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Name	Supervisor	Title	Abstract
Shinoda Hiyu	Matsui Kazumi	Robust Procedure to Adjust Spino-Pelvic Alignment of Finite Element Model Using Static Mechanical Calculation	This study proposes a method for developing a 3D human body model for orthopedic surgery. While preoperative simulations assist treatment planning and patient understanding, their application in orthopedics is limited. This method utilizes a human model from automobile crash simulations, extracts skeletal structures, applies deformations, and constructs a full-body model. Additionally, a disease-specific model is developed by simulating spinal deformities, adjusting spinal alignment, and pelvic parameters based on medical literature. This approach aims to enhance preoperative simulations in orthopedics, improving both surgical planning and patient communication.
Hiroshima Kei	Shirakawa Shinichi	Analysis of Unsupervised Domain Adaptation for Network Traffic Classification in Cyber Security	Machine learning approaches are being investigated for systems that monitor network communications to automatically detect and classify potentially malicious traffic patterns indicative of cyber attacks. However, the annotation of traffic data in target network environments is often difficult. Therefore, unsupervised domain adaptation that uses the annotated data in different environments is applied to malicious traffic detection. This study analyzes multiple network traffic datasets and comprehensively evaluates the performance of unsupervised domain adaptation in malicious traffic classification.

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Name	Supervisor	Title	Abstract
Yamamoto Yuya	Harashita Shushi	The multiplicity-one theorem for the superspeciality of curves of genus two	Igusa proved in 1958 that the polynomial determining the supersingularity of elliptic curve in Legendre form is separable. In this paper, we get an analogous result for curves of genus 2 in Rosenhain form. More precisely we show that the ideal determining the superspeciality of the curve has multiplicity one at every superspecial point. Igusa used a Picard-Fucks differential operator annihilating a Gauss hypergeometric series. We shall use Lauricella system (of type D) of hypergeometric differential equations in three variables.
Aoyama Koudai	Yoshioka Katsunari	A Study on Accuracy Evaluation of Internet Scanning Service	As part of Attack Surface Management (ASM), internet scanning services such as Shodan and Censys are widely used by organizations and individuals to identify system vulnerabilities. In this study, we deployed multiple versions of Apache and Nginx—each containing reported critical vulnerabilities—in a secure environment and made them accessible via the internet. We then investigated how accurately Shodan and Censys detect these vulnerabilities, and by analyzing the resulting scan data, we discuss both the utility and the challenges of leveraging internet scanning services for ASM.

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Name	Supervisor	Title	Abstract
Akiyama Ryota	Yamada Takahiro	Isolated element method based on the Nitsche's method for plate bending problem	The Isolated Element Method is a numerical method in which the displacement field is assumed for each element, and the elements are connected by satisfying the boundary conditions on their surfaces. Conventional Isolated Element Method uses the Lagrange multiplier method to impose the continuity conditions between elements. Generally, in the Lagrange multiplier method, the approximation functions for the Lagrange multipliers must satisfy the inf-sup condition; otherwise, the convergence of the solution cannot be guaranteed. In this study, we propose an Isolated Element Method that uses the Nitsche's method, a stabilization technique, to enforce the continuity conditions between elements.
Oe Yuzuki	Shirakawa Shinichi	3D Shape Analysis using Constructive Solid Geometry Model with Distance Images	Recently, research about a primitive decomposition task, which is one of 3D recognition tasks, has been processing because of leading to understanding human vision. Much of the prior research is 3D shape matching which regards information of whole objects as input but has issues of the cost of generating data and much operation time. In this paper, we propose a method which outputs information of Constructive Solid Geometry in a short time using distance images as input. In the experiment, we confirm reducing operation time compared to CSGNet, which is one of the previous studies, and confirm the effectiveness of the task. Moreover, we evaluate effects for patch process and cropping distance images introduced into our method.

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Name	Supervisor	Title	Abstract
Ohashi Yuto	Shirakawa Shinichi	Feature selection using Percolative Learning Method and Genetic Algorithm	Neural networks, which have been achieving success in recent years, may require large amounts of feature data, making the cost of collecting data problematic. Therefore, feature selection is required. In this paper, we propose a feature selection method using Percolative Learning Method and Genetic Algorithm. By using Percolative Learning Method, we can further reduce the number of features to be input while maintaining model accuracy. In the experiments, the effectiveness of the proposed method is verified in terms of both accuracy and feature selection results.
Okabe Takara	Shima Keisuke	Muscle training support method based on Functional Electrical Stimulation and Electromyogram classification	Efficient muscle contraction training methods are necessary to maintain and strengthen physical functions. Training with electrical stimulation is known to cause early muscle fatigue and muscle hypertrophy. The proposed method combines movement estimation based on electromyographic signals with functional electrical stimulation. This assists training by extending bodily functions or providing virtual loads. The results of a 5-week experiment using the proposed method for training the biceps brachii muscle showed that the proposed method improves muscle strength and promotes muscle hypertrophy more efficiently than training using voluntary movements alone.

