JAIST-Thai Symposium 2024

Toward Next Generation
Generative AI and Beyond

September 11-13 2024

Abstract Book

JAIST-Thai Symposium 2024:
Toward Next Generation Generative AI and Beyond

September 11-13, 2024

Hybrid Conference

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KS Lecture Hall
Japan Advanced Institute of Science and Technology

&

WebEx online meeting

Symposium Homepage:

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Introduction

Over the past decades, JAIST has actively engaged in joint research and various exchange programs with universities in Thailand, leading to a strong foundation of collaboration and innovation. Notable efforts include symposiums and workshops such as IWAM 2022, organized in partnership with Mahidol University, and the JAIST-CU Forum 2023 with Chulalongkorn University. Our partnership with Thammasat University (SIIT) has also culminated in the establishment of a dual degree program, further enhancing our collaborative research capabilities.

Building on this success, we are now focused on launching a new series of symposiums called the JAIST-Thai Symposium. This initiative aims to build upon our strong international cooperation and technological expertise between JAIST and Thai universities. By bringing together leading researchers, the symposium will create a dynamic environment that encourages the exchange of ideas and drives groundbreaking research across various fields.

This year, we focus on "Generative AI and Beyond," a widely discussed topic within global research communities. Additionally, the symposium will feature a student workshop highlighting the work of Thai students who have studied, interned, or visited JAIST. These students will present their collaborative research projects, providing a valuable platform to share their findings with our research community. This workshop not only showcases the success of our collaborative efforts between JAIST and Thai universities but also reflects our commitment to nurturing the next generation of researchers.

Natthawut Kertkeidkachorn
School of Information Science,
Japan Advanced Institute of Science and Technology (JAIST)
Organizer of JAIST-Thai Symposium 2024

Welcome Message from Prof. Kiyofumi Tanaka
Dean of School of Information Science
Japan Advanced Institute of Science and Technology

Greetings and Welcome,

It is with great pleasure that I extend my warmest welcome to all participants in the JAIST-Thai Symposium 2024. On this occasion, we have gathered to celebrate our achievements and foster deeper collaboration for future innovation and shared success. Collaboration with top universities in Thailand, Chulalongkorn University, Mahidol University, and Thammasat University, is highly meaningful for JAIST.

For years, JAIST has had the privilege of hosting and educating students from the esteemed Thai universities. The collaboration between universities has not only strengthened our academic ties but has also fostered cultural exchange and mutual understanding, which are invaluable in today's interconnected world.

This symposium represents a significant milestone in our ongoing collaboration. It offers a unique opportunity for us to engage with our cutting-edge research and share insights that will undoubtedly contribute to the advancement of our respective fields. The exchange of knowledge and ideas between the universities is not only a testament to our strong partnership but also a source of inspiration and progress for all involved.

I would like to express my deepest gratitude to our Thai colleagues for their participation and to the organizing committee for their efforts in making this event possible. Their dedication and commitment to academic excellence are deeply appreciated.

As we embark on this symposium, I encourage all participants to take full advantage of this opportunity to engage in meaningful discussions, explore new research frontiers, and strengthen our collaborative ties. Together, we can continue to build on the success of our partnership and drive innovation in our fields of study.

Sincerely,
Kiyofumi Tanaka
Dean, School of Information Science,
Japan Advanced Institute of Science and Technology (JAIST)

