

List of Dissertation Abstract (Department of Information Environment)

Name	Supervisor	Title	Abstract
ARAI Takahiro	SHIRAKAWA Sinnichi	Development of Interpretable Machine Learning Models for Image Recognition	Convolutional Neural Network (CNN) is a high-performing machine learning model in image recognition tasks. However, CNN has the problem in applying it to fields that require the prediction grounds due to its low interpretability. This study proposes a rule-based machine learning model for image classification tasks. The proposed method can train flexible and interpretable rules by a gradient descent method. We evaluate the performance of the proposed method using image classification datasets and confirm that our method can obtain the interpretable rules.

IKEGAMI Daiki	NAKAMOTO Atsuhiko	Linear number of diagonal flips in triangulations on surfaces	A triangulation is a graph embedded on a surface such that each face is triangular. Negami's theorem states that any two triangulations on a surface can be transformed each other by finite sequence of diagonal flips. It is known that there is a quadratic upper bound for the number of diagonal flips in Negami's theorem with respect to the number of vertices. We improve the bound by giving a linear upper bound for the case of surfaces with low genus.
ITO Rena	NAGAO Tomoharu	Unsupervised Video Hashing for TV commercial retrieval	In the production of commercials, there is a high demand for mechanical retrieval of past works based on video content, because it enables cost reduction in the analysis process. In this paper, we propose an unsupervised video hashing method using image clustering that is effective even for commercial videos that have many processed parts including scene development. The effectiveness of the proposed method is demonstrated through qualitative evaluation using a commercial video dataset and quantitative evaluation using a new video dataset that is similar to the nature of commercial videos.

INOUE Tamon	NAGAO Tomoharu	Unsupervised fashion image retrieval using disentangle	<p>Fashion image retrieval for each attribute is important to reflect customer preferences. In conventional research, research using supervised learning has been actively conducted. However, since fashion images have many attributes, it is costly to obtain labels.</p> <p>On the other hand, in recent years, Disentanglement Learning has been studied, which enables the acquisition of disentangled representation composed of intuitively interpretable factors from images without labels.</p> <p>Therefore, in this paper, we propose a method of unsupervised fashion image retrieval using disentangled representation.</p> <p>Experiments show the selection of latent variables improves the search accuracy.</p>
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INOUE Yuta	YOSHIOKA Katsunari	Proof of concept of evasive malware that identify target machine	In recent years, the introduction of security appliances that detect malicious behavior by executing the files to be inspected in the sandbox is progressing. However, there is a problem of evading detection by malware that pretends to be harmless in other environments by performing fraudulent activities only on the target machine. These malwares are difficult to detect in existing sandboxes. Therefore, we will examine the risk and countermeasures of attacks that identify the target machine from the information implanted into the machine or stored in the configuration file, etc.
IWASAKI Keigo	MORI Tatsunori	Recognition and structure analysis of nested named entity	Named entities refer to concepts such as specific place names and personal names. Named entity recognition is important in natural language processing systems such as question answering systems and document summarization. There is a named entity with a nested structure consisting of compound words in the named entity. In this study, we propose a method of hierarchically extracting named entities with a nested structure by dividing them into layers corresponding to the depth of nesting. We also analyze the relationship among named entities with a nested structure.

OTSU Ryota	OKAJIMA Katsunori	Development of Bidirectional Spectral Reflectance Measuring System and Texture Rendering for Multicolor Planes	Using two robotic arms and a two-dimensional spectroradiometer, we developed a system for measuring the bidirectional reflectance of materials with flat shapes. As a result of measuring silver nano-ink decorated printed material with this system, we were able to measure the rapid increase in reflectance in the specular direction of it. We also measured the bidirectional reflectance of a sample of leather using our system, and reproduced and modulated the texture of the leather under some illumination conditions on the computer. The results suggest that our system can be used to record, reproduce, and modulate the texture of flat and non-uniform materials.
ONUKE Shunpei	OKAJIMA Katsunori	Development of Virtual Reality Environment Considering Eye Accommodation and Evaluation of Car Interface	In this study, we demonstrated the validity of the visibility evaluation in the virtual environment (Exp. 1 and 2), and evaluated the car interface (Exp. 3). Specifically, we compared the visibility in the real and virtual environment when eye movement didn't occur in Exp. 1 and when occurred in Exp. 2. The results showed that it was necessary to match the luminance conditions and to add "Accommodative lag" to the focus blur according to the gaze in order to obtain similar evaluations in both environments.

