List of Dissertation Abstract　(Department of Information Environment)

Name	Supervisor	Title	Abstract
Mao Qingxin	Yoshioka Katsunari	Analyzing Carpet Bombing DRDoS Attacks Observed by Honeypot	Carpet bombing-type DDoS attacks that attack a wide address range instead of a single IP address have been reported. In this paper, we proposed a new aggregation algorithm for carpet bombing and tried to understand the actual situation of carpet bombing. As a result of the analysis, it was confirmed that the above-mentioned aggregation algorithm significantly reduces the number of attacks during the period when the number of attacks is rapidly increasing according to the conventional definition of attack events.
Aoki Shunsuke	Matsui Kazumi	Ab initio calculations to estimate the strength of two-phase interface in carbon steels	In this study, ab initio calculations were used to evaluate the ideal shear strength of the two-phase interface of carbon steel. The slip stress was obtained by differentiating the potential curve along a slip path. Its maximum value is evaluated as the ideal shear strength.The interface is considered as a major locations of void occurrence in the continuum damage mechanics. By evaluating the sliding strength at this interface, this study contributes to understanding of elementary processes of the ductile failure, namely void occurrence, growth and coalescence.

ANZAI RIKU	MATSUMOTO TSUTOMU	A Study on Aggregate Signature System for IoT Using BLS12-381 Pairing	To meet the security requirements of IoT systems, which are expected to become more complex in the future, advanced cryptographies, such as aggregate signatures, are being put to practical use. Aggregate signatures are often constructed using complex operations, such as pairing points on elliptic curves, and reducing the computational time for pairing and the computational costs, such as power consumption and memory usage, are issues that need to be addressed to become widespread. For this reason, we present an implementation of pairing on the BLS12-381 curve that is suitable for resource-rich servers and resource-limited IoT devices, respectively, for use in advanced cryptographies such as aggregate signatures.
igarashi naoki	mori tatsunori	An investigation of question-answer matching methods for automatic summarization in congressional minutes.	As a pre-processing step in the automatic summarization of the congressional minutes with the aim of creating a "Congress Newsletter (議会だより)". There has been a demand for converting the congressional minutes in the form of a batch of questions and answers into a one-question-and-answer format. In this paper, we split the batch of questions and answers to obtain the questions and answers that are the elements of the one-question-and-one answer format. Furthermore, the proposed method, which focuses on the difference in the accuracy of the segmentation, shows an improvement in the conversion accuracy. In addition, a comparative study was carried out on the method of matching questions and answers obtained by segmentation.

Ishige taiki	tomii takashi	DB design and application of load leveling oriented smart grid integrating PV and EV	This paper describes a database design and its application for simulation evaluation of a new smart grid that integrates solar power generation and electric vehicles (EVs).Renewable energies, including solar power, are unstable.This makes it difficult to match power demand to power generation.To address this problem, EVs equipped with high-capacity batteries are expected to make effective use of solar-generated power by matching power supply and demand through effective charging and supplying of power.In addition, it is possible to suppress fluctuations in net load (load leveling).This matching of power supply and demand by controlling the charging and feeding of EVs is called VGI (Vehicle Grid Integration).This study evaluates the feasibility of VGI by collecting location-specific data and using an originally designed database schema. In particular, this paper evaluated the simulation of load leveling at annual level, combining several types of real data with reasonable hypothetical data.As a result, it was confirmed that fluctuations in net load could be suppressed for most days of the year except for a few exceptional days.It was also confirmed that much of the driving power for commuting for the EVs participating in the VGI comes from solar power.

Ichino Takahiro	Nagao Tomoharu	Unsupervised Video Hashing using Image Clustering	In recent years, due to the huge amount of video content, there has been a lot of research on similarity-based video retrieval. Many studies have been carried out using unsupervised hashing methods, but they suffer from the problem of incomplete viewpoint dependence. In this paper, we propose a method for unsupervised video hashing using global and local features of the video. Experiments on a motion recognition dataset show that the proposed method improves the retrieval accuracy compared to conventional methods.
Inoue Takahiro	Yoshioka Katsunari	Analyzing Environment-Sensitive Malware using Sandboxes that Simulate File System of Real IoT Devices	In dynamic analysis of IoT malware that targets specific devices, it is difficult to analyze the original behavior of malware because a single analysis environment cannot reproduce the internal configurations of various IoT devices.In this study, we perform dynamic analysis in multiple sandboxes that simulate the internal configurations of devices built from the file system components of various IoT devices and analyze the factors that depend on the execution environment by comparing the behavior of IoT malware under different device environments.

