Nicholas Waytowich

Curriculum Vitae

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Education

2013-2015	**Ph.D. Biomedical Engineering**, *Old Dominion University, Norfolk VA*. Specialization in Brain-Computer Interfaces and Neural Engineering
2011–2013	**Masters in Electrical and Computer Engineering,**, *Old Dominion University, VA*. Specialization in Signal Processing and Machine Learning
2006–2010	**B.S. Mechanical Engineering**, *University of North Florida, Jacksonville FL*. Specialization in Robotics

Professional Experience

2015–Present	**Postdoctoral Research Fellow**, *Laboratory for Intelligent Imaging and Neural Computing (LIINC), Columbia University*, New York. Researching the neural correlates of adaptation during longitudinal feedback from brain-computer interfaces and designing novel transfer learning algorithms for real-world neuro-imaging paradigms.
2015–Present	**Postdoctoral Research Fellow**, *Human Research and Engineering Directorate (HRED), U.S. Army Research Laboratory*, Maryland. Postdoctoral researcher with a focus on the design and implementation of heterogeneous, multi-agent systems of human and computer agents for collaborative image labeling.
2010–2015	**Graduate Research Assistant**, *Advanced Signal Processing in Engineering and Neuroscience Lab - ODU*, Norfolk. Developing novel signal processing and pattern recognition algorithms for non-invasive and visual based brain-computer interfaces to aid individuals with severe neuromuscular disorders.
2008–2010	**Research Assistant**, *Brain-Computer Interface Lab, University of North Florida*, Jacksonville. Developed novel brain-computer interface applications to control anthropomorphic manipulator arms for neuroprosthetic control.
2006–2008	**Engineering Project Manager**, *Jacksonville Electric Authority*, Jacksonville. Managed the engineering and construction of several capital infrastructure projects for JEA consisting of $2.36 million in project assets and funding.

Publications

Nicholas Waytowich, Josef Faller, Javier Garcia, Jean Vettel, and Paul Sajda. "Unsupervised Adaptive Transfer Learning for Steady-State Visual Evoked Potential Brain-Computer Interfaces". In: *Accepted to IEEE International Conference on Systems, Man, and Cybernetics 2016* June, 2016.

Bohannon, Addison, **Nicholas Waytowich**, Vernon Lawhern, Brian Sadler, and Brent Lance. "Collaborative Image triage with Humans and Computer Vision". In: *Accepted to IEEE International Conference on Systems, Man, and Cybernetics 2016* June, 2016.

Saproo, S., J. Faller, V. Shih, **Nicholas Waytowich**, A. Bohannon, B. Lance, D. Jangraw, and P. Sajda. "Cortically Coupled Computing: A New Paradigm for Synergistic Human-Machine Interaction". In: *Submitted to IEEE Computing* May, 2016.

Nicholas Waytowich, Vernon Lawhern, Addison Bohannon, and Kenneth Ball. "Spectral Transfer Learning using Information Geometry for a User-Independent Brain-Computer Interface". In: *Submitted to Frontiers of Neuroscience: Neuroprosthetics* March, 2016.

Nicholas Waytowich, Yusuke Yamani, and Dean Krusienski. "Optimization of Checkerboard Spatial Frequencies for Steady-State Visual Evoked Potential Brain-Computer Interfaces". In: *Submitted to IEEE Transactions on Neural Systems and Rehabilitation Engineering* February, 2016.

Nicholas Waytowich and Dean Krusienski. "Multiclass Steady-State Visual Evoked Potential Frequency Evaluation Using Chirp-Modulated Stimuli". In: *IEEE Transactions on Human-Machine Systems* February, 2016.

Wang, Haiqiang, Yu Zhang, **Nicholas Waytowich**, Dean Krusienski, Guoxu Zhou, Jing Jin, Xingyu Wang, and Andrzej Cichocki. "Discriminative Feature Extraction via Multivariate Linear Regression for SSVEP-based BCI". In: *IEEE Transactions on Neural Systems and Rehabilitation Engineering* February, 2016.

NR Waytowich and DJ Krusienski. "Spatial Decoupling of Targets and Flashing Stimuli for Visual Brain-Computer Interfaces". In: *Journal of Neural Engineering.* April, 2015.

