction?," *interactions*, vol. 14, no. 3, pp. 53-58 (2007).

M.S. Horn, O. Shaer, A. Girouard, **L.M. Hirshfield**, E.T. Solovey, J. Zigelbaum, and R.J.K. Jacob, "Putting Tangible User Interfaces in Context: A Unifying Framework for Next Generation HCI," *Proc. ACM CHI 2007 Workshop on Tangible User Interfaces in Context and Theory (2007)*.

L.M. Hirshfield, A. Girouard, E.T. Solovey, R.J.K. Jacob, A. Sassaroli, Y. Tong, and S. Fantini, "Human-Computer Interaction and Brain Measurement Using Functional Near-Infrared Spectroscopy," *Proc. ACM UIST 2007 Symposium on User Interface Software and Technology*, ACM Press, Poster paper (2007).

Research Grants

Hirshfield, L., D'Mello, S., Bobko, P. Development of a Theoretical Framework and Intelligent Trust Modulation System for Enhancing Trust and Performance Outcomes of Human-Agent Teams. Army Research Lab. (\$616,000). July 2019-July 2022.

Williams, T., **Hirshfield, L.** APERTURE: Augmented Reality and Physio-Enhanced Robotic Gesture. National Science Foundation. (\$490,800), Sep 2019-Sep 2022.

Hirshfield, L.M., D'Mello, S., Wearable Cognitive, Physiological, and Behavioral Sensor Suite for Human Machine Teaming Research. AFOSR Defense University Instrumentation Program (DURIP). (\$508,000). March, 2019.

D'Mello, S., **Hirshfield, L.**, Modeling Brain and Behavior to Uncover the Eye-Brain-Mind Link during Complex Learning. National Science Foundation. (\$605,124), Sep 2019-Sep 2022.

Hirshfield, L.M., Velipasalar, S., Improved Cross-Subject Cognitive and Emotional State Classification Using Functional Near-Infrared Spectroscopy Data for Deep Learning. National Science Foundation. (\$494,374), Sep 2018-Sep 2021.

Hirshfield, L.M., Kainerstorfer, J., Development of a Remote-fNIRS Device for use Under Naturalistic Working Conditions" Air Force Office of Scientific Research. (\$541,605). Jan 2018 – Jan 2021.

Hirshfield, L.M. Tools for Objective Measurement and Evaluation (TOME). STTR with Aptima. NAVAIR. Phase 2 Option Period (\$140,000). May 2019-July 2020. Option Period.

Hirshfield, L.M. Tools for Objective Measurement and Evaluation (TOME). STTR with Aptima. NAVAIR. Phase 2 Base Period (\$70,000). February 2018- November 2018 Base Period.

Hirshfield, L.M. Tools for Objective Measurement and Evaluation (TOME). STTR with Aptima. NAVAIR. Phase 1 Base + Option period (\$55,000). July 1, 2016 – September 7, 2017.

Hirshfield, L.M. Adaptable System for Measuring Performance of Teams of Operators in Targeted Environments (ASYMPTOTE), funded by Charles River Analytics Inc., Prime Contractor Air Force Research Labs. (\$94,490). October 2016-October 2017.

Bobko, P., **Hirshfield, L.M.**, Algorithm Transparency Trust in Autonomy for Human-Machine Teaming (TAHMT). SRA International. Prime Contractor: Air Force Research Lab. FA8650-16-D-6616. (\$40,000.) Feb 2016 – Sep 2017.

Hirshfield, L.M. The Human Side of the Fatigue Free Platform: Helicopter Pilots' Interactions with Automation. Army Research Lab.. (\$99,669). Fall 2015-Fall 2016

Hirshfield, L.M. Understanding the Effects of Cyber Attacks on Human Operators. AFOSR Young Investigator Award. (\$357,478). Fall 2014 – Fall 2017.

Hirshfield, L.M. Cyber Trust and Suspicion. Air Force Office of Scientific Research (AFOSR). (\$306,000). Fall 2012 – Fall 2015.

Hirshfield, L.M. Measuring Trust and Suspicion in Human Computer Interactions. Air Force Office of Scientific Research (AFOSR). (\$292,300). Spring 2011 – Spring 2014

Hirshfield, S. and **Hirshfield, L.M.** Hamilton Usability Lab. Defense University Instrumentation Program. (\$458,900). Spring 2010.

Jacob, R.J.K. (PI), Using Brain Measurement to Evaluate the Effects of Interface Disruptions on Computer Users. Air Force Office of Scientific Research. (\$277,812). 2008 – 2011.

Synergistic, Outreach, and Community Activities

- Institute of Cognitive Science, Executive Committee Member (11/19 – present).
- Board President. The Clinton Early Learning Center. Clinton NY (9/17- 6/19).
- Board Member. The Clinton Early Learning Center, Clinton NY (9/15 – 9/17).
- Graduate student co-creator of Tech Camp 101 in 2003. Tech Camp 101 was a free technology camp for underprivileged students from the Denver, CO area.

Miller, L., Shearer, S., Moskal, B. Technology Camp 101. Stimulating Middle School Students' Interests in Computing. Frontiers in Education Conference. 2005.

- Co-authored a computer science education paper about the use of Alice Programming as a way to attract and retain underrepresented students to computer science.

Powers, K., Ecott, S., and **Hirshfield, L.M.**. 2007. Through the looking glass: teaching CS0 with Alice. SIGCSE Bull. 39, 1 (March 2007), 213-217.

- Chair of Special Paper Session at HCI International 2015 titled 'Using Machine Learning on Cognitive Data'. Toronto, Canada.
- Recipient of the Mohawk Valley Engineers Executive Council Young Technologist of the Year Award. April, 2012.

- Past and present reviewer for SIGCHI, ACM TOCHI, Journal of Social, Cognitive, and Affective Neuroscience, and the International Journal of Human-Computer Interaction.