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Name	Supervisor	Title	Abstract
Ogawa Kota	Shima Keisuke	An investigation of the effects of somatosensory stimulus on fingertips during walking	Preventing falls in older adults requires not only reducing external factors, such as steps, but also improving dynamic balance. This study proposes and evaluates a dynamic balance support method using fingertip vibratory stimulation, inspired by the virtual light touch, which is considered effective for static balance. Experiments on balance beam walking confirmed improved dynamic balance in both young and older adults, demonstrating the effectiveness of the proposed method.
Kai Haruto	Shima Keisuke	Training and evaluation method for human standing stability using balance games	With the aging of society, the number of accidents involving falls is increasing, and effective balance training and assessment are needed. Stability limits, which indicate the range in which the center of gravity can be shifted, exist as an evaluation index for standing stability, and improvements have been reported through training that involves weight shifting. However, there is a problem with it being unable to correspond to individual balance ability. In this study, we proposed a training system that reflects the user's stability limit, and verified its usefulness.

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Name	Supervisor	Title	Abstract
Kashiwagi Ryota	Shima Keisuke	FPGA implementation of open-set recognition method based on approximate Gaussian mixture model for interface control	Pattern recognition methods are widely used in the welfare and industrial fields. However, these methods are required to be implemented on small hardware to be embedded in prostheses and industrial machines. Moreover, these methods are also needed to deal with open-set recognition for detecting unknown data that are not assumed while learning to avoid misclassification on unknown data. This paper proposed an approximate Gaussian mixture model-based novel open-set recognition method suitable for hardware implementation and utilized our method for interface control on FPGA as the application of the welfare field.
Kataoka Takuya	Okajima Katsunori	Aging simulation of artifacts based on spectral reflectance and the effects of lighting on the oldness perception of objects	Spectral information is required to faithfully reproduce object colors under any illuminations. In this study, I degraded various color materials with pseudo-sunlight and developed an aging simulation method based on the spectral reflectance changes due to aging. Using the proposed simulation, images were created under various lighting conditions and old levels, and evaluation experiments were conducted to assess lighting effects on perceived oldness. The results showed that the lower the color temperature, the older the sample felt, and that the newer the sample, the greater the changes of perceived oldness due to color temperature.

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Name	Supervisor	Title	Abstract
Katahira Shoki	Tomii Takashi	Quantifying disadvantages based on the simulation using load leveling oriented VGIDB	VGI has some disadvantages, such as energy conversion losses and the degradation of EV batteries. In this study, we conducted a four-year VGI demonstration experiment. Using the collected data, we performed a VGI simulation to quantify these disadvantages. As a result, we found that the energy conversion loss was minimal and that the additional EV battery degradation due to VGI was at most approximately 0.7% points per year.
Kawaguchi Yamato	Yoshioka Katsunari	Research on Collecting Cybercrime Information on Discord Using Large Language Models	Discord, initially a gaming-focused platform, now facilitates cybercrime activities including scams, intellectual property theft, cybercrime-as-a-service, and illegal content distribution. This study presents a novel system leveraging Large Language Models to detect and categorize such activities on Discord. By identifying suspicious servers from directory sites, the system classified 381,297 messages into predefined crime types, uncovering 2,114 potentially criminal servers and 2,335 topics spanning Pornographic Material, Illegal Gambling & Online Games, and System Interference. Achieving 74% precision, 73% recall, and 92% weighted accuracy, it offers a scalable, effective tool for researchers and moderators to combat cybercrime on Discord and similar platforms.

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Name	Supervisor	Title	Abstract
Kawamura Asuka	Nakamoto Atsuhiro	Minor relation for quadrangulations on the torus	Minimal quadrangulations on the torus by face contraction were already classified. In this research, we focus on the minor relations between quadrangulations on the torus and listed the minor-minimal ones, although it seems to be difficult to verify a minor relation of two quadrangulations. There seem to be many minimal simple graphs, and so we consider quadrangulations which are allowed to have multiple edges. The torus admits 4-regular quadrangulations, and hence, introducing alternative operations, we classify minor-minimal ones with respect to them.
Kinjo Ryoma	Shikata Junji	An Efficient Construction of Identity-Based Signature with Code	An identity-based signature (IBS) scheme is a digital signature scheme which allows a verifier to check the validity of a message-signature pair by using a user's identity, instead of a verification key. On the other hand, code-based cryptography is one of post-quantum cryptography researched actively, and many code-based signature schemes have been proposed so far. As an extension of such signature schemes, we focus on code-based IBS. In this paper, we propose a direct construction of short IBS from codes. Its security is based on the hardness of the syndrome decoding problem. We show that its signature size and verification's CPU cycles are smaller than those of existing code-based IBS schemes. Key words Identity-based signatures, Code-based signatures, Post-quantum cryptography

