

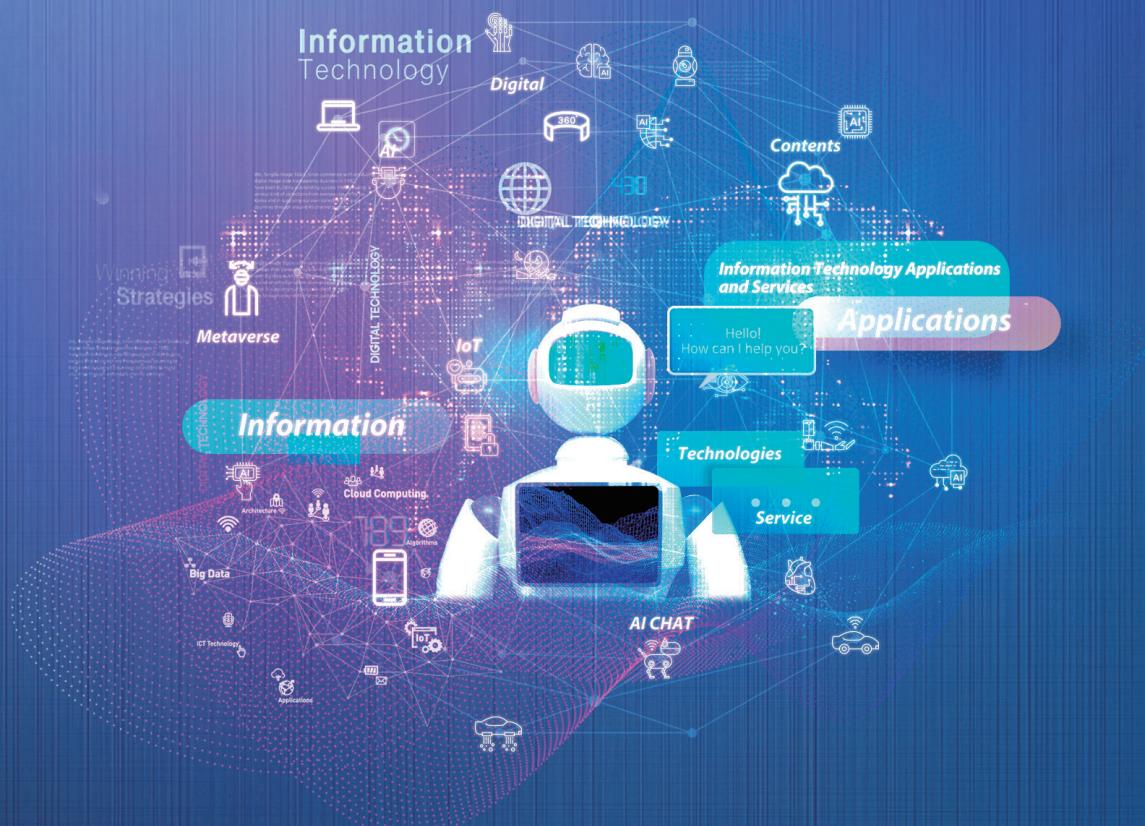
Program Book & Proceedings of the

World IT Congress

2024

The 2024 World Congress on
Information Technology Applications
and Services

February 14-16, 2024, Jeju, Korea



The 2024 World Congress on Information Technology Applications and Services

**"Advanced Mobile, Communications, Security,
Multimedia, Vehicular, Cloud, IoT, and Computing"**

February 14-16, 2024
Jeju, Korea

Organized by

World IT Congress & KCIA & KIPS SWRG



2024 International Conferences (Sponsored/Technically Sponsored by KCIA)

The 18th International Conference on Multimedia and Ubiquitous Engineering (MUE 2024)

- April 23-25 2024 (Chongqing, China)
- <http://www.mue-conference.org/2024/>

The 19th International Conference on Future Information Technology (FutureTech 2024)

- April 23-25 2024 (Chongqing, China)
- <http://www.futuretech-conference.org/2024/>

The International Conference on Big data, IoT, and Cloud computing (BIC 2024)

- August 12-14, 2024 (Hanoi, Vietnam)
- <http://www.bic-conference.org/2024/> (Unopened)

The 16th International Conference on Computer Science and its Applications (CSA 2024)

- Dec 18-20, 2024 (Pattaya, Thailand)
- <http://www.csa-conference.org/2024/> (Unopened)



General Chairs' Message from the World IT Congress 2024

The 2024 World Congress on Information Technology Applications and Services (World IT Congress 2024) - "Advanced Mobile, Communications, Security, Multimedia, Vehicular, Cloud, IoT, and Computing" will be held in Jeju, Korea on February 14~16, 2024. The World IT Congress 2024 is aimed at the address key themes on "Advanced Mobile, Communications, Security, Multimedia, Vehicular, Cloud, IoT, and Computing." World IT Congress 2024 will be the most comprehensive conference focused on information technology, computing, and applications, and will provide an opportunity for academic and industry professionals to discuss the latest issues and progress in the area of Advances in IT, Applications, and Services. In addition, the conference will publish high quality papers which are closely related to the various theories and practical applications in advanced IT. Furthermore, we expect that the conference and its publications will be a trigger for further related research and technology improvements in this important subject.

Accepted and presented papers highlight new trends and challenges of computer science and its applications. The presenters will show how new research could lead to novel and innovative applications. We hope you will find these results useful and inspiring for your future research.

We would like to express our sincere thanks to Steering Committee: James J. (Jong Hyuk) Park (SeoulTech, Korea), Hamid R. Arabnia(The University of Georgia, USA), Han-Chieh Chao (National Ilan University, Taiwan), Young-Sik Jeong (Dongguk University, Korea), Jianhua Ma (Hosei University, Japan), Qun Jin (Waseda University, Japan). Our special thanks go to the program chairs, all program committee members and all the additional reviewers for their valuable efforts in the review process, which helped us to guarantee the highest quality of the selected papers for the conference.

We cordially thank all the authors for their valuable contributions and the other participants of this conference. The conference would not have been possible without their support. Thanks are also due to the many experts who contributed to making the event a success.

World IT Congress 2024
General Chairs

Jungho Kang, Baewha Women's University, Korea
Yi Pan, Georgia State University, USA
Ka Lok Man, Xi'an Jiaotong-Liverpool University, China



Program Chairs' Message from the World IT Congress 2024

Welcome to the 2024 World Congress on Information Technology Applications and Services (World IT Congress 2024) - "Advanced Mobile, Communications, Security, Multimedia, Vehicular, Cloud, IoT, and Computing", which will be held in Jeju, Korea on February 14~16, 2024. This congress will be the most comprehensive conference focused on the various aspects of Advances in IT, Applications, and Services (AITA).

This congress provides an opportunity for academic and industry professionals to discuss the latest issues and progress in the area of computer science. In addition, the conference contains high quality papers which are closely related to the various theories and practical applications in computer science. Furthermore, we expect that this congress and its publications will be a trigger for further related research and technology improvements in this important subject. This congress contains high quality research papers submitted by researchers from all over the world. Each submitted paper was peer-reviewed by reviewers, who are experts in the subject area of the paper. Based on the review results, the program committee accepted papers.

For organizing this congress, the support and help of many people is needed. First, we would like to thank all authors for submitting their papers. We also appreciate the support from program committee members and reviewers who carried out the most difficult work of carefully evaluating the submitted papers.

We would like to give my special thanks to James J. (Jong Hyuk) Park (SeoulTech, Korea), Hamid R. Arabnia(The University of Georgia, USA), Han-Chieh Chao (National Ilan University, Taiwan), Young-Sik Jeong (Dongguk University, Korea), Jianhua Ma (Hosei University, Japan), Qun Jin (Waseda University, Japan) as the Steering Committee of World IT for their strong encouragement and guidance to organize the conference. We would like to thank World IT 2023 General Chairs for their advices to make possible organization of The World IT 2024. We would like to express special thanks to execute members for their timely unlimited support.

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Invited Speaker



Unmasking the Shadows: A Dive into Cutting-Edge Strategies against Disinformation in Online Social Networks

Prof. David Camacho

Universidad Politécnica de Madrid (UPM), Spain
Director of Applied Intelligence and Data Analysis research group

Abstract:

The spread of disinformation and misleading information in online social networks (OSN) has become a significant issue, causing harm at individual, community, and national levels. The rapid, and uncontrolled, dissemination through online social networks has created an environment for the proliferation of falsehoods, rumors, propaganda, and deceit, impacting the economy, politics, and health in recent decades. Addressing this challenge requires a comprehensive, multimodal approach involving various stakeholders such as individuals, media organizations, governments, technology companies, and researchers. This keynote aims to provide insights into the associated challenges and explore how Artificial Intelligence, Machine Learning and Social Network Analysis techniques are being used to combat disinformation. The keynote will specifically focus on two main areas: NLP and Multimodal DL architectures. The natural language processing, under the fact-check architecture (a solution utilizing ensembles and deep learning based on Transformers technology) will be presented to show how NLP and SNA can be effectively integrated to detect both misleading content and how it is spreading through the OSN. On the other hand, new deep learning models, designed to analysis and fusion multimodal (images and video) information, will be presented. This second architecture is used to analyse posts, which is a challenging task, due to the diverse information modalities, including text and images. To address this, a proposed multimodal architecture is introduced for identifying manipulated posts. The model is trained on a large-scale multimodal dataset encompassing image, caption, comments, and metadata. A coding system for comments is proposed to capture both semantics and tree structure. Utilizing a deep learning early fusion technique with CLIP as a pretrained encoder, hidden representations are combined based on the information channel, processing both multimodal and unimodal representations. Finally, some future trends and challenges related to the problem of detecting and combating misinformation will be presented.