Program

September 11, 2024		
Japan Time (Thailand Time)	**Event**	**Speakers****
13:30 - 14:00 (11:30 - 12:00)	Opening Remarks	Prof. Kiyofumi Tanaka (JAIST), Representatives from Chulalongkorn University (CU), Mahidol University (MU), and Thammasat University (TU)
14:00 - 15:00 (12:00 - 13:00)	JAIST Introduction and Exchange Program (Senior Lecturer Natthawut Kertkeidkachorn, JAIST)	
15:00 - 17:00 (13:00 - 15:00)	**Session 1:** Natural Language Processing and Speech Processing	Prof. Masashi Unoki (JAIST) Asst. Prof. Ekapol Chuangsuwanich (CU) Asst. Prof. Thanapon Noraset (MU) Assoc. Prof. Naoya Inoue (JAIST)
September 12, 2024		
09:30 - 11:30 (07:30 - 09:30)	**Session 2:** Machine Learning and Knowledge Representation	Assoc. Prof. Krung Sinapiromsaran (CU) Sr. Lecturer Teeradaj Racharak (JAIST) Dr. Akkharawoot Takhom (TU) Sr. Lecturer Natthawut Kertkeidkachorn (JAIST)
11:30 - 13:00 (09:30 - 11:00)	Lunch Seminar Location: IS 8F Seminar Room	
13:30 - 15:30 (11:30 - 13:30)	**Session 3:** AI in Practice	Assoc. Prof. Shogo Okada (JAIST) Assoc. Prof. Peerapon Vateekul (CU) Prof. Shinobu Hasegawa (JAIST) Dr. Sumeth Yuenyong (MU)
15:30 - 17:30 (13:30 - 15:30)	JAIST-Thailand Collaboration Discussion	
September 13, 2024		
09:30 - 12:00 (07:30 - 10:00)	**Session 4:** AI and Software Engineering	Prof. Toshiaki Aoki (JAIST) Asst. Prof. Arthorn Luangsodsai (CU) Assoc. Prof. Haoran Xie (JAIST) Assoc. Prof. Daisuke Ishii (JAIST) Asst. Prof. Apichon Witayangkurn (TU)
12:00 - 13:30 (10:00 - 11:30)	Lunch Seminar Location: KS Colaboration Room 2	
13:30 - 17:30 (11:30 - 15:30)	JAIST-Thailand Student Workshop	
17:30 - 17:45 (15:30 - 15:45)	Closing Remarks	

****Remarks:** The order of speakers will follow the provided list, with each speaker allocated 30 minutes for their presentation including Q&A.

JAIST-Thailand Student Workshop Program

September 13, 2024		
Japan Time (Thailand Time)	**Presenter**	**Title**
13:30-13:50 (11:30-11:50)	Thus Karnjanapatchara	Incremental Multimodal Sentiment Analysis for HAIs Based on Multitask Active Learning with Interannotator Agreement
13:50- 14:10 (11:50 - 12:10)	Phichaphop Raqsaboon	Predicting Gas Chromatographic Retention Indices Using Graph Neural Networks
14:10 - 14:30 (12:10 - 12:30)	Thin Praphong	KG-RAG: Constructing Knowledge Graphs with Retrieval-Augmented Large Language Models
14:30 - 14:50 (12:30 - 12:50)	Thiti Phuamas	Leveraging Prompt Tuning in Large Language Models for Term Typing
14:50- 15:10 (12:50 - 13:10)	Chommakorn Sontesadisai	PromptOps: Test-driven Development for Enhancing Prompt Engineering
15:10 - 15:30 (13:10 - 13:30)	Buntita Sriarunothai	Bridging Gaps between Scenario-Based Safety Analysis and Simulation-based Testing for Autonomous Driving Systems
15:30 - 15:50 (13:30 - 13:50)	Vidchaphol Sookplang	Human-in-the-Loop for Machine Learning in Offensive Cybersecurity
15:50- 16:10 (13:50 - 14:10)	Suyee Mon	Solving an Industrial-Scale Bus Route Finding in Public Transport Network using Modular Answer Set Programming
16:10 - 16:30 (14:10 - 14:30)	Pachara Wongthanakarn	Semantic-based Metric for Evaluating Ontological Embedding
16:30 - 16:50 (14:30 - 14:50)	Chavakan Yimmark	Are Embeddings All We Need for Knowledge Base Completion? Insights from Description Logicians
16:50 - 17:10 (14:50 - 15:10)	Phuriwat Angkoondittaphong	Finding Semantic-preserved Representation of Knowledge in Description Logic Ontologies: Preliminary Results in RiceDO and TreatO
17:10 - 17:30 (15:10 – 15:30)	Aran Chindaudom	Adversarial Patches

Remarks: Each presenter has a 20-minute presentation, including Q&A.