Imoto Sakuya	Matsui Kazumi	FE2 Evaluation of the Effect of Distance Between Adjacent Voids on Ductile Damage	Various papers have pointed out that the distance between micro voids affects the macroscopic damage behavior of materials. In this study, multiscale analysis is used to evaluate the effect of micro voids spacing on macroscopic ductile failure. The macroscopic loading conditions are transformed by the multiscale method. By changing the macroscopic stress direction in FE2 simulations, evaluate the anisotropic responses in macro-scale, which are caused by their microscopic structure. In addition, the effects of micro-void distances are also evaluated in their macroscopic failure behaviors.
UEDA TAKAHIRO	Yoshioka Katsunari	An internet-wide view of connected cars: Discovery and attack-observation of exposed automotive devices	In recently, although cyber-attack targeting connected cars become significant risks. Among their entry points, On-Board Equipment (OBE) that is directly accessible from the Internet can be an immediate target. In this study, we proposed discovery method to find OBE, investigated the potential cyber-attack risks against these discovered devices, and implemented the honeypots imitating these OBE to reveal the state of cyber-attacks against it. We believe this result provides a lower bound of the security risk of Internet-facing vehicular devices.

Okawa Yasuhiro	Shirakawa shinichi	Symbolic Regression Method with Solution Update Based on Gradient Information	Symbolic regression (SR) is a problem in identifying a function expression representing a relationship of given input-output data and has several applications, such as system identifications. Cartesian Genetic Programming (CGP) solves SR problems by updating the network structure representing a mathematical function using the mutation operation. This study introduces an efficient solution update method into CGP, which exploits the gradient information of the evaluation function with respect to the intermediate outputs of a network structure.
Ota Koki	Nagao Tomoharu	Event-based Anomaly Detection using Asynchronous Sparse Convolutional Neural Network	Recently, research of automatically anomaly detection from videos has been progressing, due to the spread of surveillance cameras and the improvement of video processing technology. In order to detect anomalies, motion information acquisition and background removal are necessary, resulting in a complex process. Therefore, event cameras, which record only brightness changes, are gaining attention. In this paper, we propose a lightweight event-based anomaly detection method using asynchronous sparse convolutional neural network. Also, we apply the proposed method to a dataset for action recognition and evaluate the calculation efficiency and anomaly detection accuracy to verify the effectiveness in the experiment.

Otsu Takaya	Noma Atsushi	Study about class and singularities of dual variety of projective hypersurface of dimension 2 with isolated singularities by resolution of gauss map	The purpose of this study is to clarify properties of isolated singularities of surfaces, and for that focus on degree and singularities of dual surface. The method is resolution of singularities and resolution of gauss map, and we consider relation between dual surface and divisors on the nonsingular surface. Here, ADE singularities are one of the simplest singularities of surfaces so that resolution of ADE singularities is well-known. But There is no previous research calculating resolution of gauss map of ADE singularities. Therefore, this study shows resolution of gauss map ADE singularities as a concrete example.
Onogi Hiromu	Mori Tatsunori	Generating summary sentences of parliamentary proceedings introducing evaluation of question-answer dialogue relationships by GAN	There is a great demand for automatic summarization of parliamentary proceedings. It is necessary considering the correspondence between questions and answers when summarizing, but an effective method has not yet been established. We tested a new method to train a T5-based generative summary model to consider the correspondence between questions and answers by using an adversarial generative network (GAN). We also introduced a new framework for the loss function of the generator and tried a novel method that uses the generated question summaries as input when generating answer summaries. The summaries generated by the proposed method obtained higher accuracy than the ones of many existing models. Furthermore, we believe that the "readability" of the generated summaries was improved as a result of human evaluation.

