

Abdurrahman Gümüő, PhD

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| CONTACT INFORMATION | Assistant Professor Department of Electrical and Electronics Engineering Izmir Institute of Technology, Izmir, Turkey Machine Intelligence Research and Applications Laboratory | <i>E-mail:</i> abdurrahmangumus@iyte.edu.tr <i>Phone:</i> +90 (505) 107 0633 https://miralab.tech/ |
| RESEARCH INTERESTS | Artificial Intelligence, Deep Learning, Computer Vision, Sequential Data Analysis, Multimodal Learning, Large Language Models, Computational Neuroscience | |
| RESEARCH STATEMENT | I am drawn to the compelling questions within the field of artificial intelligence, especially in the areas of sequential data analysis and computer vision. I'm currently developing AI-based techniques and exploring the potentials of transformers, diffusion-based models, multimodal systems, and large language models by focusing on the application areas of optical sensors, biosensors, medical image understanding, facial expression analysis, wearable devices, and digital health. | |
| ACADEMIC APPOINTMENTS | Izmir Institute of Technology , Izmir, Turkey: 2017 – Present Assistant Professor at the Department of Electrical and Electronics Engineering King Abdullah University of Science and Technology (KAUST) , Thuwal, Saudi Arabia: 2015 – 2016 Post-Doctoral Fellow at Integrated Nanotechnology Laboratory Computer, Electrical and Mathematical Science and Engineering Division Cornell University , Ithaca, NY, USA: 2014 – 2015 Post-Doctoral Fellow at Erickson Laboratory Electrical and Computer Engineering | |
| EDUCATION | Cornell University , Ithaca, NY, USA M.S./Ph.D. in Electrical and Computer Engineering: 2008 – 2014 <i>Advisor:</i> Professor David Erickson <i>Areas of Study:</i> Lab on a Bird: <i>in-vivo</i> Real-Time Biophysical Monitoring of Birds; Solar thermal microfluidic systems for point of care diagnostics <i>Previous Advisor:</i> Professor George Malliaras <i>Area of Study:</i> Conducting polymer devices to control cell motility and adhesion Istanbul University , Istanbul, Turkey B.Sc. in Electrical and Electronics Engineering: 2001 - 2005 <i>Advisor:</i> Professor Aydın Akan <i>Area of Study:</i> Image and texture analysis | |
| AWARDS | Cornell Nanoscale Science and Technology Facility Graduate Student Fellowship, 2011 - 2014 - Participated several process developments and tool characterizations Honor of Distinguished Istanbul University Student, 2005 - Ranked 1 st in the Department of Electrical and Electronics Engineering | |

