Shota Kato

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EDUCATION

Ph.D. Department of Systems Science, Graduate School of Informatics, Kyoto University, 2022.

M.S. Department of Chemical Engineering, Graduate School of Engineering, Kyoto University, 2019.

B.S. School of Industrial Chemistry, Faculty of Engineering, Kyoto University, 2017.

WORK EXPERIENCE

2024.4–2025.2 Visiting Researcher, University of Manchester

2022.4–Present Assistant Professor, Graduate School of Informatics, Kyoto University

RESEARCH AREAS

Process systems engineering: process modeling, process control, process informatics

Natural language processing: information extraction, mathematical language processing

PUBLICATIONS

Journal Articles

2023 S. Kato, C. Zhang, and M. Kano, "Simple Algorithm for Judging Equivalence of Differential-algebraic Equation Systems," *Scientific Reports*, 13, 11534. doi: 10.1038/s41598-023-38254-y

2022 S. Kato, S. Kim, M. Mizuta, and M. Kano, "Gray-box Model-based Predictive Control of Czochralski Process with Successive Model Update," *Journal of Chemical Engineering of Japan*, 55 (3), 154–161. doi: 10.1252/jcej.21we096

2021 S. Kato, S. Kim, M. Mizuta, M. Oshima, and M. Kano, "Gray-box Model-based Predictive Control of Czochralski Process," *Journal of Crystal Growth*, 573, 126299. doi: 10.1016/j.jcrysgro.2021.126299

2021 S. Kato, S. Kim, M. Kano, T. Fujiwara, and M. Mizuta, "Gray-box Modeling of 300 mm Diameter Czochralski Single-crystal Si Production Process," *Journal of Crystal Growth*, 553, 125929. doi: 10.1016/j.jcrysgro.2020.125929

Conference Proceedings

2024 R. Yoshida, B. Wang, S. Kato, and M. Kano, "Transfer Learning Based on Generative Adversarial Networks: Application to Chemical Reaction Process," *2024 10th International Conference on Control, Decision and Information Technologies (CoDIT)*, pp. 2676–2679. doi: 10.1109/CoDIT62066.2024.10708203

2024 S. Kato and M. Kano, "Two-Stage Fine-Tuning for Variable Definition Extraction from Chemical Process-related Papers," *The 2nd Workshop on Data Fusion for Artificial Intelligence (DAFUSAI)*.

2024 K. Nagayama, S. Kato, and M. Kano, "Data Augmentation Method Utilizing Template Sentences for Variable Definition Extraction," *Natural Language Processing and Information Systems (NLDB)*, pp. 151–165. doi: 10.1007/978-3-031-70239-6_11

2024 S. Kato and M. Kano, "Prototype of Automated Physical Model Builder: Challenges and Opportunities," *Computer Aided Chemical Engineering*, vol. 53, pp. 2839–2844. doi: 10.1016/B978-0-443-28824-1.50474-9

2023 B. Wang, S. Kato, and M. Kano, "GAN-based Homogenous Transfer Learning Method for Regression Problems," *2023 IEEE Conference on Control Technology and Applications (CCTA)*, pp. 85–90. doi: 10.1109/CCTA54093.2023.10252827

2023 P. H. Pathirannahalage, A. Nabetani, S. Kato, K. Sato, K. Yaginuma, S. Tanabe, and M. Kano, "Setpoint Determination Method for Pharmaceutical Continuous Manufacturing: Proactive-RTD-based Approach," *2023 IEEE Conference on Control Technology and Applications (CCTA)*, pp. 502–507. doi: 10.1109/CCTA54093.2023.10253250

2023 S. Kato and M. Kano, "Efficient Physical Model Building Algorithm Using Equations Extracted from Documents,", *Computer Aided Chemical Engineering*, vol. 52, pp. 151–156. doi: 10.1016/B978-0-443-15274-0.50025-1

2023 S. Chen, S. Kato, K. Fujiwara, and M. Kano, "Nearest Neighbor Search-Based Modification of RRI Data with Premature Atrial Contraction and Premature Ventricular Contraction," *2023 SICE International Symposium on Control Systems (SICE ISCS)*, pp. 53–57. doi: 10.23919/SICEISCS57194.2023.10079199

2022 C. Zhang, S. Kato, and M. Kano, "Equivalence Judgment of Equation Groups Representing Process Dynamics," *Computer Aided Chemical Engineering*, vol. 49, pp. 1513–1518. doi: 10.1016/B978-0-323-85159-6.50252-9

2022 S. Kato and M. Kano, "Towards An Automated Physical Model Builder: CSTR Case Study,", *Comptuer Aided Chemical Engineering*, vol. 49, pp. 1669–1674. doi: 10.1016/B978-0-323-85159-6.50278-5

2022 S. Kato, K. Kanegami, and M. Kano, "ProcessBERT: A Pre-trained Language Model for Judging Equivalence of Variable Definitions in Process Models," *IFAC-PapersOnLine*, vol. 55, Issue 7, pp. 957–962. doi: 10.1016/j.ifacol.2022.07.568

Preprints

2024 T. Sato, S. Miyamoto, and S. Kato, "Rheo-SINDy: Finding a Constitutive Model from Rheological Data for Complex Fluids Using Sparse Identification for Nonlinear Dynamics," *arXiv [cond-mat.soft]*. doi: 10.48550/arXiv.2403.14980