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Name	Supervisor	Title	Abstract
Kushibiki Junnosuke	Yoshioka Katsunari	Investigation into IoT Device Exposure and Security Measures in IPv6 Internet	With the transition to IPv6, IoT devices assigned global addresses are expected to become new targets for attacks. After investigating countermeasures through actual device and manufacturers, it was found that many IoT devices have insufficient security measures and manufacturers showed no intention to implement additional protections in the future. In comparison, routers tend to have more proactive security measures in place. However, products released before these security measures were implemented are unlikely to receive device protection features in the future.
Kubota Hiroshi	Mori Tatsunori	Comparison Study of Methods Using Large Language Model to Generate humor without Disturbing the Conversation for Dialogue Systems	In this study, we proposed a methods using LLM to generate humor without disturbing the conversation for dialogue systems to entertain their dialogue partners. The proposed methods consist of two methods: one that divides the task and obtains atypical phrases, and another that generates direct response sentences by providing examples of ideal outputs. We compared the proposed methods with conventional methods and a zero-shot generation method. As a result of the comparison, it was confirmed that both of the proposed methods were significantly more humorous than the conventional methods and the zero-shot method, and were significantly superior to the conventional methods in terms of the naturalness of the sentences and not disturbing the conversation.

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Name	Supervisor	Title	Abstract
Kurashige Ryuji	Yoshioka Katsunari	Research on early detection of services exploited in DRDoS attacks	This study proposes a novel approach to predict ports that are likely to be exploited in the future by capturing scan communications that serve as precursors to DRDoS attacks, thereby contributing to the realization of early countermeasures. Specifically, we focus on network scans conducted by attackers to discover potential reflectors. By analyzing the source IP addresses and payloads, as well as the synchronization of communication packets observed across multiple honeypots, we predict port numbers that are most likely to be used as reflectors in future attacks. We evaluated the proposed method using actual observation data to assess its detection rate and how many days in advance it can issue alerts before an attack occurs.
Koizumi Toshiki	Ozeki Kenta	Indicated edge-coloring game on *k*-trees	Edge-coloring is an assignment of colors to the edges of a graph under the constraint that no two adjacent edges share the same color. In this thesis, we introduce a new combinatorial game called the Indicated edge-coloring game, in which two players, Ann and Ben, take turns. Ann indicates an uncolored edge, and Ben colors it. Furthermore, we study on the game on *k*-trees for $k \leq 4$, identifying sufficient conditions under which the minimum number of colors required for Ann to win the game coincides with the ordinary edge chromatic number of the graph.

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Name	Supervisor	Title	Abstract
Komatsu Yu	Noma Atsushi	Resolution of the indeterminacy of the Gauss map of a normal 2-dimensional hypersurface with double covering over the 2-plane	A hyperplane in projective space corresponds to a point in the dual projective space. Since the tangent plane at a nonsingular point of a surface in 3-dimensional projective space is also a hyperplane, it determines a point in the dual projective space. This correspondence is called the Gauss map. The image of the surface under the Gauss map is in 3-dimensional dual projective space, and its closure is called the dual surface. Since the Gauss map is not defined at singular points of the surface, the behavior of the Gauss map at singular points of the surface is not well understood. In this study, we resolved the indeterminate points of the Gauss map by blowing-up and extended the mapping. Since it is difficult to consider all general surfaces, we restricted our focus to surfaces with double covering over the 2-plane. Then we studied how exceptional curves correspond under the extended Gauss map.
Sakurai Ryo	Shirakawa Shinichi	Co-Speech Gesture Generation with Controllable Representational Gesture Insertion	In co-speech gestures, representational gestures occur alongside the semantic content of speech. Although these gestures appear less frequently in speech, they play an important role in enhancing explainability. However, existing deep learning-based co-speech gesture generation methods struggle to produce gestures that include representational gestures due to the lack of training data with representational gestures. To address this issue, this study proposes a co-speech gesture generation method that integrates a motion generation approach, enabling the controllable insertion of representational gestures.

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Name	Supervisor	Title	Abstract
Sarukawa Sho	Okajima Katsunori	Visual Information Manipulation to Improve Pseudo 3D Moving Sensation During VR Walking-in-Place	In this study, we proposed a method to simulate the realistic sensation of ascending and descending stairs by using technology to move through a virtual space by stepping in place, and verified its effectiveness. The proposed method can synchronize the period of stepping with the movement in the video by setting a threshold value for the height of raising legs. The results of experiments showed that the proposed method enhanced the perception of steps compared to existing asynchronous methods, making the sensation of ascending stairs, and to a limited extent, the sensation of descending stairs, more realistic.
Sawafuji Hikaru	Shirakawa Shinichi	Application of Machine Learning to Self-Position Estimation of Bulldozers Using Internal Sensors	Due to the shortage of skilled bulldozer operators, there is an increasing demand for autonomous operation of bulldozers. Autonomous operation requires self-localization technology to accurately determine a bulldozer's position. While conventional bulldozer self-localization relies on satellite positioning systems, in mining areas where satellite signals are easily interrupted, continuous autonomous operation becomes difficult. To address this issue, this study proposes a self-localization method using a machine learning model based on internal sensor data from bulldozers.