Biography:

David Camacho is Full Professor at Computer Systems Engineering Department of Universidad Politécnica de Madrid (UPM), he is the head of the Applied Intelligence and Data Analysis research group, the Director of the PhD program in Computer Science and Technologies of Smart Cities, and the Director of the Master program in Machine Learning and Big Data at UPM. He has published more than 300 journals, books, and conference papers. His research interests include Machine Learning (Clustering/Deep Learning), Computational Intelligence (Evolutionary Computation, Swarm Intelligence), Social Network Analysis, Fake News and Disinformation Analysis. He has participated/led more than 60 AI-based R&D projects (National and International: H2020, MCSA ITN-ETN, DG Justice, ISFP, NRF Korea), applied to real-world problems in areas as aeronautics, aerospace engineering, cybercrime/cyber intelligence, social networks applications, disinformation countering, or video games among others. He serves as Editor in Chief of Expert Systems from 2023 and sits on the Editorial Board of several journals including Information Fusion, Human-centric Computing and Information Sciences (HCIS), and Cognitive Computation, IEEE Transactions on Emerging Topics in Computational Intelligence (IEEE TETCI), among others.

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ResearchGate: <https://www.researchgate.net/profile/David-Camacho-12>

PROGRAM SCHEDULE FOR WORLD IT CONGRESS 2024

Day 1, February 14, 2024		
Time	Min	HALL A
09:00-09:20	20	Registration
09:20-11:00	100	Session A-1 WITC 2024 Chair: Abir El Azzaoui
11:00-11:10	10	Coffee Break
11:10-12:50	100	Session A-2 HCIS 2024 Winter Workshop Chair: Joon-Min Gil
12:50-14:00	70	Lunch
14:00-14:50	50	Keynote Speech David Camacho “Unmasking the Shadows: A Dive into Cutting-Edge Strategies against Disinformation in Online Social Networks” Chair: Kwang-il Hwang
14:50-15:00	10	Coffee Break
15:00-16:30	90	Session A-3 (Private) DMLAB Workshop Chair: Namhee Moon
16:30-16:40	10	Coffee Break
16:40-18:00	80	Session A-4 (Private) SICNS Workshop for NRF Korea - EU
18:00-18:30	30	Break
18:30-20:30	120	Banquet (Only for Invited Members)

Day 2, February 15, 2024		
Time	Min	HALL A
10:00-12:00	120	Session A-5 WITC 2024 Chair: Ji Su Park
12:00-13:30	90	Lunch
13:30-15:30	120	Organizing Committee Meeting I
15:30-16:00	30	Break
16:00-18:00	120	Executive Meeting – Organized by World IT Congress 2024

Day 3, February 16, 2024		
Time	Min	HALL A
09:00-10:20	80	Local Arrangement Committee Meeting
10:20-10:40	20	Break
10:40-12:00	80	Organizing Committee Meeting II

1. A paper presentation should be made by one of authors of the paper for A paper presentation should be made by one of authors of the paper for 15 minutes (10 minutes for the presentation itself and 5 minutes for Q/A).
2. All speakers of each session should meet the session chair at their room 10 minutes before the session begins.
3. Windows 7 laptops running the Adobe Reader and Microsoft Office for paper presentations will be prepared. Please prepare for your presentation.
4. For Q&A in the online section, please email the author.

**DETAILED SCHEDULE FOR
THE 2024 WORLD CONGRESS ON
INFORMATION TECHNOLOGY, APPLICATIONS
AND SERVICES
(WORLD IT CONGRESS 2024)**

Day 1, Feb. 14, 2024 (Wednesday)

09:00-09:20 Registration

**09:20-11:00 Session A-1 WITC 2024
(Chair: Abir El Azzaoui)**

- 1. Deep Learning-based Personalized ECG Monitor**
Chunghwan Hwang, Nagyoum An, Jaehyun Park
- 2. Joinable Tabular Data Search with Table Embedding**
Yoonseok Choi, Han-joon Kim
- 3. Effective Combination of Contextual Embedding based Tensor Space Model and Transformer for Text Classification**
SoonKwan Kwon, Han-joon Kim
- 4. Container-based platform deployment system for real-time multi-user action sharing in virtual reality**
Gi Woo Hyun, Ji Won Oak, Dong Hoon Kim, Kun Woo Kim
- 5. Algorithm for Mining Maximal Balanced Bicliques using Formal Concept Analysis**
Sadriddinov Ilkhomjon, Sony Peng, Sophort Siet, Daeyoung Kim, Doo-Soon Park
- 6. Multimodal Analysis for Identifying Misinformation in Social Networks**
Adrián Girón, Javier Huertas-Tato, Jong Hyuk Park, David Camacho
- 7. Scalability analysis of DeepVATS: A Framework for Deep Learning Visual Analytics on Large Time Series Data**
Inmaculada Santamaría-Valenzuela, Víctor Rodríguez-Fernandez, Jong Hyuk Park, David Camacho
- 8. A Study on OSS License Compatibility Verification using LLMs in MSA**
Dupyo Hong, Dongwan Kim, YongJoon Joe, DongMyung Shin

11:00-11:10 Coffee Break

**11:10-12:50 Session A-2 HCIS 2024 Winter Workshop
(Chair: Joon-Min Gil)**

- 1. Audiovisual-based Surveillance System for Detecting Physical Leaks in Research and Development Environments**
Yuna Han, Hangbae Chang



2. **Data Gathering System for Identifying Insider Threat Behavior on Windows System**
Giwan Hong, Jawon Kim, Yuna Han, Hangbae Chang
3. **Towards an Conceptual Framework for Quantum City Development through QICT**
Seo Yeon Moon, Jong Hyuk Park
4. **GPU memory usage limiting techniques for running multiple AI jobs in the container environments**
Jihun Kang, Joon-Min Gil
5. **Proactive Container Autoscaling using DEVS for Efficient Cloud-Native Computing**
Byeonghui Jeong, Jueun Jeon, Young-Sik Jeong
6. **Methodology for Identifying Promising Items Based on Deep Learning**
Jeongeun Byun, Kuk Jin Bae, Sumin Seo, Eun Sun Kim
7. **A Lightweight Depth-wise ResNet-SE for Human Activity Recognition**
Seoungwoo Jang, Im Y. Jung
8. **Development of method for predicting changes in body shape based on deep learning**
Minji Kim, Sekyoung Youm
9. **Development and Evaluation of a Digital Therapeutic Using 3D Artificial Intelligence Technology for Visual Weight Loss and Health Improvement**
Hyunsook Lee, Sekyoung Youm

12:50-14:00 **Lunch**

14:00-14:50 **Invited Speaker**
(Chair: Kwang-il Hwang)

Prof. David Camacho
“Unmasking the Shadows: A Dive into Cutting-Edge Strategies against Disinformation in Online Social Networks”
Universidad Politécnica de Madrid (UPM), Spain
Director of Applied Intelligence and Data Analysis research group

14:50-15:00 **Coffee Break**

15:00-16:30 **Session A-3 DMLAB Workshop**
(Chair: Nammee Moon)

1. **Self-Training Pet Behavior Prediction Based on Pseudo Label**
JunHyeok Go, Nammee Moon
2. **Efficient Real-time Audio Analysis: The FTAE Model for Faster Early Fusion**
Jin Hwan Yang, Huck Soon Choi, Sung Sik Kim, Nammee Moon
3. **Time-Series Augmentation Using Diffusion Model for Improved Sensor Data Training**
Jeong Hyeon Park, Nammee Moon
4. **EfficientNetV2 and DistilBERT-Based Feedback Model for Intelligent Waste Sorting**
SiUng Kim, Nammee Moon
5. **Enhancing Pet Behavior Classification: A Fusion of VAE and RESNET-LSTM Models**
Hyuk Soon Choi, Sung Sik Kim, Jin Hwan Yang, Nammee Moon



16:30-16:40	Coffee Break
16:40-18:00	<u>Session A-4 SICNS Workshop for NRF Korea-UE</u>
	Privacy Session
18:00-18:30	Break
18:30-20:30	Banquet (Only for Invited Members)

Day 2, Feb. 15, 2023 (Thursday)

10:00-12:00 Session A-5 WITC 2024
(Chair: Ji Su Park)