			Exp. 3 showed that HUD had the best visibility, and also emphasized the importance of the lag of the focus blur.
OMURA Kazuya	NAKAMOTO Atsuhiro	Diagonal Flips in Triangulations on the Annulus	<p>A triangulations on the annulus is a simple graph on the annulus such that triangles except for the faces on two boundaries.</p> <p>In this paper, we simply call a triangulation on the annulus a annulus triangulation, that we shall prove that any two annulus triangulation have the same number of vertices at the boundary of two faces, they can be transformed into each other by diagonal flips.</p> <p>Moreover, the upper bound of the required number of diagonal flips is given by a linear function of the number of vertices.</p>
OKAMOTO Koki	MORI Tatsunori	Study of cryptocurrency exchange rate forecasting method considering SNS text and its spreading power	This paper focuses on SNS and financial markets. It proposes a method for predicting the exchange rate of crypto assets using SNS text and spreading power from the viewpoint of user attributes and text tense

<p>KATSURAGAWA Tomoya</p>	<p>NAKAMOTO Atsuhiro</p>	<p>The relation between domination number of maximal outerplanar graphs and the number of vertices with degree 2</p>	<p>Let G be a graph. A vertex set S of G is a dominating set of G if $S \cup N(S) = V(G)$, where $N(S)$ denotes the set of vertices adjacent to a vertex of S. The size of the minimum dominating set of G is called the domination number of G. I evaluated the upper bound of the domination number of maximal outerplanar graphs.</p>
<p>KATO Seiya</p>	<p>YOSHIOKA Katsunari</p>	<p>A Study on Adaptive Honeypot Framework for Observing Cyber Attacks Targeting Various Devices</p>	<p>Honeypots have been used to observe cyber attacks, but with the rise of the IoT, the number of target devices and services has diversified, making it difficult to observe attacks. In this study, we propose an adaptive honeypot framework that can emulate a variety of devices while maintaining a certain level of interactivity by using responses collected from real hosts. In our experiments, we confirmed that the framework can observe various types of attacks, and compared it with existing observation systems to show that the observation performance has been improved.</p>

KAMIYA Masaru	USHIKOSHI Erika	Hadamard variational formula for the fundamental solution of the unsteady Stokes equations with initial-boundary conditions	It is well known that the Stokes equations describes the motion of the incompressible fluid moving slowly. It is an interesting problem to analyze how the flow is affected by the domain deformation. In this paper, we consider the region dependence of the fundamental solution of the initial-boundary value problem of the unsteady Stokes equations. Here, the fundamental solution is the kernel of the integral representation formula for the inhomogeneous equations. In particular, our purpose is to derive the Hadamard variational formula for the fundamental solution of the unsteady Stokes equations under the domain perturbation preserving its volume.
KAWASHIMA Yuki	NEGAMI Seiya	4-coloring of graphs on surfaces in which each face is triangular or quadrangular	Tait showed that a planar triangulation is 4-colorable if and only if the dual of the triangulation is 3-edge-colorable, in the attempt to prove the Four Color Problem. Nakamoto et al. extended the result to graphs on surfaces in which each face is triangular or quadrangular, by restricting 4-coloring to cyclic 4-coloring. In this thesis, we extend this result to 4-coloring. Moreover, as an application, we give alternative proofs of two previously known theorems on coloring of quadrangulations.

