FY2025 Grant for International Project Research IMI Joint Use Research Program Proposal

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			整理番号	2025b008	
1.研究計画題目	Forum “Math-for-Industry” 2025 - Challenge of Mathematics for Industry in the AI era				
2.新規・継続	New				
3.種別	国際プロジェクト研究				
4.種目	研究集会（Ｉ）				
5.開催方法	対面開催				
6.研究代表者	氏名	Soon-Sun Kwon			
	所属部局名	Department of Mathematics, Ajou University, South of Korea	職名	Professor	
7.研究実施期間	2025年08月17日～2025年08月20日				
8.キーワード	AI in Industry , Mathematical/Statistical Modeling , Predictive Analytics , Optimization Techniques				
9.参加者人数	94				

10.本研究で得られた成果の概要

In August 2025, the Forum “Math-for-Industry” 2025 (FMfI 2025) was held at the POSCO Center in Seoul, Republic of Korea, jointly organized by the Institute of Mathematics for Industry (IMI), Kyushu University, and the Department of Mathematics, Ajou University, with support from the Asia–Pacific Consortium of Mathematics for Industry (APCMfI), the National Institute for Mathematical Sciences (NIMS), and other partner institutions in the Asia–Pacific region.

FMfI 2025 continued the tradition of the Math-for-Industry series, whose mission is to foster collaboration between academic mathematicians and industrial practitioners. Under the theme "Mathematics for Innovation and Sustainability," this forum provided a platform to discuss how advanced mathematical theory and data-driven methodologies can contribute to
sustainable technologies, intelligent manufacturing, climate solutions, and AI-powered industrial design.

The three-day program featured invited and contributed talks, focused sessions, and a round
table discussion on future directions of industrial mathematics in the era of artificial intelligence and global sustainability. Researchers and engineers from universities, research institutes, and companies across Japan, Korea, Australia, Malaysia, and other countries shared case studies demonstrating how mathematical modeling, optimization, and statistical computation can create tangible social and economic value.

This volume (or website) contains summaries of the lectures and presentations delivered during the forum. The Organizing Committee expresses sincere appreciation to all speakers,
participants, and sponsoring organizations for their contributions to the success of FMfI 2025.

We also thank the APCMfI Council and IMI Joint Usage Research Program for their continuous
support in promoting international collaboration through mathematics for industry.

We hope that the discussions and outcomes of FMfI 2025 will further strengthen the link between mathematics and society and inspire new cooperative research toward sustainable
industrial development.

FMfI2025 Final Report

1. Introduction

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2. Event Overview

The Forum “Math-for-Industry” 2025 (FMfI2025), the annual event of the Asia Pacific Consortium of Mathematics for Industry (APCMfI), was successfully held from August 18 to 20, 2025, at the POSCO Centre in Seoul, South Korea.

This year’s event, the seventeenth edition of the FMfI series, carried the theme “Challenge of Mathematics for Industry in the AI Era.” It was chaired by Prof. Soon-Sun Kwon of Ajou University and sponsored by Ajou University, POSTECH, the National Institute for Mathematical Sciences (NIMS), and IMI at Kyushu University.

Over 100 mathematicians, researchers, graduate students, and industry experts from Australia, China, Japan, Korea, Malaysia, New Zealand, Thailand, and the United States participated. The program featured 21 invited lectures and 29 student/ECR posters — the largest poster session in FMfI history.

3. Program Structure

The three-day program included invited talks, plenary sessions, thematic sessions, a Women in Mathematics roundtable, and industry-focused problem sessions. Speakers presented advances in modeling, optimization, AI-driven computation, and industrial applications.

1) Scientific Sessions

Talks covered applied PDEs, fluid dynamics, stochastic modeling, functional data analysis, AI-optimization, machine learning, numerical methods, and industrial case studies.

2) Poster Session Highlights

The student/ECR poster session included 29 high-quality presentations across applied mathematics, data science, AI, and industrial modeling. Best Poster Award: Shifan Kang (ECNU, China). Excellent Poster Awards: Kwanghyuk Park (POSTECH), Shuhei Shibata (Kyushu University).

3) Women in Mathematics Roundtable

A special roundtable on 'Advancing Women Mathematicians' discussed gender equity, challenges in research careers, institutional policies, and pathways for international collaboration.

4. International Collaboration Outcomes

FMfI2025 strengthened collaborations among Ajou University, IMI at Kyushu University, APCMfI partners, and regional universities. Plans include joint mini-symposium (Kyushu 2025), student visits, and multi-country research proposals.

5. Administrative and Logistical Coordination

The event benefited from strong administrative support from IMI, APCMfI, Ajou University, and local organizers, enabling smooth scheduling, travel support, documentation, and reporting.

6. Outcomes and Future Directions

The community emphasized AI–mathematics integration, industrial problem-solving, sustainability modeling, and stronger Asia-Pacific collaboration. Overall, FMfI2025 successfully advanced the mission of connecting mathematics with industrial needs and fostered sustainable, long-term collaboration among participating institutions. FMfI2026 will be held in Bangkok, Thailand, hosted by KMITL.

