Report-3

November 21, 2023

Summary of "A Deep Learning-Based Human Identification System With Wi-Fi CSI Data Augmentation"

Abstract: The study focuses on a Wi-Fi Channel State Information (CSI)-based human identification system using deep learning to improve accuracy and reduce data collection costs, achieving up to 92% accuracy for 8 subjects.

Introduction: Addresses limitations of traditional human identification systems in the context of IoT, proposing a cost-effective and privacy-preserving alternative using Wi-Fi CSI.

Key Contributions: The paper introduces data augmentation techniques and optimized deep learning models for small datasets, particularly focusing on CLSTM model.

System Design: Consists of hardware for data collection, a processing layer for data noise removal and augmentation, and classification using CNN, LSTM, and CLSTM.

Performance Evaluation: Conducts experiments with up to eight subjects, demonstrating that the CLSTM model provides high accuracy and stable performance.

Conclusion: The proposed system offers improved accuracy, the capability to identify more subjects, and reduced data collection costs, with future work aiming to enhance mixed data classification.

Summary of "CSIID: WiFi-based Human Identification via Deep Learning"

Abstract: Introduces CSIID, a method using WiFi CSI for human identification by analyzing gait features. It shows high accuracy ranging from 97.4% to 94.8% for identifying 2 to 6 persons.

Introduction: Highlights the significance of long-distance, contactless human identification using gait as a unique biological feature, addressing limitations of traditional methods.

Related Work and Challenges: Discusses previous gait recognition methods and the challenges in WiFi-based identification, such as complex indoor environments and data preprocessing needs.

CSIID Method: Describes the CSIID approach, which uses deep learning for automatic feature extraction from CSI time series data.

Deep Learning Model: Details the structure of the model including convolution and LSTM layers, and the softmax regression classifier.

Experimental Environment and Evaluation: Presents the indoor experimental setup and evaluation, showing the model's high accuracy and adaptability in different scenarios.

Conclusion: Concludes that CSIID offers an efficient method for human identification with WiFi CSI data, aiming for future improvements in algorithm accuracy and application in more complex environments.

EyeFi: Fast Human Identification Through Vision and WiFi-based Trajectory Matching Dataset

General Overview:

- *Context*: Part of the EyeFi project at Bosch Research and Technology Center in Pittsburgh, PA, USA.
- *Purpose*: Used in IEEE DCOSS '20 paper and DATA '20 workshop.

Data Collection Setup:

- *Tools*: Intel 5300 WiFi NIC and Linux CSI tools; Bosch Flexidome IP camera.
- *Environment*: Rectangular space and a kitchen with obstacles affecting RF reflection.
- *Equipment*: Google Pixel 2 XL smartphone, Intel 5300 NIC.
- *Transmission Rate*: Approximately 20-25 packets per second.

Dataset Structure:

- *File Organization*: Organized into folders based on the number of people present.
- *Contents*: .h5 files for different scenarios and conditions.
- *Special Notes*: Clarifications on antenna and subcarrier order in files.

Data Accessibility:

- *Library Requirement*: Requires the hdf5 library.
- *Example Code*: Python example provided in 'View-Dataset-Example.ipynb'.

Dataset Applications:

- *Smart Building Applications*: Assisted living, smart entertainment, intrusion detection, keyless access control.
- *Research Utility*: Suitable for testing algorithms in various conditions, facilitating reproducible research.

Access Link: `https://zenodo.org/records/3882104`