

Beren Semiz, Ph.D.

Curriculum Vitae

Koc University
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Research Interests

Biomedical signal processing, wearable device design, physiological monitoring systems, digital biomarkers, artificial intelligence for healthcare, data science.

Current Position

01/2021 - Now **Koc University, Istanbul, Turkey.**
Assistant Professor of Electrical and Electronics Engineering
Director of the Physiological Analysis and Wearable Systems Research Laboratory

Education

- 2016 - 2020 **Georgia Institute of Technology, Atlanta, GA, USA.**
Ph.D. in Electrical and Computer Engineering
Minor in Mathematics
- 2016 - 2018 **Georgia Institute of Technology, Atlanta, GA, USA.**
M.Sc. in Electrical and Computer Engineering
- Fall 2014 **University of Pittsburgh, Pittsburgh, PA, USA.**
Study Abroad Program
- 2012 - 2016 **Koc University, Istanbul, Turkey.**
B.Sc. in Electrical and Electronics Engineering
Minor in Economics
Track in Digital Signal Processing
- 2007 - 2012 **Robert College, Istanbul, Turkey.**
High School

Grants and Project Funding

- 07/2023 Received the **Koc University Seed Fund** with Assist. Prof. Remziye Semerci
Role: Researcher
Project Title: Multi-modal Wearable System Development for Vital Sign Monitoring
Project Duration: 12 months (07/2023 - 07/2024)
- 09/2022 Received the **TÜSEB-B Fund** from Türkiye Sağlık Enstitüleri Başkanlığı (Health Institutes of Turkey) with Assist Prof. Olgar Birsel
Role: Principal Investigator
Project Title: *SenseKnee:* Wearable Sensor-based Analysis Framework for Rehabilitation Monitoring Following Total Knee Arthroplasty
Project Duration: 24 months (05/2023 - 05/2025)
- 07/2022 Received the **2224-A Grant for Participation in Scientific Meetings Abroad** from TUBITAK (The Scientific and Technological Research Council of Turkey) - BİDEB
- 09/2021 Received the **National Young Researchers CAREER Grant** from TUBITAK
Role: Principal Investigator
Project Title: *PhysioPatch:* A Wearable Device for Non-Invasive and Continuous Cardiovascular and Cardiopulmonary Monitoring.
Project Duration: 24 months (09/2021 - 09/2023)

Awards and Distinctions

- 05/2022 Received the **College of Engineering 2021-2022 Outstanding Teaching Award**
- 02/2021 Received the **IEEE Technical Committee on Computational Life Sciences (TCCLS) 2020 PhD Thesis Award** with my thesis 'Digital Biomarker Discovery for Non-Invasive Health Monitoring with Acoustic and Vibration Signals'.
- 2016 - 2020 **Fulbright Scholar**
Scholarship covers 2 years of Ph.D. tuition and stipend. (Total amount: 100,000\$)
- Sponsorships:**
- Full sponsorship by Georgia Institute of Technology Electrical and Computer Engineering Department to attend the **iREDEFINE Workshop**, 2020
 - Full sponsorship by Georgia Institute of Technology Electrical and Computer Engineering Department to attend the **Grace Hopper Celebration**, 2019
- 05/2019 **National Science Foundation (NSF) Registration Award**
IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI)
- 2013 - 2014 **Vehbi Koc Scholar**
Due to outstanding academic achievement as undergraduate student at Koc University. Spring 2013, Fall 2013, Spring 2014 semesters.