Abstract

Invited Talk Session 1: Natural Language Processing and Speech Processing

Deepfake Speech Detection: Approaches from Acoustic Features Related to Auditory Perception to DNNs

Masashi Unoki
Graduate School of Advanced Science and Technology,
Japan Advanced Institute of Science and Technology, Japan

Abstract

Skillfully fabricated artificial replicas of authentic media using advanced AI-based generators are known as “deepfakes.” Deepfakes have become a growing concern due to their increased distribution in cyber-physical spaces. Deepfake speech, which is fabricated by using advanced AI-based speech analysis/synthesis techniques, can be abused for spoofing and tampering with authentic speech signals. This can enable attackers to commit serious offenses such as fraud by voice impersonation and unauthorized speaker verification. Our research project aims to construct the basis of auditory-media signal processing for defending against deepfake speech attacks. To this end, we introduce current challenges and state-of-the-art techniques for deepfake speech detection and examine current trends and remaining issues. We then introduce the basis of the acoustical features related to auditory perception and pro- pose methods for detecting deepfake speech based on auditory-media signal processing consisting of these features and deep neural networks (DNNs).

Diffusion-based speech enhancement and anti-spoofing applications

Ekapol Chuangsuwanich
Department of Computer Engineering, Faculty of Engineering,
Chulalongkorn University, Thailand

Abstract

Diffusion modeling has shown promising results in many applications such as image generation, planning, and speech enhancement. However, it suffers from a slower inference time due to the amount of diffusion steps required. In the first part of the talk, we will discuss a hybrid diffusion-regression model that utilizes the Brownian bridge process in order to reduce the amount of diffusion steps. Experiments have shown that our method can perform competitively despite employing only one reverse diffusion step. The second part of the talk will discuss our lab's efforts in speaker verification and anti-spoofing tasks. We will also discuss how we are using our enhancement models to amplify artifacts in synthesized speech in order to better perform anti-spoofing.

Downstream Performance of Social Media Mining Using Text Classification

Thanapon Noraset
Faculty of Information And Communication Technology,
Mahidol University, Thailand

Abstract

We primarily use text to communicate over the Internet, mainly social media websites. Mining valuable insight from these websites often involves text classification, such as topic classification and sentiment analysis. While most researchers focus on building accurate text classification models, the downstream performance of these models receives minimum attention. This talk will present the downstream impact of text classification in healthcare and social science fields. The talk will show that the aggregate statistics of models' predictions correlate with real-world statistics in national mental health, crime rates, and economic variables. The talk will also highlight the cross-lingual ability of the (small) pre-trained language models to overcome the challenges of the limited training data. An overview of other research directions in our lab will conclude the talk.

Towards Trustworthy NLP: Understanding the Behaviour and Internal Workings of Large Language Models

Naoya Inoue
Graduate School of Advanced Science and Technology,
Japan Advanced Institute of Science and Technology, Japan

Abstract

Large Language Models (LLMs) have become core technologies in Artificial Intelligence, widely used across various applications. Despite their widespread success, a deep understanding of LLMs is still developing, and challenges such as trustworthiness persist. To address these issues, our research lab is conducting a broad range of studies aimed at understanding the behavior and inner mechanisms of LLMs. Our focus areas include in-context learning, vision-LLMs, belief management, self-awareness, multi-hop reasoning, and argumentation. This talk will briefly review our ongoing research projects and explore opportunities for collaboration.

Invited Talk Session 2: Machine Learning and Knowledge Representation

Investigation into the application of deep learning techniques for the development of an optimization solver

Krung Sinapiromsaran
Department of Mathematics and Computer Science, Faculty of Science,
Chulalongkorn University, Thailand

Abstract

This research explores the application of deep learning to revolutionize optimization problem solving. Traditional optimization methods, such as simplex and interior point methods, rely on iterative processes to converge to optimal solutions. While directly predicting optimal values using deep learning may be challenging, this study demonstrates the feasibility of identifying optimal basis. By harnessing the power of deep neural networks to learn complex patterns from data, we propose a novel approach that bypasses the need for iterative optimization. Initial results on synthetic linear programming problems indicate the promise of this paradigm shift in optimization solver design.