1. Application of Transfer Learning-based Binary Classification Model for Data Augmentation
Ji Su Park
2. DT-IDS: Digital Twin enabled Intrusion Detection System for IoT Networks
Salim Mikail Mohammed, Heeji Park, Jong Hyuk Park
3. Market prediction model based on fuzzy logic system in smart city environment
Abir El Azzaoui, Jong Hyuk Park
4. OTP Empowered Blockchain for Secure Network Communication in Smart City Environment
Jimin Ha, Jong Hyuk Park
5. Quantum-based ARP anti-spoofing methods for Data Link Layer communications
Byung Hyun Jo, Jong Hyuk Park
6. Securing V2X Communication: A Machine Learning-Enabled Blockchain Framework
Yonas Tewelde medhin Gebrezgihera, Jong Hyuk Park
7. Blockchain-based Digital Forensics framework for preventing Cyber Attacks in Metaverse
Tuba Arif, Jong Hyuk Park

12:00-13:30 Lunch

13:30-15:30 Organizing Committee Meeting I

15:30-16:00 Break

16:00-18:00 Executive Meeting – Organized by World IT Congress 2024



Day 3, Feb. 16, 2024 (Friday)

09:00-10:20 Local Arrangement Committee Meeting

10:20-10:40 Break

10:40-12:00 Organizing Committee Meeting II

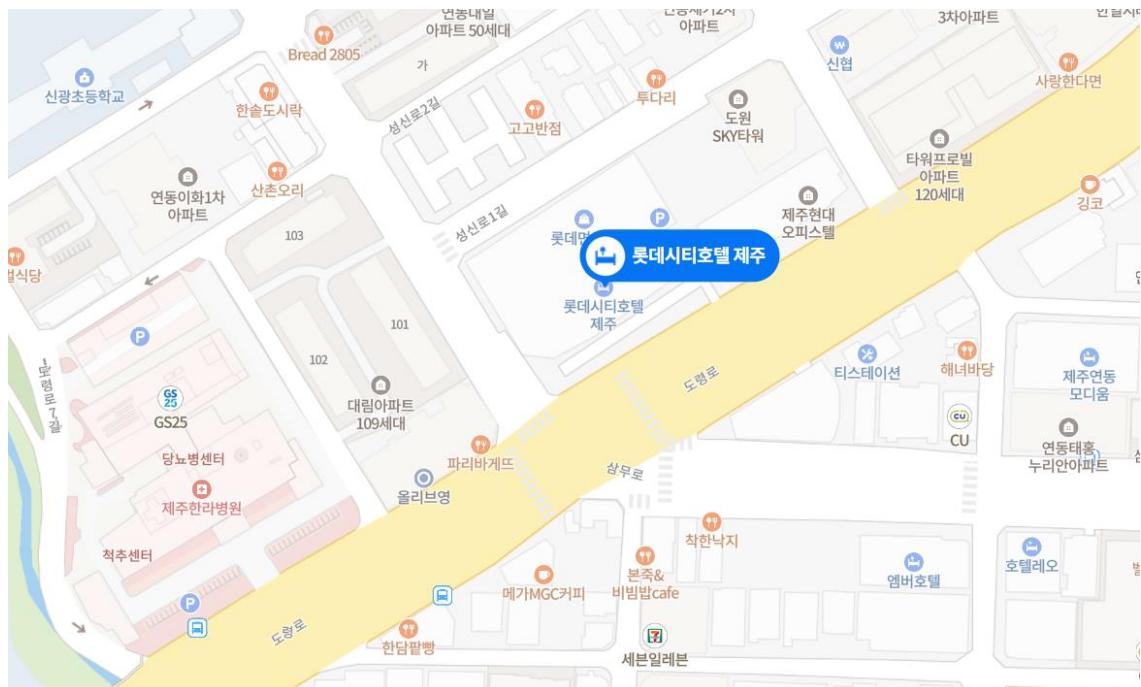


Conference Venue



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Deep Learning-based Personalized ECG Monitor

Chunghwan Hwang, Nagyoum An, Jaehyun Park *

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Abstract. Early detection of cardiovascular disease through electrocardiogram monitoring is becoming increasingly important to prevent serious heart disease. This paper presents a method to monitor electrocardiograms in real time by implementing artificial intelligence technology on IoT devices. Since the edge device used in this paper has limited resources, the TensorFlow Lite which is specially designed to support real-time machine learning (ML) inference on low-power and resource-constrained edge devices was used. The performance of the pre-trained model and the lightweight model was compared through TensorFlow Lite to confirm whether the application was suitable.

Keywords: Healthcare, electrocardiogram, deep learning, TensorFlow

1 Introduction

Among various health threats, cardiovascular disease (CVD) stands out as one of the leading causes of death globally. The primary diagnostic tool for detecting heart rhythm disorders, a leading cause of cardiovascular disease, is the electrocardiogram (ECG) which records the heart's electrical activity at specific moments [1], [2]. Traditional methods utilized in conventional electrocardiogram monitoring systems have been proven as a standard diagnosis method. However, while they showed relatively good performance for the standardized scenarios and data, they showed the limited capacity to the range of an individual's attributes such as heart condition, or changes in response to certain disease states. AI-based detection algorithm such as deep learning enables automatic identification of complex patterns from large datasets, which results in precise characterization of an individual's electrocardiogram and faster detection of early signs or abnormalities in heart disease [3].

In this paper, we implemented a lightweight edge IoT node to detect arrhythmia based on CNN-based deep learning models specialized in electrocardiogram analysis for embedded devices.

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** Acknowledgement: This work was supported by the MSIT(Ministry of Science and ICT), Korea, under the Innovative Human Resource Development for Local Intellectualization support program(IITP-2023-RS-2023000259678) supervised by the IITP(Institute for Information & communications Technology Planning & Evaluation). The authors would like to express their appreciation to Hoyoung Son and Minsub Kim at Inha University for helping experiments to improve the quality of this paper.

Joinable Tabular Data Search with Table Embedding

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Abstract. We can generate new meaningful information by integrating two or more relational tables into one table. However, finding tables that can be joined within a large dataset space (such as Data Lake, and Data Space) is a very labor-intensive and time-consuming task. In this paper, we propose a new technique (called *n-Join-pair*) of discovering three or more table datasets that can be joined by using the previously proposed *CNE-Join* technique.

Keywords: Deep Learning, Data Integration, Join, Embedding, Relational Table.

1 Introduction

By performing a join operation on a specific column for two or more relational tables, it is possible to obtain meaningful information that was not known before joining. There have been many related studies, including CNE-Join [1], which automatically finds two tables that can be joined when a large number of table data is given. However, as far as we know, no research has yet been conducted to find three or more tables that can be joined when there is a lot of tabular data and to rank the joined tables according to their quality. This paper proposes a new joinable table dataset discovery technique called *n-Join-pair*, which finds three or more relational tables that can be joined with the quality information.

2 Proposed Method

Fig. 1 shows the execution process of *n-Join-pair*. The CNE-Join is a joinable dataset discovery technique that considers both column name embedding and named entity recognition to automatically find two tables that can be joined. Basically, we first utilize the CNE-Join method to discover a set of possible join pairs for two tables, with which we can discover three or more joinable table dataset. For example, if tables *A* and *B* can be joined on columns *a* and *b*, respectively, and tables *A* and *C* can be joined on columns *a* and *c*, respectively, then tables *A*, *B*, and *C* is possible to join on columns *a*, *b*, and *c*. Next, our method maps both the joined table and its source tables into the same embedding vector space through table embedding [2]. Here, it is necessary to evaluate the quality of the joined table, and for this, we calculate the average distance between the embedding vectors of the joined table and its source tables. Our *n-Join-pair*

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** This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2022R1A2C1011937).

Effective Combination of Contextual Embedding based Tensor Space Model and Transformer for Text Classification

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Abstract. In this paper, we propose a deep learning architecture that effectively combines our previous tensor space representation model, contextual word embedding and Transformer model for more accurate text classifier. This is a type of multimodal architecture that not only considers the contextual information of words in the tensor space model, but also can learn the sequential information of words. Through experiments using 2 English news datasets, we proved that our method is superior to conventional ones.

Keywords: ELMo, word embedding, tensor space model, TextCNN, transformer, text classification

1 Introduction

In this paper, we propose a deep learning architecture that effectively combines our previous tensor space representation model [1], contextual word embedding and Transformer model [2] for more accurate text classifier. Our tensor space model represents a single document as a *term-by-concept* matrix, and however it does not consider polysemy problem and word sequence information. To achieve more reliable text classification, we devised a multimodal deep learning architecture that not only includes the contextual information of words in the tensor space model, but also can learn the sequential information of words.

2 Proposed Method

To learn the sequential information with a tensor space model, we have utilized the Transformer model widely used in NLP task. As a result, our proposed architecture has a multimodal (or 2-channel) deep learning as shown in Fig. 1. Each of documents is represented as a two-dimensional matrix with an ELMo [3] embedding vector containing contextual and semantic information, and simultaneously, the sequential information of words within the document forms a sequence channel; the former is

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** This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2022R1A2C1011937).