Publications

Journal Papers

- [J8] F. Tokmak, **B. Semiz**, "Unveiling the Relationships Between Seismocardiogram Signals, Physical Activity Types and Metabolic Equivalent of Task Scores", IEEE Transactions on Biomedical Engineering, 2022, *In Press*.
- [J7] G. C. Ozmen, M. Safaei, **B. Semiz**, D. C. Whittingslow, J. L. Hunnicutt, R. Hash, J. W. Xerogeanes, O. T. Inan, "Detection of Meniscal Tear Effects on Tibial Vibration Using Passive Knee Sound Measurements", IEEE Transactions on Biomedical Engineering, v. 68, no. 7, pp. 2241 - 2250, 2021.
- [J6] **B. Semiz**, A. M. Carek, J. C. Johnson, S. Ahmad, J. A. Heller, F. G. Vicente, S. Caron, C. W. Hogue, M. Etemadi, and O. T. Inan, "Non-Invasive Wearable Patch Utilizing Seismocardiography for Peri-Operative Use in Surgical Patients", IEEE Journal of Biomedical and Health Informatics, v. 25, no. 5, pp. 1572 - 1582, 2021.
- [J5] **B. Semiz**, S. Hersek, M. B. Pouyan, C. Partida, L.B. Arroyo, V. Selby, G. Wieselthaler, J. Rehg, L. Klein and O.T. Inan, "Detecting Suspected Pump Thrombosis in Left Ventricular Assist Devices via Acoustic Analysis", IEEE Journal of Biomedical and Health Informatics, v. 24, no. 7, pp. 1899-1906, 2020.
Selected as the featured article in the Special Issue on Integrative Sensor Networks, Informatics and Modeling for Precision and Preventative Medicine.
- [J4] S. Hersek, **B. Semiz**, M.M.H. Shandhi, L. Orlandic, and O.T. Inan, "A Globalized Model for Mapping Wearable Seismocardiogram Signals to Whole-Body Ballistocardiogram Signals Based on Deep Learning", IEEE Journal of Biomedical and Health Informatics, v. 24, no. 5, pp. 1296-1309, 2020.
- [J3] J. Zia, J. Kimball, S. Hersek, M.M.H. Shandhi, **B. Semiz**, and O.T. Inan, "A Unified Framework for Quality Indexing and Classification of Seismocardiogram Signals", IEEE Journal of Biomedical and Health Informatics, v. 24, no. 4, pp. 1080-1092, 2020.

- [J2] M.M.H. Shandhi, **B. Semiz**, S. Hersek, N. Goller, F. Ayazi, and O.T. Inan, "Performance Analysis of Gyroscope and Accelerometer Sensors for Seismocardiography-Based Wearable Pre-Ejection Period Estimation", IEEE Journal of Biomedical and Health Informatics, v. 23, no. 6, pp. 2365-2374, 2019.
- [J1] **B. Semiz**, S. Hersek, D. Whittingslow, L. Ponder, S. Prahalad, and O. T. Inan, "Using Knee Acoustical Emissions for Sensing Joint Health in Patients with Juvenile Idiopathic Arthritis: A Pilot Study", IEEE Sensors Journal, v. 18, no. 22, pp. 9128-9136, 2018.

