第 29 回博士後期課程学生発表会・アブストラクト集
The 29th Doctoral Program Student Presentation: Abstracts

2023 年 7 月 14 日（Friday）13：00 開始
Google Meet にてオンライン開催

はじめに

博士後期課程発表会は、博士後期課程の学生が日頃の研究の成果を発表するために催されるものです。今回の発表会は、3 つのセッションから構成され、1 セッションにつき 4－5 名の登壇者が発表を行います。情報科学の最先端はこの発表会に集約されるものと信じています。

今回の発表会も前回の発表会と同じく Google Meet を用いて、オンラインでの開催となります。当日はネット環境や音声関連で様々なトラブルが予想されます。皆様のご協力が必要となる場合もございますので、その際はよろしくお願い申し上げます。

今回、以前の対面での発表会で行われていた「討論者制」は休止としますが、「ベストプレゼンテーション賞」は継続します。ベストプレゼンテーション賞とは、聴衆に対して「自身の研究の内容をわかりやすく、おもしろく伝えられたか」の観点からセッション毎に聴衆の投票で決定されます。投票は、セッション終了後の休憩中（10 分間）に Google Forms にて行っていただきます。

最後に、発表者以外の多くの方の参加をお待ちしております。当日までに、事務から発表会招待メールを全教員全学生に送らせていただきますので、是非最先端の研究発表をお聞きください！もちろん、参加だけでなく、発表に対する質問やコメントもお待ちしております。皆さんで議論を活発化させ、発表会を盛り上げましょう。

Introduction

The Doctoral Program Student Presentation is held for the students in the doctoral program to present their research. This presentation program consists of 3 sessions, with 4–5 speakers per session. Certainly, this presentation represents the forefront of information science, compiling cutting-edge advancements. Following our previous program, we will hold this presentation virtually via Google Meet. We might have some technical problems due to the internet connection and sound quality. We expect your cooperation and would appreciate your support.

The “designated discussant” system will be again temporarily suspended; however, the “Best Presentation Award” system will continue. This award is determined by the audience's votes, based on the criteria of whether the research content is effectively and engagingly conveyed. Since we cannot vote using paper this time, it will be conducted online during the break (10 min.) between each session.

Finally, we look forward to seeing participants in addition to the presenters. Unlike the traditional offline program, this event does not require the participants to physically come to the venue. It is possible to join the presentation anytime, anywhere. By the day of the event, the office will circulate an invitation email to all the GSIS faculty members and students. Please participate in and listen to the presentation of the state-of-art research! We highly welcome questions and comments as well. Let’s liven up the presentation and discussion.

プログラム (Program)

13:00–13:05 Opening remarks -開会の辞- 研究科長 加藤　寧 教授 (Dean Prof. Nei Kato)

13:05–14:45 Session 1

13:05–13:25	幸田　芳紀	新生児指紋認証に関する研究
13:25–13:45	Sun Li	Towards More Accurate Video Understanding with Large-scale Multi-Modal and Language Models
13:45–14:05	Chen Guangyu	Modulation of Visual Attentional Scope: Investigating Size-Dependent Spatial Changes using SSVEP Analysis
14:05–14:25	Kavumba Pride	Investigating and Improving the Robustness of Models to Superficial Cues in Natural Language Understanding Tasks
14:25–14:45	Zhan Peng	Spatial heterogeneity analysis from the perspective of data distribution

14:55–16:35 Session 2

14:55–15:15	Steven Surya Tanujaya	Junta and A-valued Functions on the Slice
15:15–15:35	井島　慎一	市議会議員選挙の無投票当選の要因－第 20 回統一地方選挙結果に基づく実証的探索
15:35–15:55	傅　昱	コロナ禍におけるコミュニティづくり:「防疫日誌」にみる戦争メタファーからの考察
15:55–16:15	Han Zitong	受動回転球殻 UAV による面状構造物点検システムに関する研究
16:15–16:35	Guo Qi	Energy Efficient Hybrid Routing for FSO-RF Space-Air-Ground Integrated Network