Container-based platform deployment system for real-time multi-user action sharing in virtual reality

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Abstract. Most of the Virtual Reality education contents have been produced only for the purpose of one-person education, due to the lack of multi-user based technology, and could not be used for education that requires multiple people. However, after the pandemic, the need for multi-user education contents that can participate in Virtual Reality from each space has emerged. Accordingly, in this study, we verified the technology that enables multiple users to share their actions in real time in Virtual Reality using container technology.

Keywords: Virtual Reality, Container, Server Virtualization, Cloud Computing

1 Introduction

Until the early 2010s, Virtual Reality was a technology that was not easily accessible to the general public. This was because the Virtual Reality hardware at that time was large and heavy, making it difficult to use, and it required many steps to run the software. However, in the 2020s, the Virtual Reality hardware became lighter and cheaper, making it easier for ordinary users to access. After the pandemic, the number of Virtual Reality users and contents also increased explosively, and the demand for contents that involve multiple people participating at the same time also increased beyond simple one-person contents. Accordingly, the need for technology that can share user actions in real time over the network in Virtual Reality and technology that can efficiently manage them on the server emerged. In this study, we verified the

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Algorithm for Mining Maximal Balanced Bicliques using Formal Concept Analysis

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Abstract. In a bipartite graph, searching or enumerating maximal balanced bicliques (MBB problem) plays a pivotal role in graph mining and is applicable to the several real-world applications: VLSI design, interaction between protein and many others. We propose a novel algorithm to find MBB using formal concept analysis (FCA) from bipartite graphs. Contrast to the traditional approaches, we have applied an algorithm for computing formal concepts from the formal context which is the alternative way of representation of a bipartite graph. This algorithm is the first one which used an FCA to enumerate all maximal balanced bicliques in a bipartite graph.

Keywords: maximal balanced biclique, bipartite graph, formal concept analysis (FCA).

1 Introduction

Enumeration of bicliques is widely applied on various areas, e.g., detecting cyber communities, data compression, epidemiology, gene expression[1]. MBB, as an extension of enumeration of bicliques, also attracted many researchers. Some of them extended maximal clique problem, while others devised different approaches[2].

In this paper, we have adopted an algorithm for detecting k -cliques for unipartite graphs using FCA and extended so that it can handle to mine maximal balanced bicliques in bipartite graphs. The main difference was that we disregarded the term *equiconcept* by ignoring the equality of the extent and intent of a formal concept in terms of elements. Since only bipartite graphs are of interest in this paper, two sets of vertices are already disjoint. So, we simply concentrated on the equality in cardinalities of extent and intent in a formal concept. Based on proof of F. Hao et al. in [3], it is not hard to show that the problem of finding formal concepts whose extents and intents are equal in size is

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Multimodal Analysis for Identifying Misinformation in Social Networks

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Abstract. Online misinformation is a major threat to various aspects of society, including politics, social cohesion, and the economy. Addressing this issue, our paper presents a fusion approach for detecting false content in online posts, which typically include a mix of elements like text and images. We use a comprehensive multimodal dataset with images, captions, comments, and metadata. Our innovative encoding method effectively captures the meaning and structure of comments. The model employs *CLIP* and *DeBERTa* as base encoders and an early fusion strategy to integrate different types of data, effectively handling both multimodal and unimodal inputs. The overall architecture is divided into three modules that are responsible for (i) encoding (ii) merging according to the information channel and projecting to obtain a joint representation and (iii) perform binary classification. The model's effectiveness is tested on the '*Fakeddit*' dataset. Results show remarkable accuracy in simple binary classification (93.10% accuracy) despite hardware constraints.

Keywords: Misinformation, Multimodal, *CLIP*, *DeBERTa*, *Fakeddit*

1 Introduction

Social Networks have emerged as critical centers for communication in contemporary society. The repercussions of misinformation are far-reaching and severe, with notable examples including (i) the influence on public opinion, similar to the 2016 US

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Scalability analysis of DeepVATS: A Framework for Deep Learning Visual Analytics on Large Time Series Data

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Abstract. DeepVATS is a Deep learning Visual Analytic tool that seamlessly integrates Deep Learning and Visual Analytics for the analysis of extensive time series data. This paper presents the main components of DeepVATS and performs a scalability analysis in terms of the complexity of the time series studied. Execution and rendering times have been logged and analysed to make scalability analysis.

Keywords: DeepVATS, Visual Analytics, scalability analysis, shiny

1 Introduction

DeepVATS is a tool inspired by TimeCluster [1], integrates Visual analytics (VA) and Deep Learning (DL). It uses dimensionally reduction (DR) techniques for efficient analysis and interaction with large time series. Its main tasks are: training neural networks to obtain its embeddings; projecting them in 2 dimensions to detect clusters and anomalies; and finally, providing interactive visualizations to explore different perspectives of the projected embeddings. This paper analyses DeepVATS' scalability

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A Study on OSS License Compatibility Verification using LLMs in MSA

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Abstract. Issues related to Open Source Software license conflicts on large-scale networks have recently emerged. Existing services can only verify license compatibility for individual software, and there is a lack of services and research for verifying license conflicts in large-scale network environments, such as Microservices Architecture. Therefore, this paper proposes a technique utilizing large language models to extract open-source components in MSA and analyze their interconnection methods, thereby maintaining license compliance.

Keywords: Open Source Software License, Microservice Architecture, License Compliance, Large Language Model, Copyright Protection

1 Introduction

The compatibility of the Open Source Software (OSS) License used in development of services based on Microservice Architecture (MSA) is not sufficiently verified. This is attributed to the complex and distributed nature of the architecture, which makes it difficult to understand the overall structure and detect license conflicts between components[1]. For example, in services based on MSA, license conflicts may occur depending on the combination methods of components under the General Public License 2.0 and Apache License version 2.0 policies. Traditional license verification tools, which are designed for single software, are not suitable for determining license conflicts in MSA contexts[2]. These tools cannot discern the component integration structure within MSA, making it challenging to determine license conflicts. Therefore, this paper proposes a study using Large Language Models (LLM) to maintain license compliance in MSA, aiming to address these challenges.

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Audiovisual-based Surveillance System for Detecting Physical Leaks in Research and Development Environments

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Abstract. With the rise in R&D security incidents, preventing technology leaks has become imperative. Many countries have implemented security policies focusing on external cyber threats, yet these measures often need to be revised in open R&D environments, overlooking insider and physical leaks. This paper proposes the first surveillance system for detecting insider threats via physical means by deriving security requirements from a physical standpoint and constructing an audiovisual-based leak detection dataset. The methodology integrates convolutional neural networks with a novel data augmentation technique to address dataset imbalances, achieving a 91.26% leakage detection rate overall and a 99% accuracy in distinguishing eight types of normal and leak events. This result validates the effectiveness of the proposed dataset and methodology in R&D settings, setting a new academic standard for physical leak detection and introducing a universal augmentation formula for multi-class classification relevant to enhancing industrial surveillance systems.

Keywords: Intelligent surveillance system, Physical security, Mitigating insider threats, Multimodality, Data augmentation

1 Introduction

As an era dominated by technological hegemony has begun, the increasing importance of security in research and development (R&D) environments has been underscored by the intensified competition among leading nations to secure R&D dominance. In these environments, the persistent occurrence of information leak incidents, primarily due to insider threats, further emphasizes the critical need for enhanced security measures.

For instance, in 2020, the *Federal Bureau of Investigation* (FBI) sought a Chinese Communist Party official who, disguised as a student at Boston University, sent research documents back to China [1]. In 2022, a Russian researcher working as an assistant at a German university was charged with sharing Europe's aerospace launch program with Russian intelligence agents [2]. Many countries have introduced security

Data Gathering System for Identifying Insider Threat Behavior on Windows System

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Abstract. In the context of global competition for technological dominance, foundational technologies that propel industries are increasingly considered critical not only to industrial markets but also to national economic stability. In order to protect core technologies, this paper suggests the proactive management of key information, presenting a more cost-effective strategy for enhancing security than conventional reactive approaches. Therefore, this paper introduces a method designed to thwart insider threats by establishing a system that can identify and record patterns of behavior indicative of potential technology compromise by insiders within an organization. Employing a research methodology that analyzed the data schema of existing datasets on technology leakage and their associated analytical processes, this study identifies and collects discernible traces of user behavior within the Windows operating system environment. The results of this paper overcome the limitations of synthetic data in previous studies that have built insider threat analysis datasets and provide raw data based on actual user behavior data that can detect technology leakage behavior.