Owada Takumi	Matsumoto Tsutomu	Magnetic Attack on ElectroMagnetic Relay and Its Countermeasure	Relays are used in many electrical and electronic devices, including switches and sensors. Relays are incorporated into various systems, and a malfunction of a relay can significantly impact the entire system. One such relay is the electromagnetic relay, which switches circuits open and closed by operating the contact points with an electromagnet. Due to their characteristics, electromagnetic relays are easily affected by magnetic fields. Therefore, an attacker can illegally connect the contacts and manipulate the system by applying a strong magnetic field to the electromagnetic relay. We have defined this attack as a magnetic attack and reported its potential as a major threat. In this paper, we propose a method for evaluating the resistance of systems including electromagnetic relays, based on the evaluation of the resistance of electromagnetic relays alone to magnetic attacks.
Okumura Hiroyuki	Nagao Tomoharu	MIPCE: Generating Multiple Patches Counterfactual-changing Explanations for Time Series Classification	We propose Multiple Patches Counterfactual-changing Explanations (MIPCE) for time series classification. First, MIPCE obtains time series subsequences from features appearing in the FCN and divides the time series into patches. Then, it generates the process of change to the counterfactual in each patch. We compared MIPCE with other counterfactual explanation methods in terms of proximity, plausibility, and substitutability, and confirmed that MIPCE provides explanations that follow the data distribution and capture the features that contribute to classification. Furthermore, we confirmed that the proposed method leads to users' understanding of DNNs through user tests.

Onodera Keita	Matsumoto Tsutomu	A Research on Instrumentation Security of Object Detection Sensors Using Near-infrared Light	The system uses sensors to detect objects. To operate the system safely, it is necessary to consider the security of the sensors. One of the object detection sensors is a photoelectric sensor that uses near-infrared light. Photoelectric sensors are widely used because of their simple structure. Therefore, it is necessary to consider the security of photoelectric sensors. In this paper, we examine attacks on reflective and transmissive photoelectric sensors and clarify the threats. Then, we conduct an attack experiment on an actual device to confirm the studied threats.
Kaneko Yuto	Shikata Junji	Multi-Authority Attribute-Based Signatures from Lattice	We construct Multi-Authority Attribute-Based Signatures (MA-ABS) based on lattices. Our scheme is the first scheme that does not use Non-Interactive Zero Knowledge proof (NIZK) and is secure under the learning with errors (LWE) assumption. The idea is based on the technique of constructing MA-ABS from Multi-Authority Attribute-Based Encryption (MA-ABE) by Okamoto and Takashima (PKC 2013) and we apply this technique to lattice-based MA-ABE of Waters et al. (TCC 2022).

Kanoya Kosuke	Okajima Katsunori	Generating Stair Walking Perception by Manipulating Audiovisual Information in Virtual Reality Space	We have developed a VR walking system that generates the sensation of stair walking by presenting visual stimuli that consider the foot and head movements during stair walking while walking on a level ground in real space. We conducted experiments to evaluate the sensation of ascent, driving force, fatigue, instability, and stair walking. The results showed that each of the senses was perceived more strongly than with existing methods under certain conditions. Furthermore, we added auditory stimuli matched with visual stimuli. The results showed the sense of ascent was found to be enhanced. When the auditory stimuli did not coincide with the visual stimuli, the perceived sensation tended to decrease.
Kanno Haru	Ushikoshi Erika	Existence and of the time periodic solution of the Navier-Stokes equation with large boundary data in a time dependent domain	The purpose of this article is to prove existence of time periodic solution of big boudary data in a time dependent dmain. Okabe(2011) proved existence of time periodic solution of big boudary data in a time independent dmain by using generalized Helmholtz decomposition in Kozono-Yanagisawa(2009). Our way is similar to Okabe.

