

Aya Khalaf

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EDUCATION

- 2015-Present Ph.D., Department of Electrical and Computer Engineering, University of Pittsburgh.
Dissertation Title: A Brain Computer Interface Based on Electroencephalography and Functional Transcranial Doppler Ultrasound.
Supervisors: Dr. Murat Akcakaya and Dr. Ervin Sejdic
- 2012-2015 M.Sc., Systems and Biomedical Engineering Department, Faculty of Engineering, Cairo University.
Thesis Title: Novel Pattern Recognition Methods for Arrhythmia Classification.
Supervisors: Dr. Yasser Kadah, Dr. Mohamed Owis, and Dr. Inas Yassine
- 2007-2012 B.Sc., Systems and Biomedical Engineering Department, Faculty of Engineering, Cairo University.
Grade: Distinction with honors, ranked the first.
Graduation Project: Non-invasive Glucometer Using Bio-impedance Spectroscopy.

PROFESSIONAL EXPERIENCE

- 2015-Present Research and Teaching Assistant at the Department of Electrical and Computer Engineering, University of Pittsburgh, USA.
 - **RESEARCH PROJECTS**
 1. A Brain Computer Interface Based on Electroencephalography and Functional Transcranial Doppler Ultrasound.
Supervisors: Dr. Murat Akcakaya and Dr. Ervin Sejdic
 2. A Passive EEG-based Brain Computer Interface for Assessment of Visuo-spatial Neglect.
Supervisors: Dr. Murat Akcakaya and Dr. Elizabeth Skidmore
 3. Analysis of Multimodal Physiological Signals Within and Between Individuals to Predict Psychological Challenge vs. Threat.
Supervisors: Dr. Murat Akcakaya and Dr. Sarah Ostadabbas
 4. Fault Identification in Microgrids Using Wavelet Transform and Support Vector Machines.
Supervisors: Dr. Murat Akcakaya and Dr. Brandon Grainger
 5. Machine Learning Approaches for Detection of B-type Natriuretic Peptide in Human Serum.
Supervisors: Dr. Murat Akcakaya and Dr. Minhee Yun
 6. ECG Preprocessing and Arrhythmia Classification.
Supervisors: Dr. Murat Akcakaya, Dr. Ervin Sejdic, and Dr. Salah Al-Zaiti
- 2014-2015 Research Assistant at Nile University, Egypt.
 - **RESEARCH PROJECTS**
 1. Retinal Vessel Segmentation Using Deep Learning.
Supervisors: Dr. Ahmed Fahmy and Dr. Inas Yassine

- 2012-2015 Research and Teaching Assistant in Systems and Biomedical Engineering Department, Cairo University, Egypt.
 - **RESEARCH PROJECTS**
 1. Novel Pattern Recognition Methods for Arrhythmia Classification.
Supervisors: Dr. Yasser Kadah, Dr. Mohamed Owis, and Dr. Inas Yassine
 2. Microcalcification Detection in Digital Mammogram Images.
Supervisors: Dr. Inas Yassine
- 2012-2013 Researcher at [Biobusiness](#)
Project aim: Manufacturing an efficient patient monitor that can compete with other monitors produced by international companies

RESEARCH INTERESTS

- Brain Computer Interfaces
- Machine Learning
- Biomedical Signal Processing
- Biomedical Image Analysis
- Deep Learning

JOURNAL PUBLICATIONS

1. **Aya Khalaf**, Ervin Sejdic, Murat Akcakaya, " Transfer Learning for SSVEP and motor imagery EEG-ftCD brain-computer interfaces," *Manuscript in Preparation*.
2. **Aya Khalaf**, Hashim Al Hassan, Adam Emes, Murat Akcakaya, Brandon Grainger, " A machine learning approach for classifying faults in microgrids using wavelet decomposition," *IEEE Transactions on Smart Grid*, Under Review.
3. **Aya Khalaf**, Jessica Kersey, Safaa Eldeeb, Gazihan Alankus, Emily Grattan, Laura Waterstram, Elizabeth Skidmore, Murat Akcakaya, " A passive EEG-based brain-computer interface for assessment of visuospatial neglect," *Journal of Neuroscience Methods*, Under Review.
4. **Aya Khalaf**, Mohsen Nabian, Miaolin Fan, Yu Yin, Jolie Wormwood, Erika Siegel, Karen Quigley, Lisa Feldman Barrett, Murat Akcakaya, Chun-An Chou, Sarah Ostadabbas, " Analysis of multimodal physiological signals within and across individuals to predict psychological threat vs. challenge," *Expert Systems with Applications*, Under Review.
5. **Aya Khalaf**, Ervin Sejdic, Murat Akcakaya, " Motor imagery EEG-ftCD brain-computer interface using common spatial pattern and wavelet decomposition," *Journal of Neuroscience Methods*, In Press, 2019.
6. **Aya Khalaf**, Ervin Sejdic, Murat Akcakaya, " EEG-ftCD Hybrid brain-computer interface using template matching and wavelet decomposition," *Journal of Neural Engineering*, In Press, 2019
7. Elise Dagois, **Aya Khalaf**, Ervin Sejdic, Murat Akcakaya, " Transfer learning for a multimodal hybrid EEG-ftCD brain-computer interface," *IEEE Sensors Letters*, vol. 3, pp: 1-4, 2019.
8. **Aya Khalaf**, Ervin Sejdic, Murat Akcakaya, " A novel motor imagery hybrid brain-computer interface using EEG and functional transcranial doppler ultrasound," *Journal of Neuroscience Methods*, vol. 313, pp: 44-53, 2019.
9. **Aya Khalaf**, Ervin Sejdic, Murat Akcakaya, " Towards optimal visual presentation design for hybrid EEG-ftCD brain-computer interfaces," *Journal of Neural Engineering*, vol. 15, no. 5, 2018.
10. **Aya Khalaf**, Jessica Kersey, Safaa Eldeeb, Gazihan Alankus, Emily Grattan, Laura Waterstram, Elizabeth Skidmore, Murat Akcakaya, " EEG-based neglect assessment: A feasibility study," *Journal of Neuroscience Methods*, vol. 303, pp: 169-177, 2018.