Keywords: Insider threat detection, Technology leakage behavior, Windows forensic, Data gathering system

1 Introduction

The importance of economic security, exacerbated by the COVID-19 pandemic and the wars in Ukraine and Russia, is not only affecting the competitiveness of industries, but also the security of nations. There are many ways to secure economic security, but one of them is to prevent technology leakage. Technology leakage prevention is a way to proactively manage an organization's core technology to prevent it from being leaked. The leakage of critical technologies can have dire consequences at the national level,

Towards an Conceptual Framework for Quantum City Development through QICT

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Abstract. Recently, quantum cryptography communication technology has been increasingly used in real-life applications and industries due to the rapid development of quantum information and communication technology (QICT). The practical standard of a 1,000 qubit quantum computer has been announced, and applied research on quantum sensor technology is actively underway in various fields. As with the emergence of smart cities through the rapid adoption of previous ICT technologies, the development of quantum cities is imminent due to advancements in quantum technology. This paper outlines the scope and representative technologies of QICT and proposes an Conceptual Framework framework for its application in quantum city development.

Keywords: Quantum information and communication technology(QICT), Quantum City, Information security, Quantum tech

1 Introduction

QICT refers to computing, communication, and sensor technologies that utilize quantum characteristics. QICT is considered a core next-generation ICT and is being actively researched in countries with high technological capabilities such as the United States, Europe, China, and Japan. Representative examples of QICT include ultra-fast quantum computing, quantum communication for information security, and ultra-precise quantum sensors. This paper describes the scope and representative QICT. It analyzes the current smart city and proposes an conceptual framework for quantum city development.

2 Proposed conceptual framework

As shown in Figure 1, Quantum City can be divided into three basic layers. The application layer includes services provided by Quantum City and third parties, and is basically similar to a smart city, but quantum computing technology can be applied to

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GPU memory usage limiting techniques for running multiple AI jobs in the container environments

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Abstract. Cloud environments have the advantage of minimizing idle time and improving resources utilization by resource sharing. This makes it possible to run services run by multiple users simultaneously on server. However, to avoid GPU memory fragmentation, applications based on AI frameworks like TensorFlow tend to operate in a way that occupies most of the available GPU memory, regardless of the actual GPU memory requirements of the job. This results in a single AI application taking up most of the GPU memory, preventing additional AI applications from running. This makes GPU resource sharing impossible and requires more GPUs. In this paper, we propose GPU memory management technique to limit the GPU memory usage of TensorFlow-based AI jobs to solve the Out of GPU Memory (OOGM) problem caused by the default behavior of a AI application occupying the entire GPU memory, and to enable the concurrent execution of multiple AI jobs.

Keywords: Cloud, Container, OOGM, GPU Computing, AI

1 Introduction

AI jobs require large amounts of computing resources because they have to process large amounts of data in learning phase. In particular, computational acceleration requires expensive devices such as GPUs. However, inference and transfer learning require relatively small amounts of computing resources, making it possible to run multiple AI jobs simultaneously on a single GPU and improve resource utilization. In such a computing environment, the cloud systems where multiple users share the entire resources of a single server in an isolated environment are very beneficial.

However, AI frameworks like TensorFlow [1] work by default in such a way that a single AI job occupies all available GPU memory to prevent fragmentation of GPU

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Proactive Container Autoscaling using DEVS for Efficient Cloud-Native Computing

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Abstract. The reactive container autoscaling technique faces issues with service overloading and resource wastage due to dynamic and burst workloads. Therefore, this paper proposes DEVS-based proactive container autoscaling (DPCA) to ensure resource efficiency and service stability. DPCA constructs a large-scale workload dataset composed of various types through workload generation. This large-scale workload dataset calculates the optimized proactive autoscaling threshold via DEVS-based autoscaling simulation. Additionally, it manages resources optimally for future periods by predicting resource usage with high accuracy using an ensemble model.

Keywords: Cloud computing, Container autoscaling, Time-series forecasting, DEVS, Simulation

1 Introduction

As the majority of Information Technology (IT) companies transition their Information and Communications Technology (ICT) infrastructure to microservice architecture, the importance of resource management in cloud-native computing is becoming increasingly prominent [1]. Container autoscaling techniques, operating as reactive mechanisms, experience adjustment latency during scaling [2]. Hence, they suffer from issues of service overload and resource wastage due to burst and dynamic workloads [3].

Therefore, this paper proposes a discrete event system specification (DEVS)-based proactive container autoscaling (DPCA) to ensure resource efficiency and service stability for various types of workloads. DPCA generates diverse types of workloads and calculates the optimized threshold for proactive autoscaling through simulation

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Methodology for Identifying Promising Items Based on Deep Learning

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Abstract. For a company to endure, it must explore promising items by considering not only its internal capabilities but also the changing external environment. Lately, with the intensification of technology-driven global competition, countries are selecting strategic technologies at a national level and advancing policy support to secure technology sovereignty. This study proposes a data-driven methodology that enables individual companies to explore promising items by linking their technologies with the national strategic technologies in areas such as biotechnology, artificial intelligence, and materials, which is presented from a macro perspective. Promising items are explored using Wikipedia data, which ensures diversity, recency, and reliability, through deep learning-based text analysis and social network analysis. The methodology proposed in this study is applicable to the future change in policy directions and is significant in that it can present promising items that are highly relevant to specific technologies owned by individual companies and reflect the latest trends.

Keywords: Promising items, Data-driven methodology, Deep learning, Social network analysis, Strategic technologies

1 Introduction

Companies pursuing sustainability need to identify new promising business opportunities for growth before their business reaches a state of maturity. Approaches for exploring promising business opportunities have been established through academic research and business practices. However, new approaches and strategies are required due to constant changes in the external environment. Considering the escalating intensification of technology-driven global competition, the demand for preserving national capabilities to take strategic actions is growing. Under these circumstances, the concept of technology sovereignty has received significant attention [1]. To ensure technology sovereignty, countries have strategically selected core technologies and implemented political support for them. Companies need to consider both their internal capabilities and changes in the external environment to investigate promising business opportunities, and corporate tactics should be strategically combined with political

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A Lightweight Depth-wise ResNet-SE for Human Activity Recognition

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Abstract. Convolution neural networks leveraging deep learning techniques are effective in accurately detecting and classifying human activities. However, convolution layers in deep learning models typically entail many parameters and floating point operations per second, posing a challenge for real-time inference on Internet-of-Things (IoT) end devices. This study addresses this issue by introducing a novel model, called the depth-wise (DW) residual network squeeze-and-excitation (ResNet-SE) model, which combines a ResNet-SE model with lighter-weight DW convolutions for human activity recognition (HAR). Extensive experiments were conducted on three well-known public datasets for HAR to evaluate the proposed model's performance. The performance surpassed those of state-of-the-art models in HAR. In addition, the proposed model trained with the PAMAP2 dataset was deployed in an IoT end device environment. The results demonstrate that the proposed model exhibits superior activity detection capabilities compared to existing models.

Keywords: Deep learning, Depth-wise convolution, Depth-wise Mix kernel convolution, Human activity recognition, Light weight model for IoT end devices

1 Introduction

Human activity recognition (HAR) involves data analysis and interpretation to accurately infer human activities. This capability enables the development of intelligent systems that can adapt to human behaviors and provide personalized assistance [1]. HAR is applied in various areas, including healthcare [2], smart homes, and exercise monitoring [3]. HAR can be performed by vision-based or sensor-based data. Vision-based HAR data are collected from cameras embedded in environment-monitoring devices. This approach offers a intrusive approach to capturing activities but comes with privacy concerns and image quality problems [4]. Sensor-based HAR operates using sensor data obtained by accelerometers, gyroscopes, and magnetometers mounted on a user's body. It can provide more

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Development of method for predicting changes in body shape based on deep learning

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Abstract. Predicting changes in body shape using personal body images and desired BMI. Unlike traditional methods that rely on comparisons with others, our personalized approach uses frontal and side images, height, and weight data. We tackled incomplete data challenges by employing CcGAN, enhancing our dataset significantly. Our algorithm is based on conditional GANs, specializing in image-to-image translation for body shape alterations. Through rigorous qualitative and quantitative assessments, our method proved superior to existing algorithms, showing remarkable performance across various metrics. An ablation study further validated our algorithm's generator structure and loss function's effectiveness. This research introduces the first image-based algorithm for predicting body shape changes, providing a more personalized, accurate tool for weight management and envisioning body shape changes, steering clear of comparisons with others. This innovation is expected to positively impact users, offering a novel approach to weight and body shape management.

Keywords: body shape change prediction; conditional GAN; image-to-image translation

1 Introduction

Recently, women's interest in weight management has increased, to the extent that one in four state that they are managing their weight [1,2]. Despite this interest, weight management is currently based on other women's before-and-after photographs. Hence, women predict how they will change by imagining themselves (or predicting how they will change) through the subjective descriptions of doctors with extensive experience in body shape and obesity treatments. However, what people require when managing their weight is to perceive how they will change, not how others will change, meaning the subject of the prediction should be themselves. Unfortunately, the subject of prediction is other people in existing methods, and the needs of women who are trying

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Development and Evaluation of a Digital Therapeutic Using 3D Artificial Intelligence Technology for Visual Weight Loss and Health Improvement

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Abstract. This study presents an innovative solution to the global public health issue of obesity management and treatment. It highlights the direct connection between obesity and various health problems, underscoring the importance of effective management and treatment. Utilizing 3D artificial intelligence technology, the research developed a digital therapeutic that visually demonstrates the process of weight loss and health improvement for obese patients. This digital therapeutic allows users to visually track real-time progress in weight reduction and health improvement, enhancing motivation towards achieving their goals. The study evaluates the effectiveness of this digital therapeutic from various perspectives and emphasizes the potential and efficacy of digital solutions in obesity management. It suggests that further improvements and research are needed in this field, anticipating that the advancement of such digital therapeutics will positively impact individual and societal health.