Towards Trustworthiness in Artificial Intelligence

Teeradaj Racharak
Graduate School of Advanced Science and Technology,
Japan Advanced Institute of Science and Technology, Japan

Abstract

Trustworthy AI is not a new topic. The earliest work on Trustworthy AI could be found in the literature published 60 years ago, where expert systems explained their results via the applied rules or by backtracking the reasoning. Since AI research began, scientists have argued that intelligent systems should explain the AI results, mostly when it comes to decisions. In this talk, I begin from knowledge representation formalisms in AI, and traditional machine learning approaches to the latest progress in the context of modern deep learning, and then describe the major research areas and the state-of-the-art approaches in recent years. Three main topics will be covered in this talk: (1) trustworthiness in logic-based AI, (2) trustworthiness in machine learning, and (3) trustworthiness in hybrid AI that synergizes logic with machine learning. The lecture ends with some demonstrations of my current attempts in this line of research as well as a discussion on challenges and future directions.

Collaborative Frameworks for Knowledge Graph Construction: Advancing AI through KGE and RAG

Akkharawoot Takhom
Faculty of Engineering, Thammasat School of Engineering,
Thammasat University, Thailand

Abstract

This research develops collaborative frameworks to advance ontology creation, integrating Knowledge Graph Construction (KGC), Knowledge Graph Embedding (KGE), and Retrieval-Augmented Generation (RAG) for enhanced domain-specific knowledge extraction and application. Central to our approach is the use of Scrum-inspired frameworks, which streamline the ontology development process and ensure the integration of KGC, KGE, and RAG technologies. We implemented these frameworks in three key areas: a Scrum-based KGC framework for the Buddha-Image Domain, KGE methods in Thailand's Program Management Unit on Area-Based Development (PMUA), and RAG with Named Entity Recognition (NER) and Large Language Models (LLMs) in dental literature analysis. Our findings demonstrate significant advancements in ontology creation, with improved accuracy and efficiency in knowledge extraction and strengthened connectivity in domain-specific research. This research highlights the effectiveness of merging software and knowledge engineering principles to develop robust and functional knowledge frameworks, contributing to the broader field of Artificial Intelligence.

Knowledge Graph Construction and its Application

Natthawut Kertkeidkachorn
Graduate School of Advanced Science and Technology,
Japan Advanced Institute of Science and Technology, Japan

Abstract

Knowledge Graph Construction is to convert unstructured data into structured data that captures and represents the relationships among various entities across different resources. This structured representation is essential for improving data integration, enabling more efficient search and information retrieval, and supporting advanced analytics and machine learning by providing a rich, interconnected data source. In this talk, we will introduce two primary paradigms of knowledge graph construction: 1) leveraging external resources and 2) utilizing internal resources. Additionally, we will address the current challenges in knowledge graph construction, such as data quality issues, scalability, integration of heterogeneous data sources, and the ongoing evolution of knowledge. We will also discuss emerging trends in the field. Drawing from our recent work, we will share key insights gained from developing and deploying knowledge graphs. Furthermore, we will present practical applications of knowledge graphs within the finance domain.

Invited Talk Session 3:
AI in Practice

Progress and Challenges of Multimodal Interaction Research

Shogo Okada
Graduate School of Advanced Science and Technology,
Japan Advanced Institute of Science and Technology, Japan

Abstract

This talk introduces the progress of the research of multimodal interaction, including nonverbal behavior and language, observed in human-human, and human-machine (system/robot) interactions. This talk also covers a wide range of research cases related to multimodal interaction modeling, which estimates individual characteristics such as internal states (emotion and sentiment), cognitive states, communication skills, and personality traits. The potential applications and challenges of this technology will also be discussed.