KICHISE Yudai	TOMII Takashi	EV Energy Loss Visualization Based on Road Section Normalization Using Life-Log	In our previous research, we developed a system to estimate the energy consumption of EVs from the GPS logs of a running vehicle. In this study, we propose a visualization system to analyze the energy consumption data of EVs by mapping them to the locations where they have been driven. The proposed system refers to the view table in the relational database, and the analyst can define the view table using SQL, which is the operating language of the relational database, to perform various visualizations and analyses.
KUMAGAI Takuhiro	YOSHIOKA Katsunari	Observation and Analysis of Access to Honeypot Imitating a Remote Monitoring and Control System	With the spread of the Internet of Things (IoT), IoT devices have been leveraged in industrial fields. In order to understand the actual situation of attacks on remote control and monitoring systems in infrastructure facilities and factories with inadequate security, we constructed a honeypot that mimics a remote control and monitoring system, and conducted an analysis focusing on the behavior of accessors. We also conducted a survey focusing on the scanning activities of "IoT search engines".

GEMPEI Yuta	YOSHIOKA Katsunari	Detection and end-user notification on risky search keywords that lead to malicious websites	Recently, a variety of attacks have been observed on the Web. However, due to the diversification of attack methods on the Web, it is difficult to completely protect end-users from attacks using only existing countermeasures such as blocklist. Therefore, to protect end-users from attacks at an early stage, we proposed a method of identifying search keywords in search engines that are statistically likely to reach malicious websites and verified the effectiveness of notifying end-users. We detected several words that increase the rate of reaching malicious websites in the proposed method and evaluated the effectiveness of the early security notification by analyzing the notification experiments to end-users for more than 6 months.
KOSHIO Yamato	TAMURA Naoyoshi	Automatic correction of Japanese language composition exercises using graphs which have attributes of claim and premise	In the current automatic correction of Japanese language composition exercises, it is difficult to judge whether a claim has objectivity and consistency. In addition, evaluation results are often based on scores, and it is difficult to tell students why they got that score on a test. We propose a method for evaluating logicity using graphs which have attributes of claim and positive or negative relationship between claim and premise. In the meantime, we also propose a method for evaluating the logicity of

			Japanese essays, and the method can point out errors at the process.
KONDO Mizuki	YOSHIOKA Katsunari	Study on analyzing memcached DRDoS attacks and their infrastructures	Internet-facing Memcached services are known to have been misused as powerful reflectors of DRDoS attacks. In this paper, we first utilize high-interaction Memcached honeypots and Internet-wide scan results to analyze how high the amplification factors of Memcached attacks in the wild can be and how many open Memcached services there are. We then analyze how the attack infrastructures are constructed and operated. We find that 81 IPs in 7 AS are responsible for over 360,000 attacks (58% of all attacks we observed).
SHIGA Yuya	NAGAO Tomoharu	Data Augmentation for Reinforcement Learning in Feature Space	Reinforcement Learning(RL) has shown a lot of successful results in a variety of tasks; however, the learning process takes an enormous amount of time. Some works propose to improve RL agents' learning efficiency by data augmentation techniques. However, it is difficult to design good data augmentation without a given task expertise. In this paper, we propose data augmentation for RL in feature space as data augmentation which is requiring no given task

			<p>expertise. We conduct experiments on the simulation environment for the purposes of comparison of the proposed method with naive RL. Results show to improve RL agents' learning efficiency by the proposed method.</p>
SHIBATA Yuki	NAGAO Tomoharu	Role Detection in Werewolf with Utterance on the Opening Day by Using Percolative Learning	<p>In this paper, we propose a method to estimate role from the utterance on the opening day in werewolf by using percolative learning. Learning is performed using the information of the entire game, assuming that it is estimated only from the log of the opening day at the time of the test. In addition, by dividing the input of the utterance log for each date and optimizing the structure of the input part during learning, the difference in the importance of utterance for each date in role detection is considered. As a result of verifying the proposed method using the log of Werewolf BBS, it was confirmed that the accuracy was improved compared to the method of learning only from the log of the opening day.</p>