2023 S. Kato and M. Kano, "VARAT: Variable Annotation Tool for Documents on Manufacturing Processes," *Authorea*. doi: 10.22541/au.168877263.37125070/v1

2023 M. Numoto, S. Kato, and M. Kano, "Extracting Variable Definitions from Documents on Chemical Processes Utilizing Semantic Information on Variables," *Authorea*. doi: 10.22541/au.168837439.92384779/v1

Conference Presentations

2024 S. Kato, C. Zhang, K. Nagayama, and M. Kano, "Variable Extraction and Equivalence Judgment with BERT Model Pre-Trained on Chemical Engineering-Related Papers," AIChE Annual Meeting, San Diego, US, Oct. 27–31.

2024 S. Kato and M. Kano, "Two-Stage Fine-Tuning for Variable Definition Extraction from Chemical Process-related Papers," The 2nd Workshop on Data Fusion for Artificial Intelligence (DAFUSAI2024), Santiago de Compostela, Spain, Oct. 19.

2024 S. Kato and M. Kano, "Prototype of Automated Physical Model Builder: Challenges and Opportunities," The joint Symposium combining the 34th European Symposium on Computer-Aided Process Engineering and the 15th International Symposium on Process Systems (ESCAPE34-PSE24), Florence, Italy, Jun. 2–6.

2023 S. Kato and M. Kano, "Efficient Physical Model Building Algorithm Using Equations Extracted from Documents," 33rd European Symposium on Computer-aided Process Engineering (ESCAPE33), Athens, Greece, Jun. 18–21.

2022 S. Kato and M. Kano, "Annotation Tool for Variable Extraction from Documents on Manufacturing Processes," The 10th Asian Symposium on Process Systems Engineering (PSE Asia 2022), Chennai, India, Dec. 11–14.

2022 S. Kato and M. Kano, "Towards An Automated Physical Model Builder: CSTR Case Study," The 14th International Symposium on Process Systems Engineering (PSE 2021+), Kyoto, Japan, Jun. 19–23.

2022 S. Kato, K. Kanegami, and M. Kano, "ProcessBERT: A Pre-trained Language Model for Judging Equivalence of Variable Definitions in Process Models," 13th IFAC Symposium on Dynamics and Control of Process Systems, including Biosystems DYCOPS 2022, Busan, Republic of Korea, Jun. 14–17.

2020 S. Kato and M. Kano, "Identifier Information Based Variable Extraction Method from Scientific Papers for Automatic Physical Model Building," PSE Asia, Online, Nov. 4–6.

2019 S. Kato, S. Kim, M. Kano, T. Fujiwara, M. Mizuta, and S. Hasebe, "Gray-Box Model for Predicting Crystal Radius and Crystal Growth Rate of 300 mm Czochralski Single-Crystal Silicon Ingot Production Process," AIChE Annual Meeting, Orlando, US, Nov. 10–15.

2019 S. Kato, S. Kim, M. Kano, T. Fujiwara, M. Mizuta, and S. Hasebe, "Method of Estimating Temperatures of Heater and Melt to Improve Prediction Accuracy of Gray-box Model of 300 mm Czochralski Single-crystal Si Production Process," 18th Asian Pacific Confederation of Chemical Engineering Congress (APCChE 2019), Sapporo, Japan, Sep. 23–27.

2019 S. Kato, H. Yoshioka, S. Kim, M. Kano, T. Fujiwara, M. Mizuta, and S. Hasebe, "Model Predictive Control of Czochralski Process Producing 300 mm Single Crystal Silicon Ingot," The 8th International Symposium on Design, Operation and Control of Chemical Processes (PSE Asia 2019), Bangkok, Thailand, Jan. 13–16.

Note: This list includes only presentations where I was the primary author. Additional presentations where I contributed as a co-author are available upon request.

GRANTS AND AWARDS

Awards and Honors

2024 Academic Society Award "Encouragement Award," The Institute of Systems, Control and Information Engineers (ISICE).

2022 SIS Division Research Encouragement Award, The Society of Chemical Engineers Japan (SCEJ) 87th Annual Meeting.

2021 Student Presentation Award, The 65th Annual Conference of the Institute of Systems, Control and Information Engineers (SCI'21).

2019 Student Presentation Award, The 63rd Annual Conference of the Institute of Systems, Control and Information Engineers (SCI'19).

Competitive Grants and Fellowships

2023–25 JST ACT-X, ¥4,500,000.

2023–25 JSPS Grant-in-Aid for Early-Career Scientists, ¥3,500,000.

2024 Daikin GAP Fund Program, ¥3,300,000

2023 The Chubei Itoh Foundation, ¥500,000.

2023 Grant for Presentation at International Research Conferences by the Kyoto University Foundation, ¥350,000.

2021–22 Support for Pioneering Graduate Students presented by the Kyoto University Graduate Division, ¥1,100,000.

2019 Grant for Presentation at International Research Conferences by the Kyoto University Foundation, ¥250,000.

COURSES TAUGHT

Kyoto University

Practice of Basic Informatics

Mechanical and System Engineering Laboratory (Experiment)

Updated November 2024