NR Waytowich and DJ Krusienski. "Novel Characterization of the Steady-State Visual Evoked Potential Spectrum of EEG." In: *BrainKDD: International Workshop on Data Mining for Brain Science, June, 2014.*

NR Waytowich and DJ Krusienski. "Control of a Brain-Computer Interface using Parafoveal Code-modulated Visual Stimuli". In: *Society for Neuroscience, 2014.*

NR Waytowich and DJ Krusienski. "Characterizing the SSVEP Spectrum using a Broadband Noise Stimulus." In: *The International Brain-Computer Interface Conference, 2013.*

NR Waytowich and DJ Krusienski. "EEG Eye Tracking Based On Code-Modulated Visual Evoked Potentials." In: *The Southeast/Mid-Atlantic Biomedical Engineering Conference, 2013.*

NR Waytowich, GJ Johnson, and DJ Krusienski. "A Binocular Evaluation of P300 Speller Responses in EEG." In: *Society for Neuroscience, 2011.*

GJ Johnson, **NR Waytowich**, and DJ Krusienski. "The Challenges of Using Scalp-EEG Input Signals for Continuous Device Control". In: *Foundations of Augmented Cognition. Directing the Future of Adaptive Systems, 2011*, pp. 525–527.

NR Waytowich, A Henderson, DJ Krusienski, and DJ Cox. "Robotic application of a brain computer interface to staubli tx40 robots - early stages". In: *World Automation Congress (WAC), 2010*, p. 6.

GJ Johnson, **NR Waytowich**, DJ Cox, and DJ Krusienski. "Extending the discrete selection capabilities of the P300 speller to goal-oriented robotic arm control." In: *Biomedical Robotics and Biomechatronics (BioRob), 2010 3rd IEEE RAS and EMBS International Conference, 2010*, pp. 572–575.

Research and Teaching Interests

- Brain-Computer Interfaces
- Biomedical Signals & Systems
- Neural Networks & Pattern Recognition
- Digital Image Processing & Computer Vision
- Computational Intelligence & Modeling
- Computer Graphics & Visualization
- Data Visualization & Data Mining
- Multi-Agent System Development

Ph.D. Dissertation

Title	*Development of a Practical Visual Evoked Potential Based Brain-Computer Interface*
Advisor	Dean J. Krusienski
Description	Optimized visual stimulus design and developed novel paradigmatic approaches to create a practical visual evoked potential based brain-computer interface. Additionally, a custom BCI software platform was developed and implemented with the Google Glass (HMD device) for ergonomic deployment.

Teaching Experience

2008–2010	**Teaching Assistant/Laboratory Instructor**, *Robotics Laboratory, University of North Florida*. Managed UNF's Robotics and Manufacturing laboratory and taught the Robotics lab for the Introduction to Robotics course at UNF. Responsibilities included the development, preparation and teaching of weekly lectures and laboratory exercises

Honors, Professional Societies and Service

2012	Graduate Assistantship In Areas of National Need (GAANN) Scholarship Award Recipient (2012)
2011-Present	Member of the IEEE Signal Processing Society, Society for Neuroscience, American Society of Mechanical Engineers, Order of Omega Honor Society
2009-2010	President of the Florida Engineering Society at the University of North Florida Chapter
2010	1st place regional winner of the MATE ROV (Marine Advanced Technology Education for Remotely Operated Vehicles) Competition in Coco Beach FL
2010	4th place winner at the 2010 MATE International ROV Competition in Hawaii, USA

Skills

Research	Multi-agent systems, Transfer Learning, Deep Convolutional Neural Networks, Signal Processing, Image Processing, EEG Signal Mapping and Characterization, Machine Learning, BCI Development, Data Mining and Data Visualization
Programming	Matlab, C, C++, C#, Java, Android, .NET, Python, HTML, Javascript, OpenGL, DirectX, XNA, LaTeX, OpenOffice, Linux, Embedded Systems, Microcontroller Programming

Presentations

2016	Oral Presentation on Deep Learning at the 6th International BCI Meeting, Pacific Grove, CA
2014	Oral Presentation at the 20th ACM SIGKDD Conference, New York City, NY
2010-2016	Multiple Poster presentations at the International BCI conference, Society for Neuroscience Conference, and Hampton-Roads Neuro-connections conference