List of Dissertation Abstract　(Department of Information Environment)

Name	Supervisor	Title	Abstract
CHEN JIAWEI	Shikata Junji	A Study on Isogeny-based Constructions of Advanced Cryptographic Schemes by Group Actions of Ideal Class Groups	As quantum computing threatens traditional Diffie-Hellman-based cryptography, Post-Quantum Cryptography (PQC) becomes essential. This research leverages isogeny-based group actions to construct advanced, quantum-resistant primitives with compact key sizes. We first propose an efficient, tightly secure identity-based signature (IBS) scheme that minimizes signature sizes and user key sizes. Next, we introduce the first IND-CPA secure bidirectional Proxy Re-encryption (PRE) scheme based on the DC-CSIDH problem. Finally, we achieve the highest security level for isogeny-based PRE by developing a CCA2-secure unidirectional scheme resilient to adaptive corruption, utilizing simulation-sound NIZK proofs to ensure robust security.
Takahashi Daiki	Nakamoto Atsuhiro	Hamiltonian properties of 3-connected graphs on closed surfaces	This thesis studies Hamiltonian properties of 3-connected graphs embedded on closed surfaces. In particular, we focus on spanning 3-trees and 2-connected spanning subgraphs, and provide a characterization of graphs that attain known upper bounds in the planar case. Furthermore, by applying planar results, we show that for 3-connected graphs embedded on the projective plane and the torus, the only graphs attaining known bounds are radial graphs of triangulations. As a consequence, we prove that improved bounds hold for all other graphs in these classes.

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Matsuda Misato	Yoshioka Katsunari	Analysis of Harmful Content in Social Media from User and System Perspectives	Harmful content circulating on social media constitutes an information security threat. This doctoral dissertation first adopts a user perspective, using results from user experiments measuring reactions to viewing false information to identify characteristics of high-priority content and the optimal timing for implementing countermeasures. Subsequently, adopting a system perspective, it applies findings from analyzing the characteristics of fake news and illegal information to develop transparent detection criteria. The findings of this study contribute to balancing freedom and safety on social media.
Mikami Hayato	Shima Keisuke	Practical Evaluation of Physical Function Assessment for Fall Prevention and Development of Intervention Methods	Falls among the elderly and aging workers represent a critical public health challenge in Japan, where 29.4% of the population is aged 65 or older and falls account for 26.8% of occupational injuries. This study developed a contactless quantitative evaluation system for the single-leg standing test using Azure Kinect and a Wii Balance Board, modeling standing motion via a seven-state transition model and defining 15 evaluation indices rendered as a radar chart to identify individual functional weaknesses. A personalized postural stability training system calibrated to individual limits of stability was also developed, demonstrating significant post-training improvements in postural stability index across both younger and mature adults.

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Mao Qingxin	Yoshioka Katsunari	Analysis of DRDoS Attacks Targeting Network Blocks and Attack-for-Hire Services	This dissertation investigates Distributed Reflection Denial of Service (DRDoS) attacks, focusing on Carpet Bombing and its connection to the DDoS-for-hire business. By applying an aggregation algorithm, the study consolidates fragmented data into unified aggregation events, revealing that Carpet Bombing primarily targets broader network ranges, like /24 blocks. Compared to single-target attacks, Carpet Bombing affects more corporate networks, lasts longer, and utilizes multiple sources. Finally, by analyzing over 20,000 malicious IP addresses, the research successfully links IoT attack infrastructure to Cybercrime-as-a-Service operations, providing critical insights for developing more effective cybersecurity countermeasures against these escalating threats.