Keywords: Digital therapeutics, 3D body shape, Cognitive Behavioral Therapy, 3D Human body reconstruction

1 Introduction

Obesity has emerged as a global health crisis, presenting significant challenges in public health, medicine, and socio-economic aspects[1]. According to recent statistics from the World Health Organization (WHO) and the Organisation for Economic Co-operation and Development (OECD), the global prevalence of obesity has tripled since 1975. This rapid increase has led to various socio-economic costs, and there is clear evidence that obesity should be recognized as a serious health issue rather than merely a cosmetic concern[2]. In many countries, including South Korea, obesity is still often viewed as a cosmetic issue, but this overlooks its true dangers. In fact, obesity is a clear 'disease' that causes greater socio-economic costs than smoking and alcohol

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Self-Training Pet Behavior Prediction Based on Pseudo Label

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Abstract. Predicting companion animal behavior plays a crucial role in various fields such as healthcare and safety. However, models based solely on sensor data show lower accuracy compared to those that incorporating video data. Moreover, they require more data, posing limitations in terms of utility and experimentation. In this paper, we employ a self-training method utilizing Pseudo Labels to generate labels, reducing the cost of data collection. Furthermore, we demonstrate the enhancement of the performance of behavior prediction models.

Keywords: Sensor Data, Deep Learning, Pseudo Label

1 Introduction

The increase in the pet population has led to the advancement of the pet tech market, making the prediction of pet behavior an increasingly crucial issue. Pet behavior prediction primarily involves the use of sensor and video data. However, the use of video data raises concerns about user privacy and the potential leakage of personal information. On the other hand, relying solely on sensor data for prediction not only results in lower performance but also requires more data for effective learning. Therefore, this paper employs a Self-Training technique using a supervised learning model trained on labeled data to predict unlabeled data and generate Pseudo Labels [1]. Learning with Self-Training can exhibit high performance even in situations with insufficient labels, sometimes outperforming traditional supervised learning [2]. Thus, the use of Pseudo Labels can contribute to the development of effective models in the field of behavior prediction, addressing challenges in scenarios where labeled data is limited.

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Efficient Real-time Audio Analysis: The FTAE Model for Faster Early Fusion

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Abstract. The Early Fusion methodology is effective in speech classification models. However, it is challenging to apply this method for real-time speech analysis due to its extensive computational time. This study introduces an FTAE (Fourier Transform Autoencoder) designed for efficient real-time speech analysis. By training the Early Fusion feature map in the autoencoder's latent space, this method enhances the speed of feature extraction without compromising accuracy.

Keywords: Early Fusion, FTAE, Audio Feature Extraction, Audio Preprocessing

1 Introduction

The Early Fusion methodology has shown superior performance in audio classification models[1]. However, the Early Fusion approach requires three Fourier Transforms, resulting in the significant drawback of prolonged transformation times. There is a pressing need for a more efficient frequency analysis method that can be used in a real-time audio analysis monitoring system without sacrificing accuracy. Consequently, this study proposes the FTAE, an autoencoder-based approach to frequency analysis. This method generates feature maps by utilizing the proven Early Fusion technique, aligning them with audio files, and subsequently training an autoencoder.

2 Paper Preparation

2.1 Auto Encoder

An autoencoder is a model utilized for dimensionality reduction, learning the discrepancy between input and output data[2]. In this study, the input data, processed as audio, is trained, and the output data is constructed as Fourier Transform-based Early Fusion feature maps.

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Time-Series Augmentation Using Diffusion Model for Improved Sensor Data Training

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Abstract. In this paper, a sensor data augmentation method is designed using the Diffusion model commonly employed in image processing. The devised augmentation technique involves applying MinMax scaling to windowed sensor data, followed by converting it into grayscale images. These processed images are then utilized as training data for the Diffusion model. The proposed augmentation method, leveraging the well-performing Diffusion model in the field of image processing, aims to enhance machine learning models utilizing sensor data by augmenting the dataset through the application of this model.

Keywords: Time-series augmentation, generative model, Diffusion Model

1 Introduction

In various fields, the utilization of sensor data is crucial, especially in robotics, artificial intelligence, and autonomous vehicles, where training models using sensor data from real-world environments is highly important. However, due to the cost and complexity associated with collecting sensor data, there is a need for innovative approaches to data augmentation. Therefore, this paper proposes a method for augmenting sensor data using the Diffusion model, widely utilized in the field of image processing, by referencing existing studies that transform sensor data into image formats [1,2].

2 Sensor Data Generation Using Diffusion Model

The Diffusion model, as illustrated in Fig. 1, is trained by progressively adding noise to an image and subsequently restoring the original image by removing the noise. To adapt this Diffusion model for learning sensor data with time-series qualities, it requires modifications or transformations to represent the sensor data in a trainable format. In

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EfficientNetV2 and DistilBERT-Based Feedback Model for Intelligent Waste Sorting

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Abstract. Sorting waste is one way to protect the environment in daily life. To recycle contaminated recyclables more efficiently, we train with EfficientNetV2 to identify the location of contaminants. Subsequently, through DistilBERT, we provide feedback to the disposer on how to remove the contaminants, enabling efficient waste separation.

Keywords: Object Detection, Large Language Model

1 Introduction

One of the everyday practices to protect the environment is waste separation. Eighty percent of the plastic that is discarded ends up in landfills or persists in the environment[1]. Recycling one ton of plastic can save 16.8 gallons of oil, and recycling one ton of paper can save 18 trees, demonstrating significant environmental benefits[2]. However, proper recycling can only be achieved by separating contaminants such as labels and food residue from recyclables like plastic and paper. In research on recycling construction waste, various sorting processes are undertaken to remove contaminants attached to the waste and prepare it for recycling[3]. Yet, the structures in place for removing such contaminants involve significant costs and time. This study aims to combine Convolutional Neural Networks (CNN) and Large Language Models (LLM) to verify the presence of contaminants in recyclables and guide disposers accordingly, thereby saving time and costs.

2 Foreign object Feedback Model

Figure 1 illustrates the process of the proposed model in this paper. First, recyclable material data is collected through methods such as cloud sourcing and crawling. The collected data consists of plastic, paper, cans, and glass bottles and is trained using EfficientNetV2. During training, extracted features are tokenized to be input into DistilBERT. The tokenized data is transformed into fixed-size vectors through

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Enhancing Pet Behavior Classification: A Fusion of VAE and RESNET-LSTM Models

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Abstract. In this study, a new approach is proposed, utilizing sensor data collected from wearable devices to classify pet behavior. Using IMU sensor data, a total of six behaviors are analyzed. Augmented data is converted into time-series data through a preprocessing process, and data augmentation is performed using Variational Autoencoder (VAE). This enhanced data is then transferred to the RESNET-LSTM network to analyze complex features and classify behavior, taking into consideration the sequential nature of time.

Keywords: VAE, Hybrid Model, IMU Sensor Data Processing

1 Introduction

In this study, we propose a novel model that combines Variational Autoencoder (VAE) and Residual Networks with Long Short-Term Memory (RESNET-LSTM)[1]. The focus of this model is on classifying the behavior of companion animals using Inertial Measurement Unit (IMU) sensor data.

VAE excels at extracting essential features from complex data[2], while RESNET-LSTM is suitable for learning patterns in data with temporal sequences. The combination of these two models is expected to effectively extract crucial information from high-dimensional sensor data and contribute to accurately classifying companion animal behavior..

2 Dataset

This study utilizes gyro, geomagnetic field, acceleration, and Euler sensor data collected through wearable devices. It involves a total of 6 behaviors (standing, sitting, lying down, walking, sniffing, eating). The data counts are shown in Table 1.

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Application of Transfer Learning-based Binary Classification Model for Data Augmentation

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Abstract. When using small datasets for deep learning learning, data augmentation is applied to prevent overfitting and improve model performance. However, depending on the nature of the data, there are cases where the effect of data augmentation is insufficient. To solve this problem, this study tests the performance of a transfer learning-based binary classification model by applying data augmentation techniques.

Keywords: Transfer Learning, Binary classification Model, Data Augmentation

1 Introduction

A convolutional neural network basically consists of a convolutional layer, a pooling layer, and a connection layer. Since the convolutional neural network has a large number of hidden layers, the number of parameters included is large and the model is complex, so in order to implement a model with excellent performance, a large amount of high-quality learning data must be prepared [1]. However, due to practical constraints, it is often difficult to collect large amounts of data and invest time and resources for sufficient learning and verification. Representative methods to solve this problem are data augmentation and transfer learning [1]. If the obtained dataset is small-scale data containing only hundreds to tens of thousands of samples, data augmentation techniques can be applied to increase the number of data to learn.