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Name	Supervisor	Title	Abstract
Sugiura Soki	Shirakawa Shinichi	Stable Feature Selection through Joint Training of Multiple Models and Its Application to NAM	Feature selection is used in machine learning to improve model interpretability and reduce computational costs. However, it is known that feature selection can become unstable due to randomness of training sample selection and model initialization, which may undermine model reliability. In this study, we propose a method to stabilize feature selection by selecting common features during the joint training of multiple models with different training samples and initializations. Furthermore, we apply the proposed method to NAM, a highly interpretable machine learning model.
Suzuki Iori	Yoshioka Katsunari	Building Dataset on Fraudulent DeFi Tokens on Ethereum	In 2023, approximately USD 241.6 million in illicit revenue was generated in DeFi, where on-chain data such as blockchain transaction information is primarily used as a measure to combat fraud. However, in order to determine whether something is fraudulent, off-chain data such as relevant websites and social media is essential, but the latter can easily disappear, making research difficult. In this study, we constructed a dataset that integrates on-chain data related to DeFi tokens deployed on the Ethereum blockchain with over 550,000 pieces of off-chain data, including archived websites and social media. Through case studies, we demonstrated that this dataset is useful for fraud detection.

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Name	Supervisor	Title	Abstract
Suzuki Hiroto	Tomii Takashi	Multi-faceted quantification of VGI simulations in multiple regions based on generated electricity demand data	In this study, VGI simulations were conducted at multiple electricity demand sites to quantify the effects of smart grid implementation. The target areas were university campuses located in Hokkaido, Shizuoka Prefecture, and Kanagawa Prefecture, where the necessary electricity demand data for the simulations could be generated. A multifaceted quantitative analysis based on the database revealed that there exists a parameter range for the number of EVs and PV installation capacity suitable for PV utilization, demonstrating that load leveling can be achieved.
Suzuki Ryosuke	Yoshioka Katsunari	Research on collecting information through Interactions with Cybercriminals	In recent years, Telegram, SNS, and darknet forums are used for cybercrime distribution. Post analysis helps discover threats, but direct dialogue with attackers (HUMINT) is necessary for deeper insights. However, HUMINT faces challenges including knowledge gaps, language barriers, and legal concerns. This research proposes an information gathering framework using Large Language Models (LLM) to address these issues. It ensures safety by incorporating legal and ethical guidelines while conducting natural conversations with appropriate handling of technical terms. The experiment analyzed the establishment of roleplay and compliance with legal-ethical standards.

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Name	Supervisor	Title	Abstract
Sekido Kohsuke	Yoshioka Katsunari	Study on the Behavioral Factors of IoT Device Owners Who Received Security Notification	I conducted a study on alerting IoT device owners with potential risks and investigating factors influencing their behavior. Through a user-participatory security project called "WarpDrive," notifications were sent to 51 users. Results showed that 7 users checked the notification content, with effectiveness confirmed in only 1 case. Survey responses indicated that 40% found the notifications helpful, but the overall open rate was low, making the impact limited. To reach more users in the future, the study proposed improving the visibility of WarpDrive notifications and reducing the number of clicks required to access them.
Sekine Yuji	Yoshioka Katsunari	Analyzing Ransomware Group Activities Through Trends in Their Public Disclosures	LockBit3.0 utilizes a sophisticated dark web infrastructure to manage and monetize victim data. This study analyzes its operational strategies and the impact of the February 2024 takedown, “Operation Cronos.” Over 533 days, we examined ransom deadlines, victim listings, and data pricing. Findings reveal tactics such as deadline adjustments and data reposting to sustain activity. The takedown caused significant disruptions, delaying negotiations and payments. However, LockBit3.0 quickly restored its infrastructure, minimizing long-term impact.

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Name	Supervisor	Title	Abstract
Takenaka Kensuke	Shima Keisuke	Hybrid Rehabilitation System with Multiple Motion Estimation Based on FES and EMG Signals	A method for estimating movement based on muscle potential signals and transmitting the estimated movement by electrical stimulation has been proposed. In this study, we aim to provide more effective rehabilitation support by teaching accurate motion trajectories by a robot. In experiments, pointing training was conducted on healthy subjects, and the motor learning effect of the proposed method was confirmed. The proposed method is expected to be applied to rehabilitation of paralysis patients.
Tanaka Yuto	Tomii Takashi	Complete Analysis of an EV's Lifelog to Evaluate Increased Energy Consumption Due to Acceleration	In this study, we designed and developed a database that stores Energy Baseline Maps (EBM) which represents road-specific energy consumption of EVs and Electric Vehicle (EV) lifelogs, linking them to specific locations. This database enabled the comprehensive analysis of energy consumption increases due to acceleration using the all acceleration dataset from an EV's lifelog. As the result, it was shown that quick acceleration is effective from time and energy perspectives.