- C.E. Kayan, T. E. Koksall, A. Sevinc, **A. Gumus**. "Deep Reproductive Feature Generation Framework for the Diagnosis of COVID-19 and Viral Pneumonia using Chest X-ray Images." arXiv preprint arXiv:2304.10677 (2023).
- O. Duzyel, M. S. Catal, C. E. Kayan, A. Sevinc, , **A. Gumus**, "Adaptive Resizer-Based Transfer Learning Framework for the Diagnosis of Breast Cancer using Histopathology Images" Signal, Image and Video Processing, 1-10, (2023)
- C. E. Kayan, K. Y. Aldogan, **A. Gumus**, "Intensity and Phase Stacked Analysis of a Φ -OTDR System using Deep Transfer Learning and Recurrent Neural Networks." Applied Optics, 62(7), 1753-1764, (2023)
- A. Altay, **A. Gumus**, "Real-Time Superficial Vein Imaging System for Observing Abnormalities on Vascular Structures." Multimedia Tools and Applications (2023)
- W. Babatain, **A. Gumus**, I. Wicaksono, U. Buttner, N. El-atab, M. Ur Rehman, N. Qaiser, D. Conchouso, M. M. Hussain, "Expandable Polymer Assisted Wearable Personalized Medicinal Platform." Advanced Materials Technologies, 5(10), (2020)
- I. Yazgan, **A. Gumus**, K. Gökkuş, M. A. Demir, S. Evecen, H. A. Sönmez, R. M. Miller, F. Bakar, A. Oral, S. Popov, M. S. Toprak, "On the Effect of Modified Carbohydrates on the Size and Shape of Gold and Silver Nanostructures." Nanomaterials, 10(7), (2020)
- R. R. Bahabry, A. N. Hanna, A. T. Kutbee, **A. Gumus**, M. M. Hussain, "Impact of Nickel silicide Rear Metallization on Series Resistance of Crystalline Silicon Solar Cells." Energy Technology, 6(9), (2018)
- S. M. Khan, **A. Gumus**, J. M. Nassar, M. M. Hussain, "CMOS Enabled Microfluidic Systems for Affordable Personalized Healthcare Applications." Advanced Materials, 30(16), (2018)
- A. T. Kutbee, R. R. Bahabry, K. O. Alamoudi, M. T. Ghoneim, M. D. Cordero, A. S. Almuslem, **A. Gumus**, E. M. Diallo, J. M. Nassar, A. M. Hussain, N. M. Khashab, M. M. Hussain, "Smart Personalized Dental Brace With Laser Based Bone Regeneration And Enhanced Enamel Healthcare.", npj Flexible Electronics, 1(1), (2017)
- A. Gumus**, A. Alam, A. Hussain, K. Mishra, I. Wicaksono, G. T. Sevilla, S. F. Shaikh, M. Diaz, S. Velling, S. M. Ahmad, M. T. Ghoneim, M. M. Hussain, "Expandable Polymer Enabled Wirelessly Destructible High Performance Solid State Electronic." Advanced Materials Technologies, 2(5), (2017)
- K. T. Lee, Y. Yao, J. He, B. Fisher, X. Sheng, L., Xu, M. A. Anderson, Y. Kang, **A. Gumus**, R. R. Bahabry, J. W. Lee, U. Paik, N. D. Bronstein, A. P. Alivisatos, S. Burroughs, M. M. Hussain, J. C. Lee, R. G. Nuzzo, J. A. Rogers, "Concentrator photovoltaics module architectures with capabilities for capture and conversion of full global solar radiation" Proceedings of National Academy of Sciences (PNAS), 11(52), (2016)
- G. A. T. Sevilla, A. S. Almuslem, **A. Gumus**, A. M. Hussain, M. E. Cruz, and M. M. Hussain, "High Performance High- κ /Metal Gate CMOS Circuit Element on Flexible Silicon" Appl. Phys. Lett, 108, (2016)
- S. Ahsan, **A. Gumus**, D. Erickson, "Stacked Waveguide Reactors with Gradient Embedded Scatterers for High-Capacity Water Cleaning" Optics Express, 23(24), (2015)
- A. Gumus**, S. Ahsan, B. Dogan, L. Jiang, R. Snodgrass, A. Gardner, Z. Lu, K. Simson, D. Erickson, "Solar-Thermal Complex Sample Processing for Nucleic Acid Based Diagnostics in Limited Resource Settings." Biomedical Optics Express, 7(5), (2015)
- S. Ahsan, **A. Gumus**, A. Jain, L.T. Angenent, D. Erickson "Integrated Hollow Fiber Membranes for Gas Delivery into Optical Waveguide Based Photobioreactors." Bioresource Technology, 192(8), (2015).
- A. Gumus**, S. Lee, K. Karlsson, R. Gabrielson, C. Guglielmo, D. Winkler, D. Erickson, "Lab-on-a-Bird: Biophysical monitoring of flying birds" PLOS One, 10(4), (2015)
- D. Erickson, D. O'Dell, L. Jiang, V. Oncescu, **A. Gumus**, S. Lee, M. Mancuso, S. Mehta "Smartphone Technology can be Transformative to the Deployment of Lab-on-Chip Diagnostics." Lab-on-a-Chip, (2014)