Practical AI Applications: Transforming Healthcare, Transportation, and Hydrometeorology

Peerapon Vateekul
Department of Computer Engineering, Faculty of Engineering,
Chulalongkorn University, Thailand

Abstract

In recent years, AI techniques have advanced rapidly, with significant breakthroughs in deep learning and generative AI. This talk will showcase various real-world applications of these cutting-edge AI technologies. In the healthcare sector, for instance, AI assists endoscopists in real-time detection of gastric intestinal metaplasia (GIM), a type of stomach anomaly. Additionally, AI enables the automatic reconstruction of skull implants from CT scans in mere seconds, streamlining the work of design engineers. Federated learning has also emerged as a practical solution to challenges related to data privacy and distributed data. Beyond healthcare, AI applications extend to other fields as well, such as enabling real-time panoptic segmentation networks to help autonomous vehicles understand their surroundings and aiding in sub-seasonal forecasting to predict precipitation for the next 2-6 weeks.

Applications for Generative AIs in Education/Learning Technology

Shinobu Hasegawa
Graduate School of Advanced Science and Technology,
Japan Advanced Institute of Science and Technology, Japan

Abstract

This presentation introduces the concept of education/learning technology research applying Generative Artificial Intelligence (AI) to realize sustainable education and learning, comparing human learning methods with machine learning methods. In particular, based on the speaker's research areas of individual optimization of distance lectures and adaptive learning support, we would like to discuss a new teaching and learning environment based on educational Digital Transformation (DX).

OpenThaiGPT: Building a Thai LLM - Lessons Learned

Sumeth Yuenyong
Department of Computer Engineering, Faculty of Engineering,
Mahidol University

Abstract

This talk presents the research and development process of OpenThaiGPT, an open-source Large Language Model (LLM) designed specifically for Thai users. While proprietary models like ChatGPT support multiple languages, they are often limited to API access, raising concerns about data privacy, legal compliance, and cost. OpenThaiGPT aims to address these issues by providing a customizable, self-hostable alternative. We explore the challenges faced in creating a Thai-focused LLM, including:

1. The performance gap between open-source and proprietary models, particularly for non-English languages
2. The importance of cultural and social context in language processing

Our discussion covers the entire development pipeline: Data gathering and cleaning, Model training, and Deployment. By sharing our experiences and lessons learned, we hope to contribute valuable insights for developing open-source LLMs in other languages, ultimately promoting linguistic diversity in AI technologies.

Invited Talk Session 4:
AI and Software Engineering

Verification of Autonomous Driving AI

Toshiaki Aoki
Graduate School of Advanced Science and Technology,
Japan Advanced Institute of Science and Technology, Japan

Abstract

Our research is centered on the practical application of formal methods to automotive systems, with a specific focus on the AI components that drive perception and planning in autonomous vehicles. Building on our successful application of formal methods to automotive operating systems like OSEK/VDX, Classic AUTOSAR, and Adaptive AUTOSAR OSs, we are now extending our efforts to more advanced platforms, particularly those for autonomous driving systems. Modern automotive systems rely heavily on AI for tasks such as perception and planning, which are crucial for the safe operation of autonomous driving. These systems integrate AI with control mechanisms and high-performance computing infrastructures. Recognizing the critical role of AI in these systems, we have been awarded a national project under JST/CREST titled "Formal Methods and Verification Tools for Next-generation Automotive System Platforms". This project aims to develop formal methods and verification tools to ensure the safety and reliability of next-generation automotive system platforms. These tools are specifically designed to address AI-driven perception, planning, and control functions, with a strong emphasis on their practical application to real-world systems. In this talk, I will present an overview of the JST/CREST project, focusing on the challenges involved in the verification of autonomous driving AI.

Large Language Model based Software Engineering: Research Problems

Arthorn Luangsodsai
Department of Mathematics and Computer Science, Faculty of Science,
Chulalongkorn University

Abstract

The talk will present the survey of Large Language Model for software engineering and present open research problems for the application of Large Language Model to software engineers.

Designing Complex Fluids with Generative AI Models

Haoran Xie
Graduate School of Advanced Science and Technology,
Japan Advanced Institute of Science and Technology

Abstract

It is always a challenging topic to design and control intricate media content to meet the requirements of users' intentions, such as complex fluids. This talk introduces our recent works for fluid design systems using generative AI models from our research group, including GANs and diffusion models using user sketches for conditional generations.