SHIBATA Rui	YAMADA Takahiro	Representation of Dynamics by Neural Networks for Real-Time Surgical Simulation	Recently, neural networks (NNs) have been used to speed up the simulation of dynamics. In this paper, we propose a simulator that represents the large deformation problem of a beam under point contact conditions using NNs, where the shape is represented by an implicit function. The proposed method can predict the deformed shape and contact force quickly, and can explain the prediction results on the basis of friction and slip. In addition, the generalization performance of the proposed method is higher than that of general all-coupled NN models, and it can reduce the amount of teacher data required for pre-training.
SHIMIZU Shoma	SHIRAKAWA Sinnichi	Auto Berthing Using Supervised Learning and Reinforcement Learning	Autonomous ships are attracting attention as a means of preventing maritime accidents and addressing a shortage of sailors. In this study, we work on automatic berthing, which is one of the essential technologies for realizing autonomous ships, by using supervised learning and reinforcement learning. In the experiments on a simulator, we quantitatively evaluate the performance of the control law, which has not been done in previous research, and show that the obtained control law can handle a wide range of initial positions of ships and wind disturbances.

<p>SHIRAKAWA Kodai</p>	<p>USHIKOSHI Erika</p>	<p>First-Order Hadamard variational formula for the Stokes equations under general domain perturbations</p>	<p>Hadamard variational formula expresses the variation of the functional of the domain represented by Green function under domain perturbation. In this study, we consider the first variational formula of the Green function of the Stokes equations with Dirichlet boundary conditions in the bounded domain with the $C^{1,1}$ boundary. More precisely, by applying the method of Suzuki-Tsuchiya (2016) to the Stokes equation, we will generalize the regularity of the boundary of the domain in Ushikoshi (2016), which constructs the formula in C^∞ bounded domain.</p>
<p>SHINTANI Natsuo</p>	<p>YOSHIOKA Katsunari</p>	<p>Measuring impact of amplification DDoS attacks observed by Amppot</p>	<p>In this study, we measured the impacts of the attacks observed by amplification DDoS honeypot, or Amppot, by sending ICMP ping to the victims. We found that half of the victims was affected by the attacks while the other half was hardly affected. Moreover, about 10 % of affected victims hardly responded during the attacks. We also show that various factors such as attack duration, packets per second, victims' countries and ASes, the number of cumulative name resolutions, the number of connected domains, are related to the attack impact. We then propose a method to estimate the attack impact just in time of attack observation by Amppot.</p>

<p>SUEHIRO Tatsuya</p>	<p>MATSUMOTO Tsutomu</p>	<p>A Study on Instrumentation Security of Ranging Sensors</p>	<p>The importance of security in instrumentation has been recognized, and its research needs to be enhanced. This paper describes a study of instrumentation security for two types of ranging sensors, LIDARs and ultrasonic sensors. (1) We contributed to the evaluation technology by proposing an environment in which instrumentation security enhancement techniques for LIDARs can be implemented, and their resistance to attacks can be investigated. (2) We demonstrated a new attack method using laser light irradiation against ultrasonic sensors and improved the comprehensiveness of threat analysis.</p>
<p>SUZUKI Kodai</p>	<p>NOMA Atsushi</p>	<p>Weierstrass points on plane curves</p>	<p>In this study, we studied Weierstrass points that be nonsingular and satisfy special properties. We classified Weierstrass points on 7th non-singular projective plane curves by using local intersection numbers and gave examples of the curves with Weierstrass points in each case.</p>

SUZUKI Tomoro	MATSUMOTO Tsutomu	A Study on Double Laser Fault Attack on Embedded Devices	Fault attacks that inject physical disturbances into cryptographic modules to analyze their internal information, especially those using multiple lasers, are powerful, but exploring their capabilities and studying countermeasures are still issues. In this paper, we conducted an attack experiment using an originally constructed double-laser experimental environment. We demonstrated the attack's effect by simultaneously irradiating multiple points on the flash memory of an IC card. We also proved the invalidation of conventional countermeasures using laser detection sensors in FPGAs. These results contribute to the elucidation of the fault attack.
TOMIYA Honoka	NAKAMOTO Atsuhiko	The edge-weights of graphs determined by color-assignments of vertices	We study an edge-weight of a graph G by 1, 2, 3 such that the weighted vertex-degree gives a given proper vertex-coloring of G modulo 3, related to the 1-2-3 conjecture on a vertex-coloring associated with an edge-weight. We prove that every planar and projective planar even triangulation has such an edge-weight. Moreover, we generalize the result to 3-colorable graphs independent of surfaces, by using linear algebra.