Kubo Ataru	Matsumoto Tsutomu	A Study on Attack Resistant Ranging System Using Two Types of Sensors	Information from distance sensors is important for automatic driving to recognize the environment. On the other hand, various attacks have been reported to cause the distance sensor to output incorrect distance measurement results. Therefore, it is important to study countermeasures against these attacks. In this paper, we propose a method to detect attacks by combining the outputs from two types of distance sensors. We also evaluate the effectiveness of the proposed method by simulating several attack patterns using a driving dataset.
Sakakibara ryuji	Shirakawa Shinichi	Learning Excavator Operating Model Using Reinforcement Learning	In recent years, the shortage of skilled operators in the construction industry has become a problem, and automation of construction machine operation is required. In this study, we aim to obtain a model that can operate a hydraulic excavator as well as a skilled operator by combining supervised learning and reinforcement learning. Evaluation experiments show that the proposed method is effective for the task of aerial plowing with a hydraulic excavator in a simulated environment. We also discuss the application of the learned model to an environment different from the training environment.

SATO KAICHI	Ozeki Kenta	Upper bounds for isolation number of k-trees and their best possibility	A dominating set in a graph is a subset of vertices used to locate efficiently evacuation sites. Isolating sets are in a trade-off relationship with dominating sets in terms of cost, distance, and so on, and the minimum size of isolating sets is called the isolation number. In this thesis, we extend the upper bound of the isolation number for maximal outer plane graphs to k-trees and show its best possibility.
Sameshima Kaichi	Yoshioka Katsunari	Observation of Vulnerability Exploits and Attack Infrastructure of IoT Malware by Dynamic Analysis	In recent cyber-attacks where IoT devices are targeted, it is important to know the actual activities of IoT botnets, collections of malware-infected devices, in order to take countermeasures. In this study, dynamic analysis is used to perform a longitudinal analysis of the vulnerabilities exploited by IoT malware for propagation. It also aims to analyze activity trends by observing the instructions sent to IoT botnets by Command & Control servers managed by attackers.

Shichiri suke	Tomii Takashi	Design and effective use of EV energy lifelog schema based on space-sampled road data	In this study, we propose a spatial energy analysis method based on the collection of electric vehicle (EV) energy life logs.The energy consumption of EVs varies greatly depending on road conditions, such as road gradient, and driving conditions, such as acceleration/deceleration and speed range.Therefore, there is a demand for estimating the energy consumption of EVs and aggregating and visualizing it for each location.In this paper, "segments" of a road divided by a certain distance are used as aggregation units, and the energy consumed at each point is clarified.This enables more precise analysis of driving and roads, and is useful for decision-making support and review of driving.
Shibata Hirokazu	Matsui Kazumi	EXAMINATION OF BASIC ISSUES FOR EXTREMELY LOW MACH NUMBER FLOWS AROUND THREE-DIMENTIONAL SQUARE CYLINDER	The atmosphere forms a density stratification with a density gradient in the height direction due to the effect of gravity. Incompressible flow simulation has been used in conventional studies of urban wind flow, and the effect of density stratification on wind flow has not been clarified. The objective of this study is to evaluate the effect of density stratification by applying compressible flow simulation to urban wind flow. In its early stage, compressible flow simulations to flow around a three-dimensional square cylinder in uniform flow are carried out to identify technical issues.

Shimamori Eiki	Mori Tatsunori	Detection and Modification of Rephrasing Expressions to Improve Readability in Japanese Speech Text	Speech transcriptions sometimes include rephrasing, which can reduce readability and cause errors in subsequent processing. Although it is useful to mechanically correct these rephrasing, no analysis of the rephrasing for the purpose of mechanical correction has been conducted, and no method for comprehensive correction of rephrasing based on such an analysis has been studied. In this study, we proposed and evaluated a method for detecting and correcting the rephrasing that appears in Japanese spontaneous speech transcriptions.
Shoji Manato	Nagao Tomoharu	Mixing Data Augmentation using Unlabeled Data for Environmental Sound Classification	Many methods using deep learning have been proposed for environmental sound classification, but the obstacle is that the annotation cost of environmental sound data is high and there are few labeled environmental sound data. On the other hand, there are many unlabeled environmental sound data. In this study, we proposed a data expansion method that uses unlabeled environmental sound data to generate pseudo data. As a result, we confirmed that the classification accuracy was improved by adding the pseudo data using the proposed method.