SMT-Based Model Checking of Industrial Simulink Models

Daisuke Ishii
Graduate School of Advanced Science and Technology,
Japan Advanced Institute of Science and Technology

Abstract

The development of embedded systems requires formal analysis of models such as those described with MATLAB/Simulink. However, the increasing complexity of models makes analysis difficult. This talk introduces a model checking method for Simulink models using SMT solvers. Our proposed method aims at (1) automated, efficient and comprehensible verification of complex models, (2) numerically accurate analysis of models, and (3) demonstrating the analysis of Simulink models using an SMT solver (we use Z3). Experimental results against industrial examples will be given. We compare the efficiency and effectiveness of our method with other tools and present the state-of-the-art in the field.

AI for Remote Sensing and GIS Applications: Innovation and Future

Apichon Witayangkurn
Sirindhorn International Institute of Technology,
Thammasat University

Abstract

Artificial Intelligence (AI) is causing a transformative shift in remote sensing and Geographic Information Systems (GIS) by improving data analysis, automation, and decision-making processes. The combination of AI with satellite imagery, aerial surveys, and geospatial data is enhancing the accuracy, efficiency, and scalability of various applications, from environmental monitoring to urban planning. In this talk, I will emphasize the pivotal role of AI in addressing complex global challenges and revolutionizing our understanding and management of the world. Additionally, I will showcase several real-world use cases.

JAIST-Thailand Student Workshop 2024

Incremental Multimodal Sentiment Analysis for HAIs Based on Multitask Active Learning with Interannotator Agreement

Thus Karnjanapatchara
Japan Advanced Institute of Science and Technology

Abstract

Multimodal sentiment analysis (MSA) is critical in developing empathetic and adaptive multimodal dialogue systems or conversational agents that can naturally interact with users by recognizing sentiment and engagement. Addressing the challenges of collecting labeled data for MSA in human–agent interaction (HAI), this study introduces an innovative approach that combines active learning and multitask learning. Our efficient sentiment recognition model leverages active learning to select informative data for learning models, significantly reducing the labor-intensive data labeling process. Furthermore, we employ multitask learning to improve annotation (label) quality by evaluating alignment with true labels and interannotator agreement, thus enhancing the reliability of sentiment annotations. We evaluate the proposed multitask and active learning methods via a human–agent multimodal dialogue dataset that includes various types of sentiment annotations, which are publicly available. The experimental results demonstrate that by learning to predict the agreement score, multitask learning becomes better than single task learning at capturing the uncertainties in the data. This study lays the groundwork for incremental learning strategies in MSA, aiming to adaptively understand user sentiments in human–agent interactions.

Predicting Gas Chromatographic Retention Indices Using Graph Neural Networks

Phichaphop Raqsaboon
Chulalongkorn University

Abstract

Gas chromatography (GC) is an important analytical technique used for the separation and identification of chemical compounds in diverse fields. The retention index (RI), a measure of the time it takes for compounds to traverse the chromatographic column, plays a crucial role in identifying unknown compounds. In this study, we explore the use of Graph Neural Networks (GNNs) to predict the retention indices of chemical compounds. GNNs leverage graph-structured data to capture the intricate molecular interactions, making them well-suited for this application. We evaluated several models, including a baseline Convolutional Neural Network (CNN), a Graph Convolutional Network (GCN), and the more advanced Path-Augmented Graph Transformer Network (PAGTN). The PAGTN, which augments molecular graphs with long-range atom paths and employs an attention mechanism, showed the most promise, achieving a significant reduction in prediction error compared to other models. These findings suggest that advanced GNN architectures could greatly enhance the accuracy of RI predictions. Future work will focus on refining these models and exploring their application to more complex two-dimensional gas chromatography (GCxGC) scenarios.

