External Awards

JC-SAT 2024 Best Paper Award
Winners: Koyo Tategami, NTT Access Network Service Systems Laboratories; Daisuke Goto, NTT Access Network Service Systems Laboratories; Kiyohiko Itokawa, NTT Access Network Service Systems Laboratories; Tomohiro Tokuyasu, NTT Access Network Service Systems Laboratories; Fumihiro Yamashita, NTT Access Network Service Systems Laboratories
Date: December 5, 2024
Organization: 2024 Joint Conference on Satellite Communications (JC-SAT 2024)

For "DFT Transmission Beamforming for Low Computational Complexity and High Channel Capacity in Massive GW Satellite MIMO."
Published as: K. Tategami, D. Goto, K. Itokawa, T. Tokuyasu, and F. Yamashita, "DFT Transmission Beamforming for Low Computational Complexity and High Channel Capacity in Massive GW Satellite MIMO," IEICE Tech. Rep., Vol. 124, No. 289, SAT2024-54, pp. 43–48, Dec. 2024.

NeurIPS 2024 Top Reviewers
Winner: Yu Mitsuzumi, NTT Communication Science Laboratories
Date: December 10, 2024
Organization: The 38th Annual Conference on Neural Information Processing Systems (NeurIPS 2024)

Best Interactive Presentation Award
Winners: Ryo Ishii, NTT Human Informatics Laboratories; Shinichiro Eitoku, NTT Human Informatics Laboratories; Keigo Fushio, NTT Human Informatics Laboratories; Syohei Matsuo, NTT Human Informatics Laboratories
Date: December 13, 2024
Organization: The Institute of Electronics, Information and Communication Engineers (IEICE) Human Communication Group (HCG) Symposium

For "Music-to-dance Generation According to Composition."
Published as: R. Ishii, S. Eitoku, K. Fushio, and S. Matsuo, "Music-to-dance Generation According to Composition," IEICE HCG Symposium, Kanazawa, Ishikawa, Japan, Dec. 2024.

Specially Selected Paper
Winners: Sachiko Kanamori, National Institute of Information and Communications Technology; Miho Ikeda, NTT Social Informatics Laboratories; Kumiko Kameishi, NTT Social Informatics Laboratories; Ayako Hasegawa, National Institute of Information and Communications Technology
Date: December 15, 2024
Organization: Information Processing Society of Japan (IPSJ)

For "Users' Perceptions and Behaviors toward Technical Terms and Data Processing Described in Privacy Policies."
Published as: S. Kanamori, M. Ikeda, K. Kameishi, and A. Hasegawa, "Users' Perceptions and Behaviors toward Technical Terms and Data Processing Described in Privacy Policies," IPSJ Journal, Vol. 65, No. 12, pp. 1700–1719, Dec. 2024.

IEEE Signal Processing Society 2024 Outstanding Editorial Board Member Award
Winner: Atsunori Ogawa, NTT Communication Science Laboratories
Date: December 19, 2024
Organization: IEEE Signal Processing Society

For outstanding editorial board service for the IEEE Open Journal of Signal Processing.

IDW '24 Best Paper Award
Winner: Motohiro Makiguchi, NTT Human Informatics Laboratories
Date: December 23, 2024
Organization: The 31st International Display Workshops (IDW '24)

For "Implementation of Interactive Mirror-Transcending Aerial Imaging System."
Published as: M. Makiguchi, "Implementation of Interactive Mirror-Transcending Aerial Imaging System," IDW '24, Sapporo, Hokkaido, Japan, Dec. 2024.

Papers Published in Technical Journals and Conference Proceedings

Improved Plant Biomass Production under Low Nitrogen Conditions through Conditional Accumulation of the Second Messenger, Guanosine Tetraphosphate, in Chloroplasts and Mitochondria

M. Goto, T. Nemoto, K. Sakoda, A. Sakurai, S. Imamura, and S. Masuda

Frontiers in Plant Science, Vol. 15, 1524665, January 2025.

To enhance plant biomass production under low nitrogen conditions, we employed a method to artificially and temporarily accumulate the bacterial second messenger, guanosine tetraphosphate (ppGpp), to modify plastidial or mitochondrial metabolism. Specifically, we fused a chloroplast or mitochondrial transit-peptide to the N-terminus of the bacterial ppGpp synthase YjbM, which was conditionally expressed by an estrogen-inducible promoter in *Arabidopsis*. The resulting recombinant *Arabidopsis* plants exhibited estrogen-dependent ppGpp accumulation in chloroplasts or mitochondria and showed reduced fresh weight compared to wild type (WT) plants when grown on agar-solidified plates containing a certain amount of estrogen. This finding aligns with the previous study indicating that plastidial ppGpp levels can influence plant biomass production. When the recombinant plants were grown in the soil with estrogen and low nitrogen-containing water at specific time intervals, they exhibited greater fresh weight than WT plants. These results suggest that the conditional accumulation of ppGpp in not only chloroplasts, but also in mitochondria can lead to improved plant biomass production in soil with low nitrogen applications.

Rewindable Quantum Computation and Its Equivalence to Cloning and Adaptive Postselection

R. Hiromasa, A. Mizutani, Y. Takeuchi, and S. Tani

Theory of Computing Systems, Vol. 69, Article no. 6, January 2025.

We define rewinding operators that invert quantum measurements. Then, we define complexity classes **RwBQP**, **CBQP**, and **AdPostBQP** as sets of decision problems solvable by polynomial-size quantum circuits with a polynomial number of rewinding operators, cloning operators, and adaptive postselections, respectively. Our main result is that $\mathbf{BPP}^{\mathbf{PP}} \subseteq \mathbf{RwBQP} = \mathbf{CBQP} = \mathbf{AdPostBQP} \subseteq \mathbf{PSPACE}$. As a byproduct of this result, we show that any problem in **PostBQP** can be solved with only postselections of events that occur with probabilities polynomially close to one. Under the strongly believed assumption that $\mathbf{BQP} \not\supseteq \mathbf{SZK}$, or the shortest independent vectors problem cannot be efficiently solved with quantum computers, we also show that a single rewinding operator is sufficient to achieve tasks that are intractable for quantum computation. Finally, we show that rewindable Clifford circuits remain classically simulatable, but rewindable instantaneous quantum polynomial time circuits can solve any problem in **PP**.