Sugano Yuki	Okajima Katsunori	Formulation of visibility and display texture of luminous characters through decorative panels	The purpose of this study is to clarify the effects of luminance information on visibility and display texture of transmissive characters emerging from panels decorated with wood grain patterns, etc., and to formulate using correlated luminance information for each evaluation.In the experiments, samples of actual objects and displays were prepared to reproduce transmissive characters that emerge from the decoration. The experimental results show that the luminance characteristics, such as the luminance slope of the edges of the transmitted light letters, affect the visibility and the display texture.
Sugiyama Shingo	Mori Tatsunori	Automated scoring of descriptive examination using deep learning taking account of part of basis for scoring in answers	Automatic scoring technology that uses deep learning to learn scoring rules from human-scored answers has been studied as a means of reducing the burden of scoring descriptive examination. In this research, we proposed a model that uses supervised attention to learn what the grader paid attention to in the answer texts, and to score the texts while identifying the basis for scoring. Experimental results showed that the accuracy of scoring was improved compared to a model that did not use supervised attention, indicating the usefulness of learning the basis for scoring in automated scoring system.

Sugiyama Hiroaki	Yamada Takahiro	Deformation Pattern Simulations of Notched Sheet in Out-of-Plane Directions	In this paper, out-of-plane deformation pattern simulations of notched sheet were presented. A method to extract buckling points on equilibrium paths in which reaction force vector change constantly, and to show the possible existence of a bifurcation paths extending from the buckling points is proposed. By using this method, various deformation patterns were analyzed for an elastic sheet by tracing the bifurcation paths, and it was shown that bifurcation paths do indeed exist. Furthermore, by extracting the buckling points on the obtained bifurcation paths, it was shown that the switching points and bifurcation points of bifurcation paths can be distinguished.
Sekii Fumiya	Mori Tatsunori	Construction of Werewolf Agents Using Mental Space and Genetic Algorithms and Analysis of Dialogues Inducing Change of Mind	We are studying how to realize dialogue such as persuasion and deception (dialogues inducing change of mind) in werewolf games. In this paper, we constructed an agent that introduces the concept of mental space for clarify the thought process as an agent to be guided by a genetic algorithm, and observed the mental space of the agent during the game to analyze the difference in the internal state of each speech protocol.

Soeda Shunki	Yoshioka Katsunari	Analyzing environment-sensitive IoT malware with bare-metal IoT devices	Some IoT malware is known as persistent IoT malware, which continues to infect devices permanently even after they are rebooted. Although the threat of such persistent IoT malware has been increasing, the devices that can be the target of persistent infection and the removal methods in the case of persistent infection have not been sufficiently verified. In this study, we propose a method of detecting persistent infection using a simple assessment program that mimics the behavior of persistent malware, and verify the presence or absence of persistent infection and removal methods with bare-metal devices.
Takao Kyohei	Yoshioka Katsunari	Managing and Operating URL Blocklist using Cyber Security Intelligence via Web Access Log	Blocklists of malicious URLs are widely used to prevent users from reaching malicious Web sites. In this study, we proposed a method for managing the blocklist using VirusTotal, and we focused on maintaining URL blocklists and evaluated their detection/management results.As a result of the evaluation experiment, compared to previous methods, we could reduce the number of inquiries to VirusTotal was less than half compared to the case without management while maintaining an accuracy of 90% or more of our blocklist while suppressing false positives due to a flip in VirusTotal's judgment.

TAKAHASHI Atsuki	NOMA Atsushi	Classification of plane curves with *m*-ple point by system of multiplicity sequences	While it is well known that plane curves with 2-ple point can be resolved into nonsingular curves by blow up, the number of blow up required to resolve curves into nonsingular curves with *m*-ple point (*m*>=3) is not known. In this study, I performed blow up on plane curves with 3 and 4-ple point, respectively, and attempted to classify the curves by system of multiplicity sequences. As a result, it was found that plane curves with 3 and 4-ple point are classified into 7 and 19 cases, respectively.
Takahashi Daiki	Nakamoto Atsuhiro	2-Connected spanning subgraphs of circuit graphs	The Hamiltonian cycle problem is an important topic in graph theory and has been the subject of many related studies. It is known that any circuit graph with n vertices has a 2-connected spanning subgraph of which the number of edges less than 4(n-1)/3.　It is also known that this value is best. In this thesis, we give a characterization of circuit graphs with n vertices for which the number of edges of any 2-connected spanning subgraph must be at least 4(n-1)/3.