KG-RAG: Constructing Knowledge Graphs with Retrieval-Augmented Large Language Models

Thin Praphong
Chiang Mai University

Abstract

The development of Knowledge Graphs (KGs) is crucial for representing complex relationships across various domains, enhancing tasks like information retrieval and semantic search. Recent advances leverage Large Language Models (LLMs) to improve KG creation, such as the LLMKE pipeline, which integrates knowledge extraction with Wikidata entity mapping. However, LLMKE's focus on extracting data from limited sections of Wikipedia can result in incomplete knowledge representation. To address this, we propose Knowledge Graph Construction using Retrieval-Augmented Generation (KG-RAG), a method that utilizes web scraping and extends content retrieval to linked pages, combined with LLMs and cosine similarity for filtering relevant information. Evaluated on ISWC 2024 LM-KBC Challenge datasets, our approach achieved macro-average F1-scores of 0.695 and 0.698 on validation and test sets, respectively.

Leveraging Prompt Tuning in Large Language Models for Term Typing

Thiti Phuamas
Chiang Mai University

Abstract

A Term Typing task is a task to assign specific types or categories to terms within an ontology, ensuring that each term is accurately defined and properly placed within the hierarchical structure to facilitate consistent data interpretation and reasoning. Its objective is to provide a clear and unambiguous definition of each concept, allowing for consistent interpretation and use across various domains and applications. In this paper, we describe the design of our system for the Term Typing task, which leverages automated prompt generation through soft prompts to improve the accuracy and efficiency of term typing. Our experiments were conducted on various datasets, including WordNet, UMLS, GeoNames, NCI, MEDCIN, and SNOMEDCT_US. While our approach surpassed baseline methods on most datasets, it encountered difficulties with GeoNames due to the domain's complexity and specificity, leading to significantly lower scores. We also present the overall outcomes of our approach in this challenge, emphasizing its potential while identifying areas for further refinement.

PromptOps: Test-driven Development for Enhancing Prompt Engineering

Chommakorn Sontesadisai
Mahidol University

Abstract

While held-out accuracy has traditionally been the main method for assessing generalization, it often exaggerates the performance of NLP models. Alternative evaluation methods typically concentrate on specific tasks or behaviors. Inspired by test-driven development in software engineering, we present PromptOps, a task-agnostic framework for testing prompt-based NLP tasks. PromptOps features a matrix of general linguistic capabilities and test types that support thorough test ideation. We also develop a set of PromptOps APIs that allow for the rapid creation of a wide variety of test cases. We demonstrate the effectiveness of PromptOps through tests on two well-known tasks: sentiment analysis and question answering, uncovering significant flaws in the test prompt-based models.

Bridging Gaps between Scenario-Based Safety Analysis and Simulation-based Testing for Autonomous Driving Systems

Buntita Sriarunothai
Chulalongkorn University

Abstract

This study explores simulation-based testing of Autoware, an open-source autonomous driving system, using scenario-based safety analysis. We utilized the AWSIM-Labs simulator to test Autoware in specific scenarios obtained as the result of the scenario-based safety analysis. The results demonstrate the feasibility of the simulation-based testing based on the scenarios for safety evaluation. We identified gaps between the scenario-based safety analysis and simulation results, as well as key challenges in bridging these gaps.

Human-in-the-Loop for Machine Learning in Offensive Cybersecurity

Vidchaphol Sookplang
Mahidol University

Abstract

Penetration testing is one of the methods that is used to find the exploitable vulnerabilities so that we are able to fix those vulnerabilities. Intrusion detection system is one of the defensive systems that needs to be improved all the time to prevent the intruders or the cyber criminals from bypassing the detection system and stealing important and valuable information or data. Nowadays, there are automation tools that are used to support the adversarial attack on intrusion detection systems. However, those tools may have some errors that, even if they can not be detected by intrusion detection systems, they can be seen by human experts. Including the human experts in the development of the tool therefore is a way to improve the attack performance and decrease the errors of the tool. In this study, we developed a model that mimics normal traffic behavior while also being capable of evading existing detection systems, with human expert assistance to improve the performance. The result of the experiment shows that the model successfully decreases the detection rate and the performance of the attack is up to the attack types. Moreover, with the help from the expert in developing the model and in the attack process, the errors in the tool are reduced and the performance of the attack is increased.