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Name	Supervisor	Title	Abstract
Tanaka Reiji	Mori Tatsunori	Analyzing Contexts Explaining Metaphorical Expressions Using Co-reference Relation Information	Metaphorical expressions, whether spoken or written, appear frequently, and their meanings change according to the surrounding context, making it difficult to detect their meanings in various tasks of natural language processing. In this study, we collect contexts that may explain a direct metaphor by using a corpus with coreference relation information and manually selected sentences contains direct metaphor and their explanations. We also analyzed characteristic of explanations of direct metaphors from distance between direct metaphors and their explanations and objects that explanations mention. From example of explanation that we can't collect by using coreference relation information, we considered data and approach that we need to collect them.
Tamasho Tomoya	Shirakawa Shinichi	Human-in-the-Loop Semantic Segmentation for Annotation Cost Reduction	Annotation cost reduction in semantic segmentation is important for dataset creation in special domains. In this paper, we propose an annotation cost-aware segmentation framework. The proposed method uses weakly supervised learning and active learning to reduce annotation costs. Validation experiments using metallographic images confirm that the proposed method can reduce the annotation cost.

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Name	Supervisor	Title	Abstract
Tsuda Keisuke	Mori Tatsunori	An Analytical Method for Emotion Representation Using Emoji Mapping	Texts combined with emojis representing different emotions can convey special sentiments like "sarcasm" and "self-deprecation." We refer to such emojis as "rhetorical emojis," which are currently difficult to interpret automatically. This paper collects rhetorical emojis using a visualization map that places the emotions of text and emojis on the same plane and analyzes their emotional characteristics. The findings suggest that this approach can contribute to a more detailed sentiment analysis of text with emojis, enhancing the understanding of nuanced emotional expressions in digital communication.
Terada junnosuke	Okajima Katsunori	The development of a virtual movement method using body input interaction and a proprioceptive feedback device	VR is used to recreate sensations close to reality, benefiting practical tasks and learning, but there are various limitations in locomotion techniques. This study developed movement technologies suited to different situations and proposed two techniques. The first is a rotational method that utilizes gaze and head movements for tasks involving high cognitive load and movement in seated VR. This method reduced cognitive load, decreased operational errors, and alleviated VR motion sickness. Additionally, a cane-like device was developed to provide proprioceptive feedback during virtual stair climbing, which was confirmed to enhance the sense of presence.

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Name	Supervisor	Title	Abstract
Tomoshige Masaki	Nakamoto Atsuhiro	Edge coloring of outer Möbius band graphs	It is known that the edge-chromatic number of any simple graph G is equal to the maximum degree of G or the number plus 1. The former is called Class 1 and the latter is called Class 2. In this research, we define “outer Möbius band graph”, which is a graph on the projective plane and has similar properties to an outerplanar graph, and we consider the edge-chromatic number of the graphs. As a result, we identify a necessary and sufficient condition for the graphs to be Class 2.
Doi Yusei	Shima Keisuke	A foundational study on cognitive function evaluation for elderly people based on video and speech content analysis	The number of dementia patients in Japan is rapidly increasing, and early intervention is expected to slow the progression of the disease. A cognitive function test is one method for the early diagnosis of dementia, but it is only a semi-quantitative assessment made by the examiner. To address this issue, we propose a system for quantitatively assessing cognitive function based on the behavioral characteristics of elderly patients during testing. The system measures whole-body movements, facial expressions, and speech using equipment installed in the examination room. It then extracts features using a deep learning-based approach and comprehensively evaluates the relationship between these features and cognitive function.

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Name	Supervisor	Title	Abstract
Nakanishi Ryota	Shirakawa Shinichi	Construction of Transformation Model Mitigating Difference between Simulation and Real Environments for Training Controller of Construction Machinery	Due to the shortage of skilled construction machinery operators, the demand for autonomous operation is increasing. Because the training of an autonomous operation model in the real-world environment is challenging, the model trained in a virtual environment is often deployed. However, model performance is degraded because of the difference between virtual and real-world environments. This study introduces a transformation model that reduces environmental differences to mitigate performance degradation in real-world deployment. In the proposed training process, the transformation model is trained to approximate operational data collected in the deployment environment in the virtual environment, and the autonomous operation model is trained in the virtual environment combined with the trained transformation model.
Nakahara Riku	Harashita Shushi	Quotient spaces of Deligne-Lusztig varieties	Let q be a power of a prime number p, and let F_q be a finite field with q elements. It is known that SL_2(F_q) acts on the algebraic curve Y_2: xy^q-x^qy=1 (called the Drinfeld curve) in characteristic p, and its quotient space Y_2/SL_2(F_q) can be explicitly described. In this research, we extended this to a more general case, obtaining similar results for the action of SL_n(F_q) on a Deligne-Lusztig variety Y_n, and also to find the quotient space $\tilde{Y}$ _n/GL_n(F_q) for the action of GL_n(F_q) on a Deligne-Lusztig variety $\tilde{Y}$ _n (we found generators of the invariant ring for the quotient ring obtained by dividing a polynomial ring by an ideal).