TOYAMA Taku	MATSUMOTO Tsutomu	A Study on Hardware Security of USB Device and Security Equipment	USB devices are vulnerable to spoofing and man-in-the-middle attacks because they do not have authentication functions. This paper shows that USB devices can be identified by their electrical characteristics using Manhattan distance and decision tree analysis. In addition, for the first time, fire alarms, near-infrared sensors, and automatic door sensors as security equipment are analyzed from the viewpoint of hardware security. This paper evaluated these devices' resistance to laser-based attacks and replay attacks and proposed techniques to resist these attacks.
NAKANO Yoshinori	OKAJIMA Katsunori	Expanding Walking Perception by Manipulating Visual Information in Virtual Reality Space	We measured actual motions on walking on a slope, then we developed a VR walking system that can create walking perception on a slope considering the head trajectory while walking on a flat ground. We conducted an experiment to evaluate the perception of ascending and descending, perception of force of accel and braking, and perception of instability. The results showed that the perception of ascending and descending was significantly stronger than that of the previous methods. Moreover, we combined our system with curvature gains of redirected walking, which is a horizontal spatial expansion method. The results showed that our system can expand the space in both vertical and

			horizontal directions, suggesting that three-dimensional movement is possible in VR spaces without real slope.
NAGATO Yuki	NAKAMOTO Atsuhiko	Coloring and orientations of graphs	An orientation of a graph G is an assignment of a direction to each edge of G . In a given orientation of G , the indegree of the vertices of G can be regarded as a color-assignment of the vertices of G . In earlier research, some results on such coloring were established for bipartite plane graphs. In this paper, we give another proof to them.
HANAWA Naoki	SHIRAZAKI Minoru	Numerical analysis of interaction of running water and pendulum	The pendulum is one of the widely known physical systems. There are many studies on the pendulum in single phase flows, but few in multiphase flows. The pendulum motions in multiphase flows are more complex than single phase flows. In this study, I analyzed the motions caused by the collision of the pendulum and running water. Focusing on a single pendulum, and multi pendulums, the effect of the pendulum on motion was analyzed by three-dimensional numerical calculation.

HAMANO Ryoki	SHIRAKAWA Sinnichi	Analysis and Improvement of Information Geometric Optimization with Categorical Distribution	The Information Geometric Optimization (IGO) is a unified framework of black-box optimization algorithms. In this study, we perform a runtime analysis for the algorithm derived from IGO by applying the family of categorical distributions. In addition, based on the results of the runtime analysis, we develop the method to improve the efficiency and stability of the IGO algorithm and confirm its effectiveness through numerical experiments.
HARADA Kyohei	NAGAO Tomoharu	Construction of a Soft Sensor with Percolative Learning Method	If it is possible to reproduce the sensor signals of industrial products in development using the sensor signals of the product in operation, manufacturers can perform advanced analyses of the product after it has been sold close to the development phase. In this paper, we propose a Construction of a Soft Sensor with improved Percolative Learning Method that takes into account the information from the development process, by using sensor signals in development as auxiliary data in addition to sensor signals in operation which is main data.