Conference Papers and Poster Presentations

- [C17] E.H. Savas, R. Semerci, A. Sayin, B. Dinçer, **B. Semiz**, H. Urey, "BioVirtualPed: A biofeedback based virtual reality game for pediatric patients", European Society of Medical Oncology Congress, Madrid, Spain, 2023. **Published in the proceedings.**
- [C16] F. Oflaz, P. C. Aydin, T. S. Tokatlioglu, E. Eser, N. Zemen, **B. Semiz**, Y. Z. Hayirlioglu, "The effect of wearable technology on psychomotor agitation in patients with diagnostic patients with schizophrenia expansion and psychosis", 31st European Congress of Psychiatry, Paris, France, 2023. **Published in the proceedings.**
- [C15] F. Tokmak, **B. Semiz**, "Investigating the Effect of Body Composition Differences on Seismocardiogram Characteristics", IEEE 36th International Symposium on Computer Based Medical Systems (IEEE CBMS 2023), L'Aquila, Italy, 2023. **Published in the proceedings.**
- [C14] B. Kizir, **B. Semiz**, "Unveiling the Temporal and Spectral Relationships Between Seismocardiogram Signals, Systolic Time Intervals and Thorax Characteristics", 5th International Conference on Bio-engineering for Smart Technologies (BioSMART 2023), Paris, France, 2023. **Published in the proceedings.**
- [C13] E. Erin, **B. Semiz**, "Distinguishing Between Murmurs in Different Heart Valves Using Phonocardiogram Analysis", 5th International Conference on Bio-engineering for Smart Technologies (BioSMART 2023), Paris, France, 2023. **Published in the proceedings.**
- [C12] Y. Hayirlioglu, **B. Semiz**, "A Novel Multi-Modal Sensing System Prototype for Cardiovascular and Cardiopulmonary Monitoring", 16th International Conference on Biomedical Electronics and Devices (BIODEVICES 2023), Lisbon, Portugal, 2023. **Published in the proceedings.**
- [C11] E. Erin, **B. Semiz**, "Spectral Analysis of Cardiogenic Vibrations to Distinguish Between Valvular Heart Diseases", 16th International Conference on Bio-inspired Systems and Signal Processing (BIOSIGNALS 2023), Lisbon, Portugal, 2023. **Published in the proceedings.**
- [C10] B. Ataseven, A. Madani, **B. Semiz**, M.E. Gursoy, "Physical Activity Recognition using Deep Transfer Learning with Convolutional Neural Networks", 20th IEEE International Conference on Pervasive Intelligence and Computing, Calabria, Italy, 2022. **Published in the proceedings.**
- [C9] M. Imirzalioglu, **B. Semiz**, "Quantifying Respiration Effects on Cardiac Vibrations using Teager Energy Operator and Gradient Boosted Trees", IEEE 44th International Engineering in Medicine and Biology Conference, Glasgow, Scotland, 2022. **Published in the proceedings.**
- [C8] Ö. O. Nacitarhan, **B. Semiz**, "PySio: A New Python Toolbox for Physiological Signal Visualization and Feature Analysis", IEEE 44th International Engineering in Medicine and Biology Conference, Glasgow, Scotland, 2022. **Published in the proceedings.**
- [C7] **B. Semiz**, M.E. Gursoy, M.M.H. Shandhi, L. Orlandic, V. Mooney, O.T. Inan, "Automatic Subject Identification Using Scale-Based Ballistocardiogram Signals", EAI MobiHealth, Virtual, 2021. **Published in the proceedings:** Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering (v. 440)

- [C6] **B. Semiz**, M.M.H. Shandhi, J. Fan, S. Dowling, L. Klein, and O.T. Inan, "Quantification of Hemodynamic Responses to Diuretic Changes in Patients with Heart Failure using Ballistocardiogram and Electrocardiogram Recordings", IEEE Biomedical and Health Informatics Conference (BHI), Chicago, IL, 2019.
- [C5] **B. Semiz**, S. Hersek, D. Whittingslow, L. Ponder, S. Prahalad, and O.T. Inan, "Change Point Detection in Knee Acoustic Emissions using the Teager Operator: A Preliminary Study in Patients with Juvenile Idiopathic Arthritis", IEEE Biomedical and Health Informatics Conference (BHI), Chicago, IL, 2019. **Published in the proceedings.**
- [C4] **B. Semiz**, S. Hersek, C. Partida, L.B. Arroyo, V. Selby, G. Wieselthaler, O.T. Inan, and L. Klein, "Blood-Biomarker-Based Acoustical Feature Selection Improves Overall Classification Accuracy for Pump Thrombosis in Left Ventricular Assist Devices", American College of Cardiology Annual Scientific Session, New Orleans, LA, 2019. **Published in the proceedings:** Journal of the American College of Cardiology (Supplement, v. 73, no. 9)
- [C3] **B. Semiz**, S. Hersek, M. Baran Pouyan, C. Partida, O. T. Inan, and L. Klein, "Use of Ventricular Assist Device Acoustical Signatures to Detect Device Thrombosis", Heart Failure Society of America Meeting, Nashville, TN, 2018.
Published in the proceedings: Journal of Cardiac Failure (Supplement, v. 24, no. 8)
Selected for presentation in the moderated poster session. (Top 3.8% of accepted papers)
- [C2] D. Whittingslow, **B. Semiz**, L. Ponder, P.V. Fernandez, O.T. Inan, S. Prahalad, "Knee Joint Sounds: A Non-Invasive Modality for Classifying Knee Joint Health in Juvenile Idiopathic Arthritis", American College of Rheumatology Annual Meeting, San Diego, CA, 2017.
Published in the proceedings: Arthritis & Rheumatology (Supplement, v. 69, no. S10)
- [C1] D. Whittingslow, **B. Semiz**, L. Ponder, A. Wiens, O.T. Inan, S. Prahalad, "Analysis and Implications of Non-Invasive Knee Acoustical Emissions in Juvenile Idiopathic Arthritis", American College of Rheumatology Pediatric Rheumatology Symposium, Houston, TX, 2017.
Published in the proceedings: Arthritis & Rheumatology (Supplement, v. 69, no. S4)