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Name	Supervisor	Title	Abstract
Nakamura Yuki	Shikata Junji	A Key-Escrow-Free Identity-Based Signature Scheme from Lattice	One of the problems to be solved when introducing identity-based signatures (IBS) to the real world is the key escrow problem. The key escrow problem is the problem that the KGC may forge all signatures in a model where the KGC generates secret keys corresponding to all identities in the IBS. In this paper, we propose a new IBS formulation and lattice-based construction that solves the key escrow problem by introducing a new entity called Identity Certificate Authority (ICA).
Ninomiya Nobutaka	Shirazaki Minoru	Numerical analysis of splash generated by multiple objects	In this paper, a numerical analysis is performed to investigate the effect of the number of cylinders and their initial conditions on the impact of multiple cylinders on the water surface, because many studies have focused on the impact of a single object. As a result, water jets are observed twice: after the cavity generation and collapse. The water jets are higher when the gap between the cylinders is appropriately small after the generation and when it is larger after the collapse. The same trend is observed when the number of cylinders and the velocity of impact are changed.

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Name	Supervisor	Title	Abstract
Fukuoka Kodai	Mori Tatsunori	Research on Construction of Inquiry Response System Using Accident Case Documents	In industries such as manufacturing, responding to inquiries about accidents on-site is currently done manually, which is inefficient. Consequently, there is a significant demand for automated response systems. In this research, we worked on the construction of a system for structuring accident case documents with the aim of visualizing and presenting the flow of accidents. In addition, to realize a inquiry response system, we worked on the construction of inquiry response system. The evaluation experiments of each system showed that the proposed system was effective, but that there is room for further improvement when considering its actual implementation in a company's internal system.
Hosaka Taisuke	Segawa Etsuo	Study of pulsatility of quantum walks on graphs	In this study, we introduce a phenomenon called ``pulsation'' in quantum walks. This phenomenon is as follows: For two connected graphs, we consider the composite graph formed by a disjoint union of two graphs. In addition, we assume that the initial state exists only on one graph. Then almost all states transfer to another graph on a suitable steps. These phenomena occur periodically. We analyzed the existence of this phenomenon on the composite graph formed by the Johnson graph and star graph.

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Name	Supervisor	Title	Abstract
Miura Dai	Shikata Junji	Analysis of Backdoor Attacks on Multi-User Configurations in Code-Based Cryptography	(Classic) McEliece is a finalist in the cryptographic standardization project led by NIST and is one of the most promising cryptographic schemes. In a single-user setting (a simplified model with omitted information), a backdoor attack against (Classic) McEliece has been proposed. These analyses are based on the definition of an attack known as SETUP. In this paper, we demonstrate the effectiveness of backdoor attacks in a multi-user setting (a more realistic and concrete model). Our goal is to emphasize the importance of countermeasures and analyze attacks in a practical model. Furthermore, we redefine SETUP in a scenario where countermeasures against backdoor attacks exist and explore new attacks that satisfy SETUP. Our aim is to enable a more detailed analysis of attacks that fall under the category of SETUP.
Mizokuchi Masataka	Yoshioka Katsunari	A Study of Cyber-Attacks Misusing Vulnerable Routers	The risk posed by a compromised router at a network boundary is high. In recent years, cases have been reported in which the VPN function of a home router was abused as a stepping stone to gain unauthorized access to an enterprise. However, the extent and nature of abuse involving compromised routers remain unclear. Therefore, in this study, we build a honeypot using a physical router to investigate the actual state of abuse, deliberately allowing configuration changes and VPN connections by attackers to the greatest extent possible. Furthermore, we analyze the attackers' intentions, such as whether the router is used as a relay point or a direct attack target, based on the communications observed in the honeypot.

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Name	Supervisor	Title	Abstract
Mitoma Ryo	Shima Keisuke	Deep Learning-Based Behavior Monitoring and Non-Cognitive Skill Evaluation for Students	Computer vision technologies such as pose estimation and action recognition are increasingly applied in the field of education. This study proposes a behavior monitoring system that leverages 2D and 3D pose estimation models to extract features such as body movement, head angles, and hand-raising. The system's accuracy was validated using benchmark data in environments with significant occlusion, demonstrating its effectiveness. Furthermore, the causal relationships between the behavioral features extracted from videos recorded in actual classrooms and students' cognitive and non-cognitive ability survey results were analyzed, providing comprehensive data-driven educational insights into the interplay between their abilities and visual cues.
Muroya Shunsuke	Yamada Takahiro	NUMERICAL SIMULATION OF RAINFALL UNEVENLY DISTRIBUTED BY URBAN WINDS	In recent years, the increasing frequency of guerrilla rains and other torrential rains has caused serious damage from internal flooding. Meteorological simulations used to predict damage from such torrential rains have a resolution of around 1 km on the ground surface and cannot represent the uneven distribution of rainfall inside a city. On the other hand, with the improvement of supercomputer performance, technology has been developed to reproduce the wind environment inside a city during a typhoon at high resolution by connecting to the weather simulation. The objective of this study is to develop a numerical simulation method that can apply such technology to investigate the impact of complex wind environments on rainfall in urban areas.