Solving an Industrial-Scale Bus Route Finding in Public Transport Network using Modular Answer Set Programming

Suyee Mon
King Mongkut's Institute of Technology Ladkrabang

Abstract

Finding user-satisfied bus routes subject to the minimal travel time and the number of route transfers is a challenging problem in transportation networks. In our context, bus routes and bus stations form a directed graph. Thus, a solution to finding the user-satisfied bus routes is a route path between two given stations satisfying a collection of different user's constraints. While this problem could be related to existing research, such as, the study of graph traversal and path finding algorithms. We show that our problem is more suited to formalizing the navigation system in terms of an answer set programming (ASP) rather than solving the more common graph traversal problems such as the well-known Dijkstra's algorithm, which only provides a statically single solution with lowest cost. An empirical evaluation on a real-world bus network shows how well our ASP encoding works in producing a wide range of high-quality solutions that explore the trade-off between the two optimization criteria, all the while keeping Dijkstra's result as a point of comparison. The findings show promise for extending to richer transit representations and optimization objectives beyond the two considered here.

Semantic-based Metric for Evaluating Ontological Embedding

Pachara Wongthanakarn
Thammasat University

Abstract

Despite the growing trend of generating embeddings for mainly unstructured data and, more recently, for structured data, there is still no comprehensive suite for assessing the quality of these embeddings. This gap is particularly noticeable for embeddings generated from structured data, as there are no well-defined evaluation metrics that measure both the quality of the encoded structure and the semantic patterns within the embedding space. In this work, we discuss our preliminary analysis that discusses an important aspect called "concept subsumption" of any description logic-based ontology. We propose an intrinsic metric for evaluating embedding quality. Several experimental studies were conducted to compare the quality of existing embedding models.

Are Embeddings All We Need for Knowledge Base Completion? Insights from Description Logicians

Chavakan Yimmark
Mahidol University

Abstract

Description Logic knowledge bases (KBs), i.e., ontologies, are often greatly incomplete, necessitating a demand for KB completion. Promising approaches to this aim are to embed KB elements such as classes, properties, and logical axioms into a low-dimensional vector space and find missing elements by statistically inferencing on the latent representation. These approaches make inference based solely on existing facts in KBs and the likelihood of KB completion with implicit (duplicated) facts could be high, making the performance of KB embedding models questionable. Thus, it is essential for the KB completion's procedure to prevent completing KBs by implicit facts. In this paper, we present a new perspective of this problem based on the logical constructs in description logic and originally introduce a novel 'implementation recipe' for KB completion operations called KBCOps. Our findings exhibit KB completion with fact duplication when using state-of-the-art KB embedding algorithms.

Finding Semantic-preserved Representation of Knowledge in Description Logic Ontologies: Preliminary Results in RiceDO and TreatO

Phuriwat Angkoondittaphong
Mahidol University

Abstract

In recent years, there has been a notable increase in new approaches to vector embeddings of symbolic knowledge bases (KBs), primarily aimed at KB completion or logical inferencing to answer reasoning queries. Despite variations in the specifics, these methods generally follow a similar high-level process: a symbolic KB is ingested and embedded into a vector space using a neural network, and logical queries are then translated into score-based algebraic operations within this vector space. While these neural approaches are more resilient to input noise compared to purely symbolic logic frameworks, they have a significant drawback -- they do not guarantee that the embeddings preserve the logical structure and the descriptive semantics given in the ontology. Some of these neural methods only capture the logical structure in the ABox but and not in the TBox, while others that attempt to maintain the TBox structure produce embeddings with a logical structure that is inherently unsound. In this study, we investigate such a problem of representation learning ranging from Quantum Logic-inspired embedding to conventional knowledge graph embedding on two well-defined description logic EL ontologies named RiceDO and TreatO.

Adversarial Patches

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Abstract

Adversarial Patches were introduced as a form of physical Adversarial Examples, an effective attack method against current state-of-the-art deep convolutional neural networks (CNN) image recognition models. The patterns on Adversarial Patches are designed to be independent of the target scenes, so they could be utilized without prior knowledge of lighting conditions, camera angles, or other objects in the target scenes. The talk frames Adversarial Patches through three fundamental questions: Where do they come from? What are they? Where do they go from here?