16:45–18:05 Session 3

16:45–17:05	羽場　廉一郎	Nonnegative binary matrix factorization by continuous relaxation and reverse annealing
17:05–17:25	Yunmeng Li	Chat Translation Error Detection for Assisting Cross-lingual Communications
17:25–17:45	Xia Tian	Penalty Gradient Normalization for Generative Adversarial Networks
17:45–18:05	宮西　祐香子	英語科デジタル教科書の操作ログを対象とした ビッグデータ解析による学習傾向に関する研究

18:05–18:10 Closing remarks -閉会の辞- 副研究科長 田中　和之 教授
(Deputy Dean Prof. Kazuyuki Tanaka)

アブストラクト集 (Abstracts)
Session 1 (13:05-14:45)

発表時間内訳（発表 15 分・質疑応答 5 分）
Each speaker will have a 15-min of presentation and a 5-min. Q&A session

氏名：幸田 芳紀
題目：新生児指紋認証に関する研究
要 約：指紋認証は，終生不変・万人不同な指紋の特徴により，高精度な本人確認が可能であり，各国の国籍管理で活用が進んでいる．そこで国連は，「2030 年までに，すべての人々に出生登録を含む法的人格を提供する」を掲げている．一方で，既存の指紋認証は，出生登録を行う新生児期を利用対象としていない．本研究は，新生児指紋認証の撮像機と照合器の基礎研究と実証研究で得た結果をもとに，新生児指紋認証の実現手法の提案を目的とする．

氏名：Sun Li
題目：Towards More Accurate Video Understanding with Large-scale Multi-Modal and Language Models
要 約：The rapid proliferation of video content on the internet necessitates advanced tools and methodologies to ensure accurate video understanding. This study aims to address this challenge by integrating large-scale multi-modal and language models, focusing on three significant aspects. First, I will introduce the zero-shot video content analysis, a critical component to comprehend and categorize unseen video data without the need for extensive labeled training data. This approach holds promise in mitigating the bottleneck of manual annotation and enhancing the scalability of video understanding models. Second, I will introduce a prompt-based prototype few-shot learning method to improve performance on domain-specific issues in video understanding. By learning from a small number of examples, this method provides a robust solution to handle the vast variety of video content that may not be well-represented in existing datasets. Third, I will briefly discuss the synergy of large-scale language models with multi-modal models to further enhance video comprehension capabilities. By harnessing the power of these combined models, we aim to unlock new potentials in video content analysis, including improved context recognition and more accurate sentiment prediction. Despite significant strides in video analysis, the field still grapples with challenges like handling diverse and complex content, understanding context accurately, and dealing with the scarcity of labeled data. By focusing on these key issues, our study aims to pave the way towards more accurate video understanding, contributing to the ongoing evolution of this vibrant research field.

氏名：Chen Guangyu

題目：Modulation of Visual Attentional Scope: Investigating Size-Dependent Spatial Changes using SSVEP Analysis

要 約：This study investigated how human's spatial attention changes to cover different sizes of visual stimuli. We measured Steady-State Visual Evoked Potentials (SSVEP) to each of four different sizes of concentric rings flickering at different frequencies (SSVEP frequencies). The participant was instructed to attend to one of four sizes to detect a target stimulus in sequences of numbers presented rapidly (4 times per second) for four seconds, during which EEG signals were recorded. Frequency analysis showed clear peaks at each of four SSVEP frequencies, which was influenced by attention condition, suggesting a clear attention effect for stimulus sizes. SSVEP for each of four stimuli with different sizes as a function of attended size showed the largest amplitude when that stimulus was attended, with decreasing with difference in size between the stimulus and the attended size. The present experiment revealed that visual attention changes its size to cover the area of stimulus target, and that there are enhancement and inhibition effects in size of visual attention.