Takeda Misaki	Okajima Katsunori	Evaluation of Walking Space by Immersive Human Flow Simulation Considering	In this study, an impression evaluation experiment was conducted under three different density conditions to investigate the effect of the presence of human flow on the psychological evaluation of walking spaces with different structures and interiors using an immersive human flow simulation. As a result, it was found that the wider the aisle width, the more comfortable it is to walk and the more lively it seems, but in a space with few people, the width of the aisle has no effect. It was also found that placing objects near the wall is more comfortable for walking, but in low-density spaces, placing objects in the center gives a better impression. This result indicates that spatial evaluation can be performed even in a virtual space, and is expected to be further utilized in architectural design.
Tachibana Kazuki	Matsumoto Tsutomu	A Study on Remote Physical Attacks against IoT Systems	IoT systems use a variety of devices for a wide range of applications. The leakage of confidential information due to attacks inside these devices has become a problem. Even if internal threats are eliminated, there are still external threats such as eavesdropping on communications between devices. In this paper, we examine two specific threats: a remote physical attack inside the device of an IoT system, and a remote physical attack outside the device, showing that they are serious threats.

Tamura Sadamichi	Fujii Tomohiro	On the c-command constraint in Japanese Wh-questions: A rating and modeling study	It has been known that in Japanese, wh-phrases such as “dare” are dependent on the Q particle “ka” in a certain way; wh-Q dependencies are subject to what is called the c-command constraint. The current study conducted an acceptability rating experiment to examine whether Japanese speakers possess the grammatical knowledge in question. The results show that the condition violating the constraint was rated significantly lower than those that do not. The study also addresses N-gram a learning model for the constraint. It is demonstrated that our trigram model is able to learn the constraint when it is provided with the training data informing what syntactic nodes are spanned by wh-Q dependencies in child-directed speech.
Toya Kotaro	Matsui Kazumi	Numerical Simulation of GTN model by Block Newton method	The objective of this paper is to define a coupled problem of the equilibrium equation, the yield conditional equation, the damage variable evolution equation, and hardening coefficient evolution equation for the elasto-plastic damage problem using the GTN model, and to apply a numerical method to them based on the Block Newton method by simultaneously linearizing them.

Nakayama Tomoe	Okajima Katsunori	Quantifying the effect of chewing sounds on the evaluation and mood of cold confectionery	To quantify the influence of chewing sound of cold confectionery on food evaluation and mood change, experiments 1 and 2 were conducted to evaluate sound stimuli with increased or decreased frequency components of chewing sound and artificial chewing sound of created chocolate. As a result, it was shown that the pleasant evaluation of the chewing sound, the feeling of hardness, and the mood evaluation before and after the stimulus presentation were changed by increasing or decreasing a specific frequency band, and that the two kinds of artificial chewing sounds created could be substituted as the actual chewing sound of chocolate. In addition, when the sound stimuli that showed those changes in Experiment 1 and 2 were presented at the time of eating, it was examined whether they had the same effect on food evaluation and mood change, and it became clear that the same change occurred in the pleasant evaluation.
Nishihara Kenta	Shirakawa Shinichi	Automatic Berthing Control Using Reinforcement Learning in Environment with Control Uncertainty and Wind Disturbance	Automatic ship operation has attracted attention in the shipping industry as a solution to maritime accidents caused by human factors and the seafarers' shortage. In this study, we use reinforcement learning to address automatic berthing, a technology necessary for realizing automatic ship operation. This study aims to obtain the berthing control law on a simulator where the difficulties of control in a real environment, such as the influence of the topography and wind in a real port and the accuracy of the operation of ships' actuators, are reproduced. In addition, we propose a learning method to handle these difficulties and analyze the success rate of berthing and the collision probability with obstacles in the harbor due to the difference in wind direction.