Projects with Media Coverage

- 18/09/2019 **Fox 5 Atlanta**, "*GeorgiaTech researchers develop patch to track heart failure*".
- 16/09/2019 **Fox 5 Atlanta**, "*GeorgiaTech researchers say knee sounds reveal secrets about joint health*".
- 14/02/2019 **GT Research Horizons**, "*Mending a Broken Heart*".
- 02/11/2017 **CNN**, "*This is what your knee sounds like: "Chhh, chhh, chhh"*".

Teaching and Mentoring Experience

- Spring Semesters **Koc University, Istanbul, Turkey.**
Instructor, Programming with Python (COMP 125)
In the **highest 10%** based on the **Course Evaluations** (*Overall evaluation of the instructor in Spring 2021 and 2022.*)
- Fall Semesters **Koc University, Istanbul, Turkey.**
Instructor, Biomedical Signal Processing (ELEC 447/547)
In the **highest 10%** based on the **Course Evaluations** (*Overall evaluation of the instructor in Fall 2021.*)
- 2021 - Now **Koc University, Istanbul, Turkey.**
Undergraduate student advising (in total 48 students)

- 2021 - Now **Koc University, Istanbul, Turkey.**
Research advisor for undergraduate students:
- Koc University: Kemalcan Küçük, Efe İsmet Yurteri, Can Tekdemir, Şebnem Demirtaş, Umut Zengin
 - Bogazici University: Ecem Erin and Eda Demirsoy
 - Alumni: Zeynep Gündoğan (ITU), Dilan Kaya (ITU), Duy Tran (KU), Fadime Tokmak (KU), Mine İmirzalıoğlu (KU), Özgün Ozan Nacitarhan (KU)
- 2021 - Now **Koc University, Istanbul, Turkey.**
Research advisor for graduate students:
- Dunya Moradi, *Doctor of Philosophy, co-advised with Assoc. Prof. Atay Vural*
 - Riaz Minhas, *Master of Science*
 - Berke Kizir, *Master of Science*
 - Yusuf Ziya Hayırlıoğlu, *Master of Science*
- 2021 - Now **Koc University, Istanbul, Turkey.**
Co-advisor of Koc University Society of Women Engineers (KUSWE)
- 08/2021 **Stanford CS Bridge Program, Online.**
Co-organized by Koc University, Stanford University and Izmir Democracy University
- Spring 2020 **Georgia Institute of Technology, Atlanta, GA, USA.**
Graduate Teaching Assistant, Biosystems Analysis (ECE 4782)
- 2017 - 2019 **Georgia Institute of Technology, Atlanta, GA, USA.**
Mentored two undergraduate students from our research laboratory (Lara Orlandic and Nazli Goller) and published several journal papers together: [J2] and [J4]