氏名：Kavumba Pride

題目：Analyzing and Improving the Robustness of Models to Superficial Cues in Natural Language Understanding Tasks

要 約：In natural language understanding, the objective is to create models/systems that can understand human language. To assess these systems, we use crowdsourced datasets, which function as training and evaluation resources. However, these datasets may contain superficial cues, or features unrelated to the task but can predict labels. Systems trained on these datasets tend to rely on these shortcuts, which causes two problems: first, the datasets become less reliable, and second, the models don't perform as well on datasets without these superficial cues. My research focuses on investigating this phenomenon, with the aim of enhancing both the datasets and the models.

氏名：Zhan PENG

題目：Spatial heterogeneity analysis from the perspective of data distribution

要 約：Spatial heterogeneity refers to the variations in relationships between geospatial phenomena and their determinants due to the diverse individual preferences, socioeconomic characteristics, and environmental conditions across space. Spatially varying coefficients (SVC) models have been developed to quantify and interpret the underlying spatial heterogeneity. However, previous SVC models are primarily based on conditional mean regression, which limits their ability to consider differences in the full data distribution and capture detailed information beyond average trends. Moreover, the mean regression approach is susceptible to outliers and skewed distributions, resulting in inaccurate estimations. To overcome these limitations, we propose a novel SVC model framework to capture the spatial variation in relationships on multiple quantiles or partitions of the data distribution, instead of focusing only on its mean value. This enhancement provides a more detailed and comprehensive understanding of the underlying spatial heterogeneity.

Session 2 (14:55-16:35)

氏名：Steven Surya Tanujaya
題目：Junta and *A*-valued Functions on the Slice
要 約：A set consisting of all *{0,1}*-vectors with the same length and the same weight (they contain exactly the same number of *1*s) is called the slice (of a boolean hypercube). A function that maps the slice into *A*, for a non-empty set *A* with the size at least *2*, is called an *A*-valued function on the slice. Also, it is called *n*-junta if the output depends only on (at most) *n* fixed coordinates of the inputs. In this presentation, a recent work of Yuval Filmus (March 2023) and our attempts to improve some parts of that work will be presented.

氏名：井島 慎一
題目：市議会議員選挙の無投票当選の要因－第 20 回統一地方選挙結果に基づく実証的探索
要 約：令和 5 年 4 月に執行された第 20 回統一地方選挙において、市議会議員選挙の無投票当選は 4.8%（14 市）と過去最高を記録し長野県岡谷市では定数割れも生じた。立候補の意思決定は、理論的には議員となって得られる便益、当選確率、出馬費用といった要因を考慮して行われる。便益としての議員報酬や当選確率としての議員交代率などの要因は市議会議員選挙の無投票当選にどのような影響を与えているのだろうか。本報告はこれら要因の影響を探るため、第 20 回統一地方選挙結果を用いて、無投票当選となった 14 市が所在する 10 道県の 82 市を対象とした実証的な探索を行い仮説の整理につなげるものである。

氏名：傅 昱
題目：コロナ禍におけるコミュニティづくり:「防疫日誌」にみる戦争メタファーからの考察
要 約：中国のあるコミュニティを例として、そこに展開されたコロナ禍におけるコミュニティづくり活動を記録した「防疫日誌」において、繰り返し登場する戦争メタファーによる作られた「戦争モデル」を考察した。それを通して担い手であるコミュニティワーカーが、このような「戦争モデル」の創出・維持に重要な役割を果たしたことが明らかとなった。本研究では、今後のコミュニティづくりの方向性について、自治組織としての性格という観点から展望した。

氏名： Han Zitong
題目：受動回転球殻 UAV による面状構造物点検システムに関する研究
要 約：面状構造物点検システムとは飛行ロボットの安全性向上，連続飛行可能時間延長，位置決め性能向上等を主な目的としてテザーと呼ばれる給電ケーブルを接続した形態のロボットシステムである．飛行ロボットの積載可能量には限りがあるため，接続したテザーの張力最小化は非常に重要な課題である．我々はテザー長調節だけでなく，複数本のテザーを異なる方向から接続し張力を打ち消し合わせてテザー張力を最小化する手法を提案し，原理検証を行った．