Nojo Daigo	Tomii Takashi	Application of Visualization System Using SQL-Like Manipulation Language and Data Manipulation Acceleration for Lifelog Analysis	We have proposed a system (PC)2DV (Parallel Coordinates Plot Commutative Data Visualizer) that can visualize data consisting of multiple attributes using PCP, and store and reproduce their states in a unique SQL-like language representation. In this paper, we attempt to support data manipulation for the purpose of lifelog analysis. First, we show the usefulness of (PC)2DV by using it to analyze electricity data. Time-series data acquired on a daily basis is converted into periodic data by PIVOT operation, and visualized using PCP. This allows us to visualize the periodic information in the life log data. Next, (PC)2DV speeds up data manipulation for lifelog analysis by reducing the number of data by GROUP BY aggregation. As a verification, we quantitatively compare the rendering time with conventional methods and show that (PC)2DV is capable of big data analysis.
Noguchi Masashi	Shirakawa Shinichi	A Robust Domain Generalization Method for Open-Set Recognition in Domain Shift	In real-world applications, a machine learning model is required to handle an open-set recognition, where unknown classes appear during the inference, in addition to a domain shift, where the distribution of data differs between the training and inference stages. Domain-Augmented Meta-Learning (DAML) is a method to consider this situation, where both domain shift and open set recognition occur, but it is expensive to learn. This work comprehensively evaluates domain generalization methods for open-set recognition in domain shift and shows that computationally inexpensive domain generalization methods exhibit comparable performance with DAML. In addition, we attempt to improve their methods by introducing the techniques used in DAML and report their performance.

Noma Takaya	YOSHIOKA Katsunari	Who Left the Door Open? - Analyzing Root Causes for Exposed IoT Devices through Campus Notification and Manufacturer Survey-	Recently, vulnerable services such as Telnet and FTP running on many IoT devices have been exploited in cyber attacks. In this study, we conducted a university notification survey and interviews with device manufacturers, and we conclude that the presence of misconfigured devices was less driven by the human error of the owners and more by the choices of the manufacturers.
Hasegawa yuichi	shikata junji	Security Analysis of a Lattice-based Fuzzy Signature Scheme	In this paper, we focus on a fuzzy signature scheme, which is an effective technique that provides authentication of systems based on both biometric information and cryptographic schemes. In addition, the current trend of research on cryptography is increasing the demand for the post quantum cryptography(PQC) due to the realization of a quantum computer in the future. The existing post-quantum fuzzy signature scheme presented by Kaafarani and Katsumata is based on the RLWE (Ring-Learning with Errors) assumption, but we modify this scheme so that its security is based on the MLWE (Module-Learning with Errors) assumption, which is a generalization of the RLWE assumption, and then provide a rigorous security proof. Also we give formal security definitions for digital signatures, which are suitable for constructing fuzzy signatures, and set parameters based on our security proof.

Hiraishi Chika	Katsunari Yoshioka	Proposal for a URL block list creation method using external security services and web access logs	Security services using URL blocklists are widely used against malicious sites, but the creation of blocklists is time-consuming and technically expensive. In this study, we propose a method for creating a URL blocklist using Web access logs and external security services to protect users of an organization. The results of evaluation experiments show that the proposed method is more effective than other security services in protecting users.
HIROSE Yoichi	SHIRAKAWA Shinichi	Automated Feature Construction with Domain Knowledge Using Language Models	Feature construction is effective in improving machine learning, and its automation methods have been developed. However, they do not consider domain knowledge sufficiently, and their execution time depends on the number of columns in tabular datasets because they create candidate features exhaustively. In this study, we propose a method that predicts features from meta-information in a dataset and aims to exploit domain knowledge using a language model. The experimental results show that the performance of the proposed method is comparable to previous studies and that the execution time does not almost no change with the number of columns in tabular datasets.