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Name	Supervisor	Title	Abstract
Motegi Naoya	Okajima Katsunori	Pseudo-Generation and Tactile Modulation of Stickiness Using Dynamic Visual Information	We propose a new Pseudo-Haptic that presents a pseudo-stickiness sensation using visual information without using a special tactile presentation device. The experiments showed that by deforming a virtual object or a virtual hand displayed in a VR space in response to finger movements, it is possible to present a sticky sensation in the feel of fingertips, a desk, and mid-air CG. In addition, it was shown that the perceived sense of stickiness can be strengthened by adding a delay to the movement or by varying the gain of the virtual hand when displaying it.
Mori Yuto	Yamada Takahiro	Evaluation of the impact of flying debris generated during strong winds in an urban cavity space	In this study, we developed a framework for probabilistically assessing the impact of windborne debris on buildings to evaluate the risk of strong wind disasters. Specifically, we assumed the generation of flat-plate debris from a single building and analyzed its collision damage to surrounding structures. This framework employs Monte Carlo simulations to model the six-degree-of-freedom motion of debris, incorporating the wind field of a typhoon reproduced by a high-resolution meteorological model. By analyzing the statistical distributions of debris impact locations and impact energy, we discuss the applicability of this approach to risk assessment of strong wind disasters in urban areas.

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Name	Supervisor	Title	Abstract
Morimoto Shizuko	Shirakawa Shinichi	Patch-based Anomaly Detection and Classification of Chest X-ray Images with Continual Learning	Post-verification by experts is indispensable for the actual operation of medical AI, and is an obstacle to its practical use. Therefore, methods that effectively combine AI and human expertise are attracting attention. This paper proposed a patch-based abnormality detection and classification method for lung X-ray images, and that can be continuously trained based on medical knowledge. Experimental results show that the proposed method achieves comparable detection and classification accuracy with a smaller number of data than conventional methods. Furthermore, it confirmed that the accuracy of the model can be further improved by re-training.
Yamakawa Keita	Shikata Junji	Propopsal and Evaluation of a Deep Learning Model for Lattice Problems	Since public-key cryptography currently in wide use will be broken by large-scale quantum computers, the U.S. government (NIST) promotes the standardization of post-quantum cryptography (PQC). In this paper, we focus on the lattice decision problems, which play an important role in the security of lattice-based cryptography, and we propose a mechanism using deep learning to solve the problems. Specifically, we construct and evaluate a deep learning model for lattice decision problems for instances with sparse binary secrets. As a result, we show that the proposed method has high performance for small sparse LWE and Ring-LWE instances.

List of Dissertation Abstract (Department of Information Environment)

Name	Supervisor	Title	Abstract
Yamanoi Kazuaki	Shima Keisuke	Study on the human standing-function assessment method based on the virtual light touch control and factor analysis	Methodologies to prevent falls are essential to extend healthy life expectancy. In this study, we measure the center-of-pressure sway during a one-minute standing measurement with somatosensory disturbance and perform factor analysis on the obtained features. The results are compared with the subject's information such as physical fitness test and history of falls. By comparing the results with the human standing control model, we interpreted the factors that constitute the human standing posture. As a result, an important index for fall risk assessment was proposed.
Yamamoto Yusuke	Okajima Katsunori	Relationship between psychological effects and acoustic features of chewing sounds	It is known that chewing sounds play an important role in the recognition and evaluation of food properties in the human eating experience. In this study, two experiments were conducted to clarify the psychological effects of chewing sounds. In experiment 1, we measured the effects of the chewing sound of a complex structured frozen dessert on the perception of sound quality, mood changes, and preference. In experiment 2, we proposed a model to predict subjective evaluation scores from acoustic features for the chewing sounds of various foods, and analyzed the physical characteristics that determine the "hardness" and "pleasantness" of chewing sounds.