11. **Aya Khalaf**, Matthew Sybeldon, Ervin Sejdic, Murat Akcakaya, "A brain-computer interface based on functional transcranial doppler ultrasound using wavelet transform and support vector machines," *Journal of Neuroscience Methods*, vol. 293, pp: 174-182, 2018.
12. **Aya Khalaf**, Mohamed Owis, Inas Yassine, "A Novel technique for arrhythmia classification using spectral correlation and support vector machines," *Expert Systems with Applications*, vol. 42, no. 21, pp: 8361-8368, 2015.

CONFERENCE PUBLICATIONS

1. **Aya Khalaf**, Ervin Sejdic, Murat Akcakaya, "Mutual information for transfer learning in hybrid EEG-fTCD brain-computer interfaces," *International IEEE EMBS Conference on Neural Engineering (NER)*, accepted for publication, 2019.
2. Elise Dagois, **Aya Khalaf**, Ervin Sejdic, Murat Akcakaya, " Bhattacharyya distance-based transfer learning for a hybrid EEG-fTCD brain-computer interface," *International Conference on Acoustics, Speech, and Signal Processing*," accepted for publication, 2019.
3. Amr Hassan, **Aya Khalaf**, Khaled Sayed, Hai Li, Yiran Chen, "Real-Time Cardiac Arrhythmia Classification Using Memristor Neuromorphic Computing System," *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2018.
4. Ervin Sejdic, **Aya Khalaf**, Murat Akcakaya, "Within and across subject analysis for hybrid brain computer interfaces based on EEG and fTCD," *International BCI Meeting*, 2018.
5. Murat Akcakaya, **Aya Khalaf**, Jessica Kersey, Safaa Eldeeb, Gazihan Alankus, Emily Grattan, Laura Waterstram, Elizabeth Skidmore, "EEG-based neglect assessment," *International BCI Meeting*, 2018.
6. Douglas Weber, Safaa Eldeeb, **Aya Khalaf**, Murat Akcakaya, "EEG-guided electrotactile stimulation for haptic feedback," *International BCI Meeting*, 2018.
7. **Aya Khalaf**, Matthew Sybeldon, Ervin Sejdic, Murat Akcakaya, "An EEG and fTCD based BCI for control," *Asilomar Conference on Signals, Systems and Computers*, 2016.
8. **Aya Khalaf**, Inas Yassine, Ahmed Fahmy, "Convolutional neural networks for deep feature learning in retinal vessel segmentation," *International Conference on Image Processing (ICIP)*, 2016.
9. **Aya Khalaf**, Inas Yassine, "Novel features based on wavelet and statistical analysis for microcalcification detection in digital mammogram images," *International Conference on Image Processing (ICIP)*, 2015.
10. **Aya Khalaf**, Mohamed Owis, Inas Yassine, "Image features of spectral correlation function for arrhythmia classification," *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2015.
11. Khaled Sayed, **Aya Khalaf**, Yasser Kadah, "Arrhythmia classification based on novel distance series transform of phase space trajectories," *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2015.
12. **Aya Khalaf**, Inas Yassine, "Spectral correlation analysis for microcalcification detection in digital mammogram images" *International Symposium on Biomedical Imaging (ISBI)*, 2015.
13. **Aya Khalaf**, Mohamed Owis, Inas Yassine, "Novel Bayesian classifier discriminant function optimization strategies for arrhythmia classification" *International Conference on Biomedical and Health Informatics (BHI)*, 2014.
14. Ahmed Abutaleb, **Aya Khalaf**, Khaled Sayed, "Blind deconvolution of EEG signals using the stochastic calculus" *Cairo international Biomedical Engineering Conference (CIBEC)*, 2012.