Fukuda Ittetsu	Shirakawa Shinichi	Robust Focus Classification Model for Different Shooting Environments in Bhas42 Cell Transformation Assay	In the Bhas42 cell transformation assay (Bhas42 CTA), a method for evaluating the carcinogenicity of chemical substances, experimenters stain cells exposed to the test substance and need to identify regions of cancerous cell populations, called focus, visually. Deep learning-based judgment models have been developed to reduce the experimenters' burden and realize objective judgments. In this study, we construct a robust focus judgment model against differences in shooting environments between model training and operation phases by automatically selecting and applying image pre-processing during the model operation phase.
Matsubara Kyosuke	Nagao Tomoharu	Prediction of Arteriosclerosis Index from Medical Examination Data Based on Medical Knowledge	CAVI, an index of arteriosclerosis, is difficult to measure due to the need for individuals to visit medical institutions and the difficulty of testing depending on the area of residence. In this paper, we propose a method to predict CAVI from medical examination data to enable routine acquisition of the arteriosclerosis index. The proposed method uses quantile regression to indicate the range and probability in a multistage manner, leading to the user's next action. Appropriate pre-processing of input variables improves the prediction performance of CAVI, and comparative validation experiments of four methods confirm the effectiveness of the proposed method.

Mishima Shigemasa	Yamada Takahiro	NUMERICAL SIMULATION OF PLASTIC DEFORMATION OF GRANULES IN POWDER COMPACTION	The rearrangement and plastic deformation of granules that appear during the molding process of ceramics may affect the quality of the final product. Prediction of mechanical behaviors in compression molding from a single particle characteristic enables the appropriate control of particle characteristics to improve product quality. In this work, we propose a numerical procedure for compression molding by considering the plastic deformation of granules. Numerical results show that the proposed procedure can simulate the decreased gaps between particles due to plastic deformation.
Mishima Yudai	Okajima Katsunori	Influence of temporal changes in visual information of food on taste perception	The purpose of this study was to measure the effects of visual information of food on taste perception. Based on psychophysical experiments, we examined the effects of visual information on taste expectation of food, presentation time of visual information, and temporal variation of visual information. The results showed that the cross-modal effects of color and taste information require prior expectations, and that these expectations are larger the longer the presentation time of color information is. It was also shown that visual information input just before eating significantly affects taste perception.

Yazaki Hirofumi	Nishimura Takashi	Fundamental problems in the envelop in the plane	A family of straight lines may create a curve called an envelope. This is a field where this curve has been studied for a long time. I consider four basic problems about their envelopes in the plane: definition problem, existence problem, representation problem, and uniqueness problem. Special attention is paid to the situation when the Gauss map has a singularity and when it does not, since the situation is different.
Yamanishi kouta	Shirakawa Shinichi	Proposal of Neural Additive Models with Feature Selection Using Prior Information	Neural Additive Models (NAMs) exhibit excellent interpretability and prediction accuracy, which are effective for tasks requiring an explanation of the basis for predictions, such as medical and legal applications. Extensions of NAMs, such as methods taking into account feature interactions and introducing a feature selection mechanism, have also been proposed. In this study, we propose to use feature importance given from such as domain knowledge and sensing cost as prior information in NAM with a feature selection mechanism.

WANG FUJUN	OKAJIMA Katsunori	Haptic system for reproducing food tactile felt by hand through cutlery	Aiming to simulate the tactile of food by hand through cutlery. First, the texture characteristics of food were obtained using a compression test machine. Next, the real touch of the food was replicated by adjusting the variables of the haptic device (Phantom). Then, based on these data, multiple regression analysis was performed and a model that can predict each haptic variable was obtained. Results from the reproduction evaluation experiment with two conditions (with and without visual stimulation), showed that the touch of cutting and piercing food can be accurately reproduced, and the influence of visual stimulation on touch was demonstrated.
ZHANG ZIOU	NAGAO TOMOHARU	Improving the Accuracy of Small Object Detection in Drone Images Using Super-Resolution	In recent years, drone imagery has been increasingly developed and applied in a variety of fields. However, object detection using drone images is less accurate for detecting small objects. For drone images with low resolution, small objects have little pixel information so that improving object detection methods alone is not sufficient. In this study, we propose a method to improve the accuracy of small object detection in drone images by using superresolution. And experiments using actual drone images confirmed the accuracy improving.