List of Dissertation Abstract (Department of Information Environment)

Name	Supervisor	Title	Abstract
Yukawa Hidefumi	Matsui Kazumi	Application of Block Newton method to mixed FEM and GTN model	This study applies the Block Newton method to the elasto-plastic damage problem using the GTN model and a three-variable mixed finite element method based on Hu-washizu to obtain tangent coefficients and residuals algebraically. The analytical derivation of the tangent coefficients is difficult because many internal variables are used to describe the ductile fracture of the metal. In order to avoid volume locking that occurs at the end state of the material, a three-variable mixed finite element method based on Hu-washizu was used in this study.
Yo Tatsumi	Shima Keisuke	A training system for EMG-controlled interface based on the usage of functional electrical stimulation	Interface control based on myoelectric signals, which are biological signals generated during muscle contraction, is one method of assisting the disabled limb. However, to achieve efficient control, it is necessary for patients to voluntarily generate muscle contraction patterns with different characteristics. In this study, we applied electrical stimulation to the patient's muscles to teach an ideal muscle contraction state and perform intuitive muscle contraction training. The aim is to obtain characteristic muscle contraction patterns and to achieve stable and precise control of the myoelectric interface.

List of Dissertation Abstract (Department of Information Environment)

Name	Supervisor	Title	Abstract
Watanabe Yohei	Shirakawa Shinichi	A Hierarchization Framework for Black-Box Optimization to Reduce the Cost of Changing Design Variables	Although changing design variables in optimization requires cost, there are few black-box optimization methods for low-cost optimization when the cost of changing each design variable is different. This study proposes a hierarchization framework of black-box optimization methods for low-cost optimization when the cost of changing some design variables is high. The optimization method is hierarchized, with the variables with high change costs as the upper variables and the variables with low change costs as the lower variables. Furthermore, the cost is decreased by reducing the changes associated with optimizing the lower variables.
Aiman Syazwan Bin Abdul Razak	Yoshioka Katsunari	Analysis of Cryptocurrency Management and Third-Party Dependencies in Darknet Markets	Darknet markets promote illicit activities like drug trafficking and cybercrime, posing regulatory challenges. These markets rely on third-party services, such as payment gateways and hosting platforms, creating vulnerabilities. Cryptocurrencies like Bitcoin complicate efforts to track illicit transactions. This study analyzed 100 markets, identifying nine dependency types in 52 markets, including e-commerce platforms and analytics tools. Using OnionScan, links to clearnet markets were revealed. Responsible disclosure led to API restrictions, and domain suspensions, disrupting six markets and eight domains. Additionally, Bitcoin address generation of 58 markets and fund flows were studied, offering insights into financial mechanisms. This research highlights dependency targeting to combat darknet activities.

List of Dissertation Abstract (Department of Information Environment)

Name	Supervisor	Title	Abstract
HE XIN	Tomii Takashi	Temperature-Aware Predictive Energy Consumption Visualization System for Supporting Long-Distance EV Driving	During long-distance driving of electric vehicles (EVs) in winter, increased energy consumption due to air-conditioner use and higher rolling resistance at low temperatures becomes a significant challenge. In this study, we propose an energy consumption prediction model that considers temperature effects on air-conditioner operation and rolling resistance, thereby improving prediction accuracy. Furthermore, we developed a driving support system that visualizes predicted energy consumption and state-of-charge (SOC) transitions, assisting drivers in route selection and charging planning. The results demonstrate that practical EV operation planning is feasible even under winter conditions.
Jeon Sewon	Yamada Takahiro	SPH Simulation for inter-/intra-granular crack propagation in micro-cantilevers	The micro-cantilever test is widely used to determine the mechanical properties and uncover fracture mechanisms of polycrystalline ceramics material. Observations have revealed both intergranular and intragranular fractures, emphasizing the need for simulations capable of capturing both. However, conventional finite element methods (FEM) face challenges in predicting intra-granular fractures due to their mesh-based spatial discretization. To overcome this limitation, this study employs the mesh-free Smoothed Particle Hydrodynamics (SPH) method, which is known to be suitable for large deformation and fracture simulation. This study aims to develop a robust SPH simulation which can consider both inter-granular and intra-granular fractures in ceramics.

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Name	Supervisor	Title	Abstract
Sha Peng	Yoshioka Katsunari	Internet-wide Discovery of IoT Platforms Focusing on Keywords in their Web UI	Security of IoT platforms operating on the cloud is crucial, yet its actual status remains unclear. This study proposes a method to explore IoT platforms using the Internet-wide scanning system Censys and several IoT keywords. The results of the exploration using the proposed method were manually evaluated through random sampling. As a result, it was confirmed that a variety of IoT platforms could indeed be discovered.
Rawat Adwait	Shima Keisuke	FPGA-Based Open-Set Recognition: A Novel Approach Using RNNs	Supervised learning performs well in closed-set scenarios but struggles with unknown conditions, making open-set recognition (OSR) essential for real-world applications. In Industry 4.0, OSR enhances CNC milling by optimizing machining parameters and improving productivity. However, existing software-based OSR models introduce latency, limiting real-time adaptability. To address this, we propose a real-time FPGA-based OSR system for rapid classification of CNC sensor data, enabling efficient assessment of machined surface quality. Our approach leverages FPGA’s parallel processing capabilities for high-speed, adaptive classification. Experimental results demonstrate superior performance over traditional models, highlighting the potential of hardware-accelerated OSR in intelligent manufacturing.