氏名： Guo Qi
題目：Energy Efficient Hybrid Routing for FSO-RF Space-Air-Ground Integrated Network
要 約：Space-Air-Ground Integrated Network (SAGIN) is a promising architecture for next-generation wireless networks. It combines satellite networks, aerial networks, and terrestrial networks, offering ubiquitous global network services to ground users and enhancing connectivity for a wide range of wireless applications. In this research, we construct an FSO-RF space-air-ground integrated network that aims to enable large-scale data transmission as well as degrading the burden on terrestrial networks. Also, a decentralized deep-Q network-based reinforcement learning with two hops node information is proposed to execute dynamic energy-efficient hybrid routing strategy while ensuring system load balancing.

Session 3 (16:45-18:05)

氏名： 羽場 廉一郎
題目：Nonnegative binary matrix factorization by continuous relaxation and reverse annealing
要 約：Nonnegative/binary matrix factorization is a technique for extracting features by approximating a nonnegative matrix as a product of a nonnegative and a binary matrix. Determining optimal binary states is computationally challenging. Quantum annealing is a heuristic algorithm to solve such problems by utilizing quantum fluctuations. Though typically a global search method, it can function as a local search via reverse annealing starting with some initial states. In this study, we introduce a reverse annealing framework using relaxation strategies to approximate initial states. Experimental results show comparable performance to exact optimization techniques, indicating the potential for expanding the applicability of quantum annealing.

氏名： Yunmeng Li
題目：Chat Translation Error Detection for Assisting Cross-lingual Communications
要 約：Machine translation models are still inappropriate for translating chats, despite the popularity of translation software and plug-in applications. The complexity of dialogues poses significant challenges and can hinder cross-lingual communication. Instead of pursuing a flawless translation system, a more practical approach would be to issue warning messages about potential mistranslations to reduce confusion. In this research, we first designed a survey to demonstrate the warning messages' contribution to making chat translation systems effective. We then developed an assistance system that detects erroneous translations to facilitate cross-lingual communications due to the limitations of current machine chat translation methods. We trained an error detector as the baseline of the system and constructed a new Japanese–English bilingual chat corpus, BPersona-chat, which comprises multi-turn colloquial chats augmented with crowdsourced quality ratings for evaluation. The error detector can be an encouraging foundation for more advanced erroneous translation detection systems.

氏名： Xia Tian

題目：Penalty Gradient Normalization for Generative Adversarial Networks

要 約：We propose a novel normalization method called penalty gradient normalization (PGN) to tackle the training instability of Generative Adversarial Networks (GANs) caused by the sharp gradient space. Unlike existing work such as gradient penalty and spectral normalization, the proposed PGN only imposes a penalty gradient norm constraint on the discriminator function, which increases the capacity of the discriminator. Moreover, the proposed penalty gradient normalization can be applied to different GAN architectures with little modification. Extensive experiments on three datasets show that GANs trained with penalty gradient normalization outperform existing methods in terms of both Frechet Inception and Distance and Inception Score.

氏名： 宮西 祐香子

題目：英語科デジタル教科書の操作ログを対象としたビッグデータ解析による学習傾向に関する研究

要 約：教育ビッグデータを分析して得られた知見を教育改善に役立てる、ラーニングアナリティクスに関する取り組みが広まっている。さらに、政府による全国の小中学校へのデジタル教科書の導入が急速に進められている。本研究では、義務教育における英語学習を対象に、デジタル教科書から取得される操作ログのビッグデータを解析し、その利用の実態や学習の傾向を明らかにすることを試みる。また、データから得られるエビデンスをもとに、個人に適した支援方法の可能性を検討する。