Invited Talks and Seminars

- 07/04/2022 **Koc University, Istanbul, Turkey.**
School of Nursing Symposium
Title: Wearable Devices and Artificial Intelligence in Healthcare
Original Title in Turkish: Sağlıkta Giyilebilir Cihazlar ve Yapay Zeka
- 05/01/2022 **Koc University, Istanbul, Turkey.**
Beyond the Popular Seminar by Koc University Artificial Intelligence and Robotics Society
Title: Wearable Devices and Artificial Intelligence in Healthcare
- 26/12/2021 **Koc University, Istanbul, Turkey.**
Opening Speech, Koc University Society of Women Engineers Networking Event
- 2021 - Now **Koc University, Istanbul, Turkey.**
Guest Lecturer, Introduction to Electrical and Electronics Engineering (ELEC 100) in Fall and Spring semesters.
- 08/05/2021 **Izmir University of Economics, Izmir, Turkey.**
BIOMEDTALKS Seminar organized by IUE Biomedical Engineering Student Club
Title: Wearable Devices and Artificial Intelligence in Healthcare
Original Title in Turkish: Sağlıkta Giyilebilir Cihazlar ve Yapay Zeka
- 07/05/2021 **Koc University, Istanbul, Turkey.**
College of Engineering Faculty Seminar Series
Title: Continuous and Non-invasive Health Monitoring with Acoustic and Vibration Signals
- 20/03/2021 **Koc University, Istanbul, Turkey.**
Opening Speech, Koc University Society of Women Engineers Girls Who Code Event
- 19/11/2019 **Georgia Institute of Technology, Atlanta, GA, USA.**
Guest Lecturer, Biomedical Sensing Systems (ECE 4781)

Work Experience

- 2016 - 2020 **Georgia Institute of Technology, Atlanta, GA, USA.**
Graduate Research Assistant, *Inan Research Lab*
Advisor: Prof. Omer T. Inan
- 03/08-28/08, 2015 **Ericsson, Istanbul, Turkey.**
Research and Development Intern
- 23/06-18/07, 2014 **Arcelik-LG, Kocaeli, Turkey.**
Research and Development Intern

Professional Services

Committee Member, Coordinator and Chair Duties

- 02/2023 Chair in *Wearable and Mobile Devices* session, 16th International Conference on Biomedical Electronics and Devices (BIODEVICES 2023), Lisbon, Portugal.
- 2022 - Now Koc University MECHLab - Makerspace Committee
- 2022 - Now Koc University Summer Practice (ELEC291) Coordinator
- 2021 - Now Koc University Electrical and Electronics Engineering Faculty Search Committee
- 2021 - Now Koc University Quality Commission
- 07/2022 Co-Chair in *Sensor Informatics - eHealth and mHealth* session, IEEE 44th International Engineering in Medicine and Biology Conference, Glasgow, Scotland.
- 06/2022 Robert College High School Science Symposium (HiSci) Award Selection Committee
- 02/2022 IEEE Technical Committee on Computational Life Sciences (TCCLS) 2021 PhD Thesis Award Selection Committee

Invited Panelist/Consultant

- 2021 - Now
- **Panelist**, TUBITAK (The Scientific and Technological Research Council of Turkey).
 - **Outer Consultant**, TUBITAK (The Scientific and Technological Research Council of Turkey).
 - **Outer Consultant**, TUSEB (Health Institutes of Turkey).

Invited Reviewer

- Scientific Reports
- Frontiers in Digital Health
- IEEE Transactions on Biomedical Engineering (TBME)
- Turkish Journal of Electrical Engineering and Computer Sciences
- Physical and Engineering Sciences in Medicine
- IEEE Journal of Biomedical and Health Informatics (JBHI)
- IEEE Journal of Translational Engineering in Health and Medicine (JTEHM)
- IEEE Sensors Conference - 2020
- IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI) - 2019