HIDAKA Fumiya	OZEKI Kenta	Quadrangulation of a polygon with Steiner points	<p>All polygons can be triangulated by adding diagonals, but some polygons cannot be quadrangulated. To quadrangulate such polygons, we add new points which called Steiner points inside and/or outside the polygon. Ramaswami et al. evaluated the number of Steiner points that suffice to quadrangulate a polygon by the number of vertices of the polygon. However, the evaluation is far from sharp value for some polygons, for example, convex polygons that can be quadrangulated without any Steiner points. In this thesis, we evaluate the number of Steiner points by the spirality, which is determined from the structures of the polygons.</p>
FUKUCHI Takeyuki	YAMADA Takahiro	Assessment of Numerical Procedures for One-Dimensional Wave Propagation Analysis with a Focus on Peak Value Errors	<p>In numerical simulations of the wave equation, numerical dispersibility appears as a dispersion relation that differs from that of the exact solution. In this work, we propose an index to assess numerical methods in terms of wave distortion of numerical solutions caused by numerical dispersibility. By using this index, relative changes in the time history of wave peak value can be estimated. Comparison between proposed estimation and the actual behavior of numerical solutions indicates that the proposed index is useful to assess the relative difficulty in the shape distortion of a traveling wave.</p>

FJII Kairi	MORI Tatsunori	Analysis of possible fake news information using the comment section of news articles	<p>In recent years, there is problem that we have little information that doubts fake news In the fact check task. Therefore, we propose a detection system for that information using the comment section of the news site .</p>
FUJIWARA Motohide	MATSUI Kazumi	On identification procedures of mechanical property for hyperelastic materials	<p>The mechanical properties of a rubber-like material used in numerical simulations are determined from the experimental results of several material tests, such as tensile, compressive, and shear tests. However, the stress state of material tests is different from those in structures. In this work, we propose a procedure in which the mechanical properties of the structure are determined by considering the importance of the deformation state of the structure. Values of the stored energy function of hyperelastic materials is taken as parameters to describe response surfaces for reaction force of the structure.</p>

<p>FURUKAWA Momoko</p>	<p>MATSUI Kazumi</p>	<p>Method for identifying mechanical properties of organs after removal by multiple loading tests</p>	<p>In recent years, the development of surgical simulators has progressed.</p> <p>Mechanical properties are required to express the deformation of organs in the simulator. In previous studies, the Mechanical properties obtained from in-vitro test are applied, but the physical characteristic of the organs are considered to be different inside and outside the living body. Therefore, the purpose of this study is to identify mechanical property values that are close to the in-vivo environment by conducting indentation tests on organs immediately after removal.</p>
<p>HOTAKA Juri</p>	<p>SHIKATA Junji</p>	<p>A Study on Broadcast Authentication with Control of Verification Functionality</p>	<p>In recent years, with the development of the Internet, more and more IoT devices will be connected to the Internet. In this study, we focus on "Broadcast Authentication" as a cryptographic technique for one-to-many communication to control a large number of devices. In our model, in addition to the two values (accept or reject), the verification algorithm outputs a third value, which means that the validity of the message cannot be verified. Our model makes it possible to know the verification result more precisely, which in turn makes it possible to control IoT devices precisely.</p>

<p>MIZUYAMA Yoshino</p>	<p>NAGAO Tomoharu</p>	<p>Growth Rate Forecast for Maximizing Yield in Plant Factories</p>	<p>The appearance of closed-type artificially lighted plant factories, in which each growing shelf is enclosed, has made it possible to obtain accurate values of environmental variables. Therefore, it is necessary to predict the growth rate and to analyze the relationship between the growth rate and environmental variables in order to maximize the yield. In this study, we propose a three-step method to improve accuracy in order to construct a regression model with good explanatory power from a small amount of data. Although the proposed method did not improve the accuracy compared to the comparative method, we were able to express the relationship between the growth rate and environmental variables, which has been a black box, by using equations.</p>
<p>MIYAZAWA Tomoki</p>	<p>SHIKATA Junji</p>	<p>A Study on Construction of Semi-Adaptively Secure Inner-Product Predicate Encryption from Lattices</p>	<p>Recently, quantum computers have been actively developed. Considering that a practical quantum computer appears in the future, it is important and interesting to develop post-quantum cryptography that is resistant to quantum computers. In this thesis, we propose a lattice-based semi-adaptively secure inner-product predicate encryption (IP-PE) scheme. The IP-PE is a functional encryption where we can specify decryption conditions by embedding attribute vectors</p>