BOOK CHAPTERS

1. **Aya Khalaf**, Ervin Sejdic, Murat Akcakaya, “Hybrid EEG-ftCD Brain-Computer Interfaces,” in *Neuroergonomics: Principles and Practice*. NY: Springer, in Preparation.

TEACHING COURSES

- 2016-2018 Signals and Systems Analysis – University of Pittsburgh
- 2015-2016 Signal Processing Laboratory – University of Pittsburgh
- 2015 Digital Signal Processing – Cairo University
- 2014 Electric Circuits – Cairo University
- 2013-2014 Computer Vision and Software Engineering – Cairo University
- 2012-2013 Control Systems and Biomedical Equipment – Cairo University

HONORS AND AWARDS

- Apr. 2019 Outstanding RA award from ECE department at University of Pittsburgh.
- Apr. 2019 Travel grant from Graduate and Professional Student Government (GPSG) at University of Pittsburgh.
- Mar. 2019 Travel grant from Engineering Graduate Student Organization (EGSO) in ECE department at University of Pittsburgh.
- Sep. 2016 Excellence in graduate studies from School of Engineering at Cairo University.
- Aug. 2015 Best paper from Africa and the Middle East in the IEEE EMBC 2015 best paper award competition.
- Sep. 2012 Best graduation project award, IEEE Egypt.
- Aug. 2006 Travel grant to Germany from the Egyptian ministry of education for excellence in German language.

VOLUNTEERING WORK AND ACTIVITIES

- May 2016 Organizer at IEEE SPS Summer School on Signal Processing and Machine Learning for Big Data.
- Jan. 2015 Program Chair at IEEE EMBS International Student Conference.
- Aug. 2014 Mentor for a team participating in Cairo University IEEE EMBS Students Chapter Project Development Competition.
- 2012-2014 Mentoring students on the following graduation projects:
 - ECG Signal Classification Using Wavelets.
 - Home Patient Monitoring System.
- Oct. 2013 Session Chair at IEEE EMBS International Student Conference.
- Dec. 2012 Organizer at Cairo international Biomedical Engineering Conference.
- Jul. 2010 Member at ADVANCE scientific community.
 - Assisted in the design of a prosthetic hand.

TECHNICAL SKILLS

Programming languages	C/C++, C# and visual basic.
Simulation and Statistical Packages	MATLAB.
Web Development	HTML and CSS.

Database Management Systems	SQL
Graphics APIs	Open GL.
Operating Systems	Ubuntu Linux and Microsoft Windows.
Hardware Languages	VHDL.
Embedded systems kits	Silicon Laboratories C8051F020, MBED NXP LPC1768 and Bayes FPGA.

CONFERENCES, WORKSHOPS, AND SUMMER SCHOOLS ATTENDED

- Mar. 2019 IEEE EMBS International Conference on Neural Engineering, San Francisco, CA, USA.
- Nov. 2016 Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, USA.
- May 2016 IEEE SPS Summer School on Signal Processing and Machine Learning for Big Data, Pittsburgh, PA, USA.
- Aug. 2015 International Symposium on Biomedical Imaging, New York, NY, USA.
- Jun. 2014 IEEE EMBS International Conference on Biomedical and Health Informatics, Valencia, Spain.
- Dec. 2014 Cairo International Biomedical Engineering Conference, Cairo, Egypt.
- Oct. 2013 IEEE EMBS International Student Conference, Cairo, Egypt.
- Dec. 2012 Parallel Computing Workshop, Cairo International Biomedical Engineering Conference, Cairo, Egypt.
- Dec. 2012 Cairo International Biomedical Engineering Conference, Cairo, Egypt.

COURSES ATTENDED

- 2017
 - Modern Spectral Estimation
- 2016
 - Adaptive Control
 - Radar Signal Processing
 - Pattern Recognition
 - Mathematical Neuroscience
- 2015
 - Optimization Methods
 - Analysis of Stochastic Processes

REFERENCES

- Dr. Murat Akcakaya Assistant Professor, Department of Electrical and Computer Engineering, University of Pittsburgh, Pittsburgh, PA 15260, USA.
Email: akcakaya@pitt.edu
- Dr. Ervin Sejdic Associate Professor, Department of Electrical and Computer Engineering, University of Pittsburgh, Pittsburgh, PA 15260, USA.
Email: esejdic@pitt.edu
- Dr. Elizabeth Skidmore Professor, Department of Occupational Therapy, University of Pittsburgh, Pittsburgh, PA 15260, USA.
Email: skidmore@pitt.edu