FMfl2025 Program

	Aug 17		Aug 18		Aug 19		Aug 20
		8:30 – 9:15	Registration				
		9:15 – 9:30	Welcoming remarks	9:00 – 10:00	Session 5	9:00 – 10:00	Session 8
					Pierluigi cesana (IMI, Kyushu University)		Nguyen Dinh Hoa (IMI, Kyushu University)
					ZHOU TAO (Chinese Academy of Sciences)		Wang, Hongqiao (Central South University)
		9:30 – 10:30	Plenary Talk	10:15 – 11:15	Session 6	10:30 – 11:30	Session 9
			Jong Chul Ye (KAIST)		Jaemin Yoo (KAIST)		Yuan, Hairong (School of Mathematical Sciences, East China Normal University)
					Eunho Koo (Chonnam National University)		Jaeryong Kweon (POSTECH)
		10:45 - 11:45	Session 1	11:30 – 12:30	Session 7	11:30 – 13:00	Lunch break
			Fukumizu, Kenji (The Institute of Statistical Mathematics)		Tanaka, Emi (Australian National University)		
			Yeachan Park (Department of mathematics, Sejong University)		Ryoya Fukasaku (Institute of Mathematics for Industry, Kyushu University)		
		11:45 - 12:00	Photo Session				
13:00-14:00	IMI board meeting	12:00 – 14:00	Lunch break	12:30 – 14:00	Lunch break	13:00-14:00	Session 7
							Taerin Lee(NearBrain)
							Hyuki Hwang(RIST)
14:30-15:30	APCM board meeting	14:00 - 15:00	Session 2	14:00 – 15:00	Round table	14:15 – 15:15	Keynote
			Hyun Suk Choi (CMO, DEEPNOID)		Arifah Bahar(UTM), Tanaka, Emi (Australian National University)		Hyun-Min Kim (Pusan National University)
			Kyunghoon Kim (CEO, Core.Today)		Busayamas pimpunchat (King Mongkut's Institute of		

					Technology Ladkrabang)		
15:30-16:30	APCM general meeting	15:15 – 16:15	Session 3	15:30-17:30	Poster session	15:15 – 16:00	Closing remarks
			Yuichi Goto (Kyushu University)				
			Minwoo Chae (Department of Industrial and Management Engineering, POSTECH)				
16:30-17:00	IJMI editorial board meeting	16:45 – 17:45	Session 4				
			Zaitul Marlizawati Zainuddin (UTM)	18:00-	Poster competition & Banquet		
			Guo, Ling (Shanghai Normal University)				

Speaker List

1. **Plenary Talk**

- **Speaker: Jong Chul Ye (KAIST)**
  Title: Guiding Diffusion and Flow Models for Image, Video and 4D

2. **Session 1**

- **Speaker: Kenji Fukumizu (The Institute of Statistical Mathematics)**
  Title: Pairwise Optimal Transports for Training All-to-All Flow-Based Condition Transfer Model
- **Spealer: Yeachan Park (Sejong University)**
  Title: Do Language Models Understand Math?

3. **Session 2**

- **Speaker: Takaharu Yaguchi** (Kobe university)
  Title: An Extension of SympNets for Learning of Multiple Hamilton Systems
- **Speaker: Kyunghoon Kim (Core.Today)**
  Title: Formal Thinking in the Age of AI: Why Mathematical Reasoning Matters More Than Ever

4. **Session 3**

- **Speaker: Yuichi Goto (Kyushu University)**
  Title: ANOVATS: A subsampling-based test for differences among short time series in marine studies
- **Speaker: Minwoo Chae (POSTECH)**
  Title : Online Bernstein-von Mises theorem

5. **Session 4**

- **Speaker: Zaitul Marlizawati Zainuddin (Universiti Teknologi Malaysia)**
  Ttile: Multi-Objective Optimization of Location-Routing Decisions in Biomass Supply Chains
- **Speaker: Ling Guo (Shanghai Normal University)**
  Title: Uncertainty Quantification in Scientific Machine Learning via the Information Bottleneck Principle

6. **Session 5**

- **Speaker: Pierluigi Cesana (IMI, Kyushu University)**
  Title : Integrating AI and Human Expertise for the Design and Control of Smart Materials

- **Speaker: Tao Zhou (Chinese Academy of Sciences)**
  Title: Efficient deep learning methods for very high dimentional parabolic and HJB equations

7. **Session 6**

- **Speaker: Jae-Min Yoo (KAIST)**
  Title: Mining Interconnected Data: Robust, Generalizable, and Interpretable Methods
- **Speaker: Eunho Koo (Chonnam National University)**
  Title: Efficient Node Classification on Simplicial Interaction via Augmented Maximal Clique Selection

8. **Session 7**

- **Speaker: Emi Tanaka (Australian National University)**
  Title : Growing success with statistics in plant breeding
- **Speaker: Ryoya Fukasaku (IMI, Kyushu University)**
  Title : Algebraic Approach for Statistical Models

9. **Round Table**

- **Speakers: Arifah Bahar (Universiti Teknologi Malaysia), Emi Tanaka(Australian National University), Busayamas Pimpunchat (King Mongkut's Institute of Technology Ladkrabang)**
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10. **Session 8**

- **Speaker: Nguyen Dinh Hoa (IMI, Kyushu University)**
  Title : From Natural Intelligence To Artificial Intelligence
- **Speaker: Hongqiao Wang (Central South University)**
  Title : Accelerated Bayesian Optimal Experimental Design via Conditional Density Estimation and Informative Data

11. **Session 9**

- **Speaker: Hairong Yuan (East China Normal University)**
  Title : Some advances on mathematics of hypersonic flows
- **Speaker: Jaeryong Kweon (POSTECH)**
  Title : Pohang Earthquake, Thermalelastics among Rock Matrix zones and Mathematical Modelling

12. **Session 10**

- **Speaker: Ji-Su Hong** (The Miracle Soft)

  Title**:** Industrial AI Innovation: Mathematical Challenges and Applications

- **Speaker: Yong-Hoon Lee** (Mokpo University)

  Title: Integrating LIBS and Machine Learning for Practical Industrial Applications in Alloy Identification and Analysis

13. Keynote

- **Speaker: Hyun-Min Kim (Pusan National University)**
  Title : Mathematics in the Age of Intelligent Machines: From Ancient Logic to Industrial Innovation