			both in private keys and ciphertexts. By comparing with the existing construction, we show that our construction is more efficient in terms of secret key-size.
MIYAZONO Fumiki	MATSUMOTO Tsutomu	A Study on Instrumentation Security of In-vehicle Monocular Cameras	Recently, quantum computers have been actively developed. Considering that a practical quantum computer appears in the future, it is important and interesting to develop post-quantum cryptography that is resistant to quantum computers. In this thesis, we propose a lattice-based semi-adaptively secure inner-product predicate encryption (IP-PE) scheme. The IP-PE is a functional encryption where we can specify decryption conditions by embedding attribute vectors both in private keys and ciphertexts. By comparing with the existing construction, we show that our construction is more efficient in terms of secret key-size.

YAGI Hitomi	NOMA Atsushi	Weierstrass Points of non-hyperelliptic curves of genus three	Among in-vehicle sensors, inadequacies in the measurement results of in-vehicle monocular cameras, which are used for a wide range of functions such as perimeter checking, lane detection, and sign detection, can lead to serious traffic accidents. In this paper, we investigate new attacks that threaten the instrumentation security of in-vehicle monocular cameras from various perspectives. The feasibility of the attacks and their impact on the system are analyzed, and countermeasures against the attacks are established to improve the security of the in-vehicle monocular camera.
YAMAGUCHI Satoshi	NAGAO Tomoharu	Proposal of Machine learning model for Brain Tumor Detection	Over the last few years, tumor detection with deep learning has attracted ample attention. Various models have been proposed in the brain tumor detection field, However, it is difficult for doctors to understand the detection procedures of these models. This difficulty hinders their practical implementation. Therefore, for practical use, we need to propose a model that is easy for doctors to understand. In this paper, we propose a model that detects tumors in a way that is easy for doctors to understand. To validate the effectiveness of the model, we applied it to data provided by a medical practice to check the output images and the

			accuracy of the proposed model. The results showed an improvement in the continuity and readability of the prediction results compared to the model proposed in 2018.
YAMAZAKI Mitsufumi	MATSUMOTO Tsutomu	A Study on Side-Channel Security of Pairing Hardware	We have studied the side-channel security of hardware that computes pairings for advanced cryptography with low latency. The main result is that in the FPGA implementation of Optimal-Ate pairing on the BN254 curve, the correlation power analysis using about 10,000 waveforms can disclose the secret information when the inputs are selected conveniently for the attacker. This result implies that secure implementations of pairing need to ensure that the input value verification.
YOSHINARI Nozomu	SHIRAKAWA Sinnichi	Developing an Architecture-Aware Initialization Method for Neural Networks	Weight parameter initialization is an essential part of neural networks' training due to the non-convexity of the loss function. However, while network architectures are becoming more complex, classical initialization methods assuming simple models are still used. In this study, we build an architecture-aware initialization method considering all models in NAS-Bench-201. We show the proposed method improves the performance of many models and

			<p>prove the importance of initialization considering network architecture.</p>
<p>YOSHIHARA Hiromasa</p>	<p>USHIKOSHI Erika</p>	<p>Asymptotic behavior of eigenvalues and eigenfunctions of a thin elastic rod with non-uniform cross-section</p>	<p>I study the asymptotic behavior of eigenvalues and eigenfunctions of a thin elastic rod with non-uniform cross-section. The purpose of this study is to generalize the asymptotic behavior of previous research by introducing new thinness parameter. Specifically, new asymptotic behavior is defined by parameter which differ in each component. As a result, I generalize previous research in the form of expansion of it.</p>
<p>WATANABE Takashi</p>	<p>TOMII Takashi</p>	<p>Evaluation of Vehicle-Grid Integration Using a Lifelog Database Integrating Renewable Energy and Electric Vehicle Data</p>	<p>In this research, we construct a database enabling quantification of energy flow in smart grid environment of the future by storing power demand, renewable energy and electric vehicle (EV) charging/discharging lifelog. By aggregating/comparing energy flow for each scenario classified by the presence or absence of microgrid components using actually collected lifelog, we showed that it is possible to evaluate the feasibility of VGI (Vehicle-Grid Integration): the idea of regarding EVs as smart grid batteries.</p>