Data augmentation techniques are commonly used to increase the number of data by applying physical methods such as enlargement, reduction, rotation, and cropping [1][2]. Transfer learning is a method of creating a new model using part or all of a model that has completed prior learning by applying existing benchmark data [1], and various pretrained models exist. In the case of a pre-trained model, even if the benchmark data used in prior learning is different from the current target dataset, knowledge transfer is possible, and the characteristics of the new data can be extracted

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DT-IDS: Digital Twin enabled Intrusion Detection System for IoT Networks

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Abstract. The rapid deployment of Internet of Things (IoT) technologies in the smart city environment requires enhanced cybersecurity due to persistent and evolving cyber threats. In this paper, we propose a Digital Twin-enabled Intrusion Detection System (DT-IDS) for IoT networks, underpinned by digital twins that replicate key urban infrastructures like healthcare, industrial, and smart buildings. This system primarily monitors network data flows within these digital environments to detect network anomalies. At its core, the DT-IDS employs a Hybrid Deep Learning algorithm to analyze the digital twin data for signs of cyber intrusions. For scalability and efficiency, the system integrates a distributed digital twin framework within the edge computing layer, ensuring real-time threat detection and response in IoT environments.

Keywords: Intrusion Detection, Digital Twin, Edge Intelligence, IoT.

1 Introduction

The extensive data harvested from the Internet of Things (IoT), is pivotal for informed decision-making across diverse sectors including manufacturing, logistics, healthcare, and military operations. The integration of IoT in these intelligent, predominantly cloud-based systems emphasizes the necessity of robust cybersecurity measures. However, the manufacturing constraints of IoT devices, particularly in cost-sensitive segments, often reduce in importance the security considerations to a lower priority. This lapse manifests in the widespread use of generic, easily compromised passwords across product lines, rendering them susceptible to brute force attacks or simple search engine queries. Furthermore, the limited computational and battery capacities inherent in these devices pose significant challenges in implementing comprehensive and effective security protocols, such as advanced intrusion detection systems. This challenge highlights the need for innovative, resource-efficient cybersecurity solutions in the IoT ecosystem.

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Market Prediction Model based on Fuzzy Logic System in Smart City Environment

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Abstract. In the rapidly evolving landscape of financial market analysis, the fusion of artificial intelligence (AI) and big data analytics has introduced groundbreaking methodologies for predicting market trends. This paper presents an innovative approach that leverages Quantum Fuzzy Neural Networks (QFNNs) to analyze sentiment data extracted from social media, particularly Twitter, alongside traditional stock market indicators. The study explores the utility of QFNNs in interpreting vast unstructured data from social media, merging it with quantitative market indices to forecast future market behaviors. By incorporating the computational speed of quantum computing, the flexibility of fuzzy logic, and the pattern recognition capabilities of neural networks, this approach presents a novel method in financial analytics. The research demonstrates how sentiment analysis, when integrated with conventional market data, can offer deeper insights into market dynamics, influenced by both investor sentiment and objective financial metrics. The results showcase the potential of QFNNs in enhancing prediction accuracy, thus providing a valuable tool for market analysts, investors, and financial institutions in navigating the complexities of stock market prediction. This study not only contributes to the existing body of knowledge in financial market analysis but also opens new avenues for the application of AI and quantum computing in other domains where large-scale data analysis and decision-making under uncertainty are pivotal.

Keywords: Fuzzy Logic, QFNN, Sentimental Analysis, Stock Market Prediction

1 Introduction

The landscape of financial market forecasting has undergone a paradigm shift with the integration of artificial intelligence (AI) and big data analytics. In this evolving scenario, the use of quantum fuzzy neural networks (QFNNs) for analyzing sentiment data from social media, particularly Twitter, combined with traditional stock market

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OTP Empowered Blockchain for Secure Network Communication in Smart City Environment

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Abstract. As smart cities continue to evolve, the security of network communication becomes increasingly critical. The integration of Internet of Things (IoT) devices, from traffic lights to public transportation systems, poses significant security challenges, particularly in terms of data integrity and privacy. This paper introduces a novel approach to enhancing the security of network communications in smart city environments by leveraging One-Time Password (OTP) technology in conjunction with blockchain. Our method combines the dynamic security features of OTP, which provides a unique password for each transaction or session, with the immutable and decentralized nature of blockchain technology. This combination ensures not only the confidentiality and integrity of the data but also its traceability and non-repudiation. Through a series of simulations, we demonstrate the effectiveness of our proposed system in thwarting a range of cyber threats, including man-in-the-middle attacks, replay attacks, and data tampering, thereby ensuring secure and trustworthy communications within smart city infrastructures.

Keywords: One-Time Password, Network Communication, Blockchain, Security.

1 Introduction

The advent of smart cities has revolutionized urban living, offering unprecedented levels of efficiency and convenience. At the heart of this transformation is the extensive deployment of IoT devices, which collect and transmit data to manage various city services intelligently. However, this growing connectivity also introduces significant security vulnerabilities, with the potential to compromise personal privacy, public safety, and the integrity of critical infrastructure. Traditional security

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Quantum-based ARP anti-spoofing methods for Data Link Layer communications

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Abstract. ARP is a protocol that converts IP addresses to MAC addresses, which is a necessary step for IP communication, but it has the disadvantage of being vulnerable to ARP spoofing. ARP spoofing is an attack in which an attacker intercepts a MAC address request message and associates his MAC address with a legitimate IP address, causing all data that should be sent to the intended IP address to be sent to the attacker's MAC address instead. To counter ARP spoofing attack, which is an important issue in network security, this paper proposed a technique to prevent ARP spoofing by utilizing quantum key distribution system and quantum authentication technology. The proposed method enables secure key sharing through quantum key distribution and secure storage of MAC addresses through quantum authentication, which protects the network from ARP spoofing attacks. In addition, this work presents a novel approach for efficient key management and resource usage.

Keywords: Quantum Key Distribution, Quantum Identification, ARP, ARP Spoofing, Security

1 Introduction

In the modern world, the development of network technology has enabled the rapid exchange of information, but it has also increased various security threats. In particular, an ARP spoofing attack is an attack that exploits the trust between devices on a network to intercept information by sending forged ARP Reply packets to an attack target on the same local network and storing the forged MAC (Media Access Control) address in the attack target's ARP CACHE TABLE. The attacker may enable IP forwarding capabilities to make it look like normal communication [1]. ARP spoofing poses the risk of unauthorized access and modification of sensitive data. Furthermore, if the MAC address is forged by an ARP spoofing attack, it can lead to DNS spoofing, where the attacker is located between the user and the DNS server,

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Securing V2X Communication: A Machine Learning-Enabled Blockchain Framework

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Abstract. V2X communication is vulnerable to adversarial and persistent attacks, posing significant threats to connected and autonomous vehicles (CAVs) security and privacy. We extensively reviewed individual applications of machine learning and Blockchain in V2X security and explored their integrated potential. Highlighting the existing research gaps, we propose a novel application framework that integrates Blockchain into machine learning technology tailored to secure V2X communications. This integration utilizes MEC for secure anomaly detection and data storage presenting a promising solution to fortify the security of V2X communications networks.

Keywords: V2X, Security, Machine Learning, Blockchain, MEC

1 Introduction

1.1 Background and motivation

The emergence of connected autonomous vehicles (CAVs) indicates a transformative era marked by heightened user experiences, enhanced road safety, and diversified transportation landscapes. [1] However, concerns over CAV safety persist, underlined by notable incidents like the 2018 pedestrian fatality involving a self-driving Uber vehicle and the 2021 Tesla car crash. Numerical simulations in [2] indicate that cyber-attacks on vehicles detrimentally impact traffic flow, escalating risks of collisions, air pollution, and fuel consumption.

Within V2X security concerns, authentication and privacy preservation emerge as critical issues [3]. V2X authentication, crucial for authorizing access to network resources, prompts a multitude of proposed solutions categorized into cryptography-based and trust-based schemes [4].¹

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Blockchain-based Digital Forensics framework for preventing Cyber Attacks in Metaverse

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Abstract. The metaverse, a dynamic virtual environment blending physical and virtual reality, is rapidly evolving, necessitating robust cybersecurity measures to address emerging threats in our rapidly evolving digital era. Concurrent with the changes, the escalating cyber risks, encompassing virtual property theft and identity breaches, underscore the critical need for prioritizing security measures among businesses, developers, and users. Blockchain emerges as a transformative technology, offering decentralization, security, and transparency, strengthening the metaverse against cyber threats. Through this study, we will explore the pivotal role of blockchain technology in enhancing metaverse security and advancing digital forensics methodologies. From diligent data collection to AI-powered forensics and encryption, this study aims to advocate the fusion of cutting-edge blockchain techniques with metaverse digital forensics, ensuring an encrypted and reliable framework for evidence integrity. These methods not only protect privacy rights but also ensure open and reliable investigations in the dynamic metaverse environment.

