

Personalized Ensemble Based Stress Detection Using Wearable Sensor Data

Kyungtaek Oh*, Jun Kyun Choi*, Hyunseo Park*, Seungjin Lee**

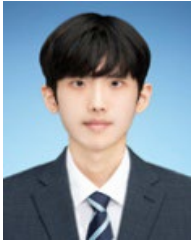
*School of Electrical Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea

**School of AI·SW Convergence, Kyungnam University, Changwon, Republic of Korea

okt5380@kaist.ac.kr, jkchoi59@kaist.edu, tkf92001@kaist.ac.kr, sjinlee@kyungnam.ac.kr

Abstract— With the recent advancements in Internet of Things (IoT) technology, the digital healthcare industry has seen significant growth. Stress detection is a key area within digital healthcare, focusing on classifying human stress based on various physiological signals. The need for highly stable classification of human states based on wearable sensor data is becoming increasingly important. This study introduces an ensemble-based stress detection model that utilizes multimodal features and metadata to capture personalized patterns for each individual. Using the WESAD dataset, which contains physiological and motion signals, we compared the performance of our model to other deep learning and machine learning approaches. Our proposed model, comprising three CNN-based classifiers and an ensemble attention module, achieved the highest mean accuracy of 94.01%, demonstrating its robustness and reliability. This makes it a promising solution for stress management systems in workplace environments.

Keyword— Internet of things, Artificial intelligence, Metadata, Digital healthcare, Ensemble model, Stress detection



Kyungtaek Oh received the B.Sc. degree in electrical and computer engineering from University of Seoul, Seoul, Republic of Korea, in 2023. He is currently pursuing the M.S. degree in electrical engineering in Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea. His main research interests include machine learning and Internet of Things (IoT).



Jun Kyun Choi received the B.Sc. (Eng.) from Seoul National University in electronics engineering, Seoul, Korea in 1982, and M.Sc. (Eng.) and Ph.D. degree in 1985 and 1988, respectively, in electronics engineering from Korea Advanced Institute of Science and Technology (KAIST). From June 1986 until December 1997, he was with the Electronics and Telecommunication Research Institute (ETRI). In January 1998, he joined the Information and Communications University (ICU), Daejeon, Korea as Professor. At the year of 2009, he moved to Korea Advanced Institute of Science and Technology (KAIST) as Professor. He is a Senior Member of IEEE.



Hyunseo Park received the B.Sc. degree in electrical and computer engineering from University of Seoul, Seoul, Republic of Korea, in 2017, completed the M.Sc. in electrical engineering from Pohang University of Science and Technology (POSTECH), Pohang, Republic of Korea in 2019, and the Ph.D. degree in 2024 in electrical engineering from Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea. He is currently working as a post-doctoral researcher in electrical engineering from Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea. His current research interests include active learning and other machine learning tasks.



Seungjin Lee received the B.S. degree in Information and Communication Engineering from Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, in 2005, and the M.S. and Ph.D. degrees in Information and Communication Engineering from KAIST, Daejeon, South Korea, in 2008 and 2023, respectively. From March 2023 to February 2024, Dr. Lee served as a post-doctoral researcher at the Institute for IT Convergence, KAIST. In 2024, he joined Kyungnam University, Changwon, South Korea, as an Assistant Professor in the School of AI·SW Convergence. His research interests include artificial intelligence, autonomous manufacturing, autonomous driving, and machine learning for networking.