VALLEJO PARRA DIEGO AUGUSTO	OKAJIMA Katsunori	Simulating Realistic Haptic Sensation Using Dynamic Visual Information of Real Objects	<p>We conducted a study to check if it was possible to simulate tactile sensations of the texture of real objects on a computer through the Phantom Premium haptic device from the visual information of these. First, we made a dataset of ninety objects with different textures and appearances. Then, we calculated the tactile parameters of each one with the Phantom and a large number of features obtained from videos of them. We used this information to perform a multiple regression model with which to make predictions from the dynamic visual information of the objects. Subsequently, with the obtained predictions, we created 3D tactile models using the Unity tool. The results of our model showed a good level of efficiency. To validate this information, we performed three experiments on participants to validate the level of reproducibility acquired, and the efficiency of the model when evaluated by a group of people. The results showed that the more defined characteristics of the object were, the greater reproducibility and naturalness to the touch were achieved.</p>
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WANG Zizhou	OKAJIMA Katsunori	Development of Multi-spectral Light Source and Spectral Distribution Reproduction Display	<p>Most displays have three primary colors of RGB for each pixel, so the color reproduction area is narrow. In this study, we have developed a multi-spectral light source that can generate an arbitrary spectral distribution using micromirrors. A program that can automatically control each state of the micromirror array from wavelength information was realized, and illumination light with an arbitrary spectral distribution was generated. Furthermore, by combining the developed multispectral light source and a monochrome monitor, we have developed a multispectral display that can control the spectral distribution and images in synchronization.</p>
XIE Jun	OKAJIMA Katunori	Rendering method to reproduce the quality of projected object in projection mapping	<p>In this paper, we focus on the effect of blurring and propose a rendering method that improves the quality of the texture in the projected image for high-precision visual reproduction of the object surface in projected AR. By introducing it into an adaptive projection AR system based on the XYZ color space, it is possible to suppress the "Luminous Feeling" in which the projected object appears to shine in real time. Specifically, after calculating the projected color, the obtained image data of the projected texture and the</p>

			sharpening filter are convoluted to emphasize the outline of the part that is blurred by the smoothing processing.
ZHANG Zhihan	SHIRAKAWA Sinnichi	Accuracy improvement of retinal vessel segmentation using neural architecture search	Improving the precision of human retinal image segmentation is of great help to doctors' diagnoses. Aiming for the accuracy improvement of the retinal image segmentation, this study extends ASNG-NAS that is a stochastic relaxation-based one-shot neural architecture search and develops a search space for image segmentation. From the experiment using the retinal image datasets, we show that the architecture obtained by the proposed method can improve the segmentation accuracy.
PEI JINXING Pei Jinxing	SHIKATA Junji	A Study on Algebraic Manipulation Detection Codes with Non-uniform Distribution	In the modern information society, it is important to guarantee reliability and trust of information. The cryptographic schemes that satisfy the functionality in terms of information theoretic security includes the algebraic manipulation detection code (AMD-code) that detects data tampering without any secret key. In this thesis, we study AMD-code with non-uniform randomness. For AMD-codes, we derive a lower bound on randomness and show an optimal construction.

LING Xiaotao	NAGAO Tomoharu	Semantic Segmentation Using Depth Information	<p>In recent years, various methods have been proposed in the area of autonomous driving. For safe and highly efficient autonomous driving, the technology for recognizing the surroundings of a vehicle is very important, and one of them is a method called semantic segmentation that assigns class labels at the pixel level. However, since there is a limit in learning with only a single image, in this study, we propose a segmentation model structure using depth information with an Attention mechanism in the channel direction added based on PSPNet. In addition, to solve the problem that the CG data used for learning is not precise, we propose a data preprocessing method that imitates the way human observe by using Morphological Transformation of Closing. According to the experimental results, the accuracy of the proposed model is improved by 1.41% compared to PSPNet trained only with RGB images, and when the Closing processing is used, the accuracy is further improved by 0.50%</p>
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