A. Gumus, S. Lee, K. Karlsson, R. Gabrielson, D. Winkler, D. Erickson, “*Real-Time in-vivo Uric Acid Biosensor System for Biophysical Monitoring of Birds.*” Analyst, 139, (2014)

V. Oncescu, S. Lee, **A. Gumus**, K. Karlsson, D. Erickson, "Autonomous Device for Application in Late-Phase Hemorrhagic Shock Prevention." PLOS-One, 9(2), (2014)

S. Syed, **A. Gumus**, D. Erickson, “*Redox Mediated Photocatalytic Water-Splitting in Optofluidic Microreactors.*” Lab-on-a-Chip, 13, (2013)

A. Gumus, J. P. Califano, A. Wan, J. Huynh, C. A. Reinhart-King, G. G. Malliaras, “*Control of Cell Migration using a Conducting Polymer Device.*” Soft Matter, 6, (2010)
(Featured as a joint *Soft Matter* and *Journal of Materials Chemistry* themed issue on Tissue Engineering)

A. Wan, D. J. Brooks, **A. Gumus**, C. Fishbach, G. G. Malliaras, “*Electrical Control of Cell Density Gradients on a Conducting Polymer Surface.*” Chem Commun., 35, (2009)

PATENTS

“Wearable personalized medicinal platform” Muhammed Mustafa Hussain, **Abdurrahman Gumus**, Wedyan Babatain, United States Patent, Patent No: US 11,172,879 B2, Date of Patent: Nov. 16, 2021

“Activatable electronic component destruction device” Muhammed Mustafa Hussain, **Abdurrahman Gumus**, United States Patent, Patent No: US 10,777,512 B2, Date of Patent: Sep 15, 2020

SELECTED CONFERENCE PUBLICATIONS AND PRESENTATIONS

H. O. Demir, S. Z. Parlat, **A. Gumus**. “*Ethereum Blockchain Smart Contract Vulnerability Detection Using Deep Learning.*” 7th International Symposium on Innovative Approaches in Smart Technologies (ISAS 2023), Istanbul, Turkiye, 2023

E. Aksoy, A. D. Cakir, B. A. Erol, **A. Gumus**, “*Real Time Computer Vision Based Robotic Arm Controller with ROS and Gazebo Simulation Environment.*” 14th International Conference on Electrical and Electronics Engineering (ELECO 2023), Bursa, Turkiye, November 2023

C. Yilmaz, B. A. Erol, **A. Gumus**, “*Open-Source Visual Target Tracking System Both on Simulation Environment and Real UAV.*” 2nd International Congress of Electrical and Computer Engineering (ICECENG'23), Bandirma, Turkiye, November 2023

A. T. Kersu, Z. D. Salman, C. Rollas, M. A. Salam, **A. Gumus**, “*Development of Open Source and Command Prompt Based Analog Circuit Simulator.*” International Conference on Studies in Engineering, Science, and Technology (ICSEST 2023), Antalya, Turkiye, 2023

A. Altay, **A. Gumus**, “*Development of Low-Cost Portable Blood Vessel Imaging System.*” Medical Technologies Congress (TipTekno) Antalya, Turkiye, November 2021

A. Gumus, A. Alam, A. M. Hussain, K. Mishra, I. Wicaksono, G. A. Torres Sevilla, S. F. Shaikh, M. Diaz, S. Velling, M. T. Ghoneim, S. M. Ahmed, M. M. Hussain, “*Destructible High Performance Solid State Electronics.*” 13th Nanoscience and Nanotechnology Conference (NanoTR13), Antalya, Turkiye, October 2017

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Gumus, A., Winkler, D., Erickson, D., “*Lab on a Bird: Autonomous microsystems for in-vivo real-time biophysical monitoring of birds.*” MicroTAS 2011 – The 15th International Conference on Miniaturized Systems for Chemistry and Life Sciences, Seattle, WA, USA, October 2011