Keywords: Cyber Security, Cyber Attacks, Digital Forensics, Blockchain, Metaverse.

1 Introduction

The technology of the metaverse has taken center stage in the rapidly changing digital world, changing the way people engage with the virtual environment [1]. In the metaverse, users can interact in real time with a computer-generated environment in a shared virtual area that combines virtual and physical reality. Its rapid expansion has been fueled by growing demand for immersive digital experiences, improved connection, and technological improvements.

Strong cybersecurity measures are becoming more and more necessary as the metaverse grows. Because of the large volumes of data that users are creating and

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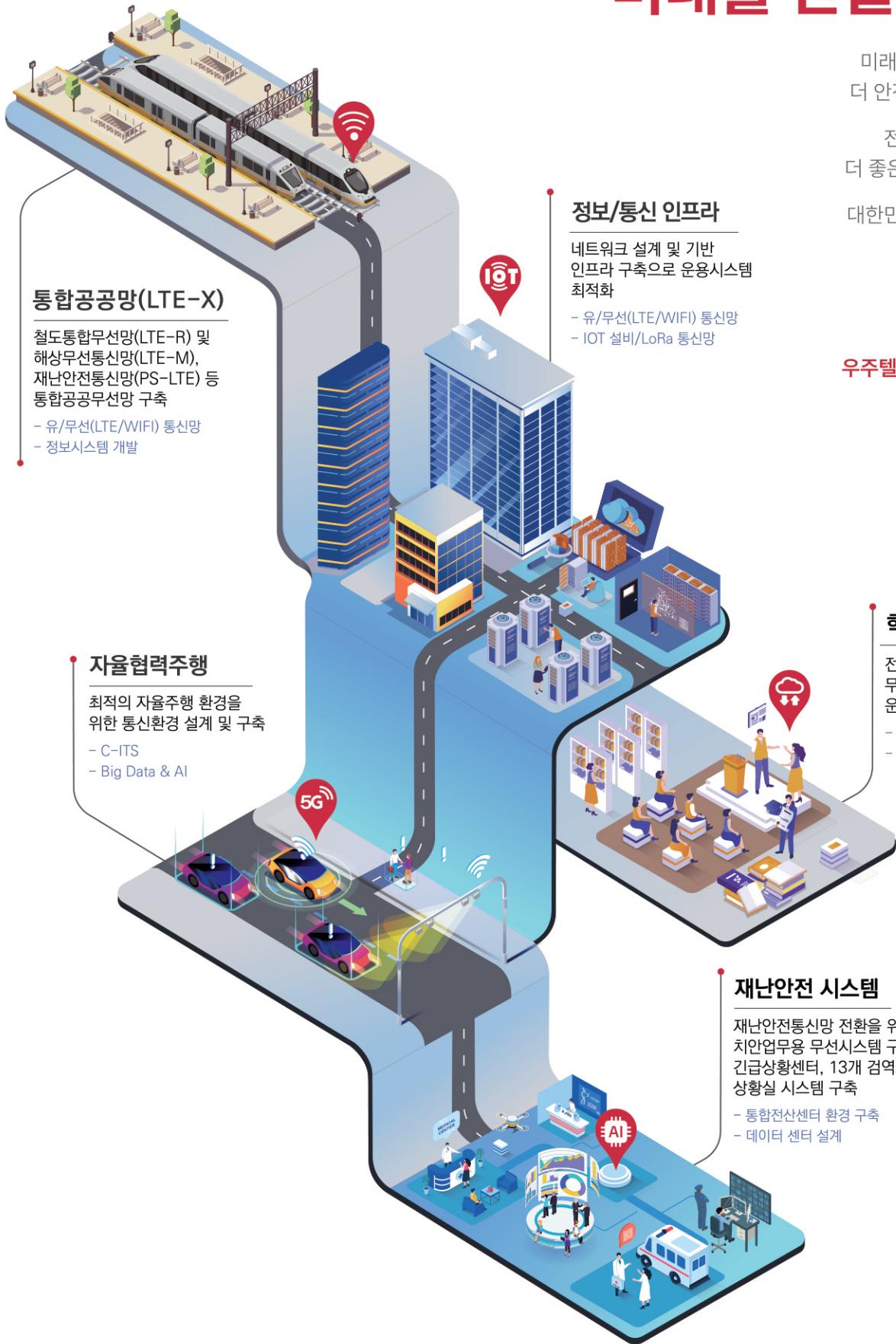
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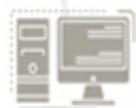
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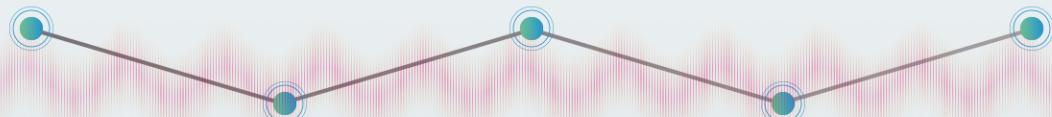
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정보시스템

통합플랫폼을 기반으로 고객 맞춤형 정보시스템을 개발·제공합니다.

교통시스템

도로, 항공, 해상 등에 이르는 다양한 분야의 교통시스템을 제공합니다.

스마트시티

IT 기술을 기반으로 도시 전반의 영역 융합 및 안전하고 지능적인 스마트도시를 만들어 갑니다.

영상시스템

CCTV영상 모니터링 및 관련기관과 연계하여 시민의 안전확보를 최우선으로 합니다.

재난시스템

신속하고 정확한 정보수집과 상황판단으로 재난현장 컨트롤타워 기능을 수행합니다.

환경에너지

급격히 팽창할 미래산업으로 신재생에너지 사용을 활성화하여 에너지 공급 및 탄소배출저감 정책에 앞장 섭니다.

IT아웃소싱

각종 교통시스템, IT인프라 등 다양한 산업 분야의 정보시스템 설비를 운영·유지관리를 합니다.



모두가 행복한 ICT 세상!

풍요롭고 행복한 세상을 만드는 ICT기업

대보정보통신

IT컨설팅에서 시스템 통합(SI) 및 유지관리(SM)까지 고객이 필요로 하는 최적화된 솔루션과 서비스로 고객의 성공비즈니스를 만들어 갑니다.



System Integration

최적화된 시스템을 구축합니다.

Industry Solution (전자정부, 공공, 공항, 국방, 교육 등) /
Ubiquitous Solution (U-City, ITS 등) / Network Intergration

System Management

IT시스템의 효율을 극대화합니다.

IT Outsourcing (시스템, 데이터센터, 보안서비스) / ITS 운영관리 /
장대터널 운영관리

Solutions

한발 앞선 솔루션을 제공합니다.

ITS기반 솔루션 / Smart Highway / 데이터 분석 / 검색엔진 / 보안 /
Mobile App / U-BIZ / Hi-pass



고객이 신뢰하는 기업!
존재와 가치가 살아 숨쉬는 기업!
사람을 위해 노력하는 믿음의 기업!

풍부한 경험과 오랜 기간 축적된 기술력을 바탕으로
ICT기반의 정보통신망 설계/컨설팅/구축/유지보수, 고객
맞춤형 솔루션, 기업 모바일, Public/Private 클라우드 서비스,
빅데이터 기반의 차량정보 플랫폼개발, 상품 유통 등
Total IT 전문 기업으로 역할을 수행하고 있습니다.

고객을 최우선으로 생각하는 사용자 중심의 파트너로,
사람과 기술을 연결하는 ICT 분야를 선도하는 기업으로,
새로운 가치를 창출하며 함께 성장해 나가도록 하겠습니다.



>> 주요사업 <<



IT장비 임대사업

- 네트워크, 보안, 솔루션



모바일사업

- 스마트폰/IoT개통



통신화선사업

- 전송 - VPN - Flexline



차량정보화플랫폼사업

- 업무용 차량 공유·관리 서비스
- eTAS 대행 제출·차량관제 서비스



네트워크/정보보안사업

- 네트워크 - 무선랜 - 정보보안
- 현장설치관리서비스



e-커머스사업

- 상품유통 - 브랜드사업 - e-DAS



클라우드사업

- xTrain Cloud - Private Cloud
- 매니지드 서비스



공사업

- 정보통신공사 - 전기공사
- 소방시설공사



솔루션사업

- 이더넷스위치 - 팀즈보이스 - 통화솔루션
- 페이퍼리스 - mVoIP - 네트워크선별장관리



유지보수사업

- 유지보수 상주 - IDC 운영 - 원격관제

주식회사 진인프라

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홈페이지 www.jininfra.com



고객을 최우선으로 생각하고
함께 노력하고 성장하는
태진T&S는 항상 곁에 있습니다.



x86 서버
생산 및 연구개발



클라우드시스템
구축 및 서비스



통합운영 및
유지관리



정보시스템 구축
및 서비스



데이터센터
컨설팅



|주|태진티엔에스

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