

NIMS Joon Heo @ ICIAM2019

Main activities and achievements of industrial mathematics in KOREA



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Korea's policies that promote industrial mathematics

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National Institute for Mathematical Sciences(NIMS)

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Major activities and achievement of NIMS

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Suggestions



1. Industrial Mathematics of KOREA



01. Industrial Mathematics Promotion Plan (2016)

1	2	3
Hunting of industrial problems	Solving of industrial problems	Human resource development & industrialization
1-1 Deriving industrial field problems	2-1 Industrial mathematics hub	3-1 Talent training program
Institute & University	Institute	Institute & University
1-2 Mathematics for public interest	2-2 Strategic project of industrial mathematics	3-2 Development of math. based company
Government	Institute & University	Government
1-3 Mathematics for strategic technology	2-3 Industrial mathematics center	3-3 Education program of mathematics
Government & Institute	University	Institute & University

★ In 2017, Korean government selected and supported 113 projects in 11 areas were related to industrial mathematics



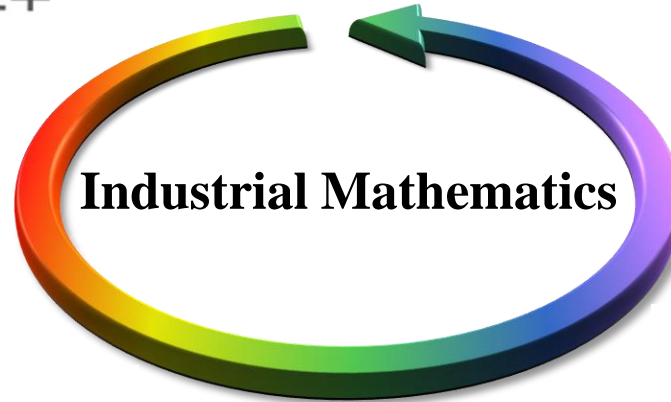
02. Major Organization for Industrial Mathematics



과학기술정보통신부
Ministry of Science and ICT



국가수리과학연구소
National Institute for Mathematical Sciences



Industrial Mathematics



서울대학교
SEOUL NATIONAL UNIVERSITY



부산대학교
PUSAN NATIONAL UNIVERSITY



2. National Institute for Mathematical Sciences (NIMS)



01. National Institute for Mathematics Science

Mission

Contributing to national competitiveness through application of science & technology and industrial application of mathematics

Strategic Goals



1.

Secure core technologies for future-oriented industrial mathematics



2.

Expand the social value of industrial mathematics



3.

Enhance the sustainability of the organization

2005.
2008.

2005. 10. 01

- Founding of NIMS as a government-funded research institution in the field of mathematics
※ Article 31 Paragraph 2 of association of the Korea Basic Science Institute

2005. 10. 01

- Inauguration of Dr. Yong Seung Cho as the first President of NIMS

2008. 10. 17

- Inauguration of Dr. Jeong Han Kim as the 2nd President of NIMS

2012.
2013.

2012. 08. 09

- Transfer of NIMS as an affiliate research institution of the Institute for Basic Science directly under the Ministry of Science and ICT
※ Article 37 Paragraph 2 of association of the Institute for Basic Science

2012. 09. 11

- Inauguration of Dr. Dongsu Kim as the 3rd President of NIMS

2013. 11. 01

- Opening of the Center for Applications of Mathematical Principles(CAMP)

2015.
2019.

2015. 09. 18

- Inauguration of Dr. Hyungju Park as the 4th President of NIMS

2016. 03. 24

- Opening of the Innovation Center for Industrial Mathematics (ICIM) located within the Pangyo start-up campus

2018. 01. 30

- Inauguration of Dr Soon-Yeong Chung as the 5th President of NIMS

2019. 02. 15

- Relocation of the Innovation Center for Industrial Mathematics (ICIM) to Gwang Gyo Techno-Valley

2019. 02. 21

- Opening of the Center for Medical Mathematics

02. Organization

NIMS

Basic Research of Industrial Mathematics

- Uncertainty analysis of numerical Ice-sheet models
- Forecast simulations of the spread of infectious Diseases
- Mega science research
- Cryptographic algorithms based on mathematical hard problems

Raising the Public Understanding of Industrial Mathematics



Innovation Center for Industrial Mathematics

- Hunting and Solving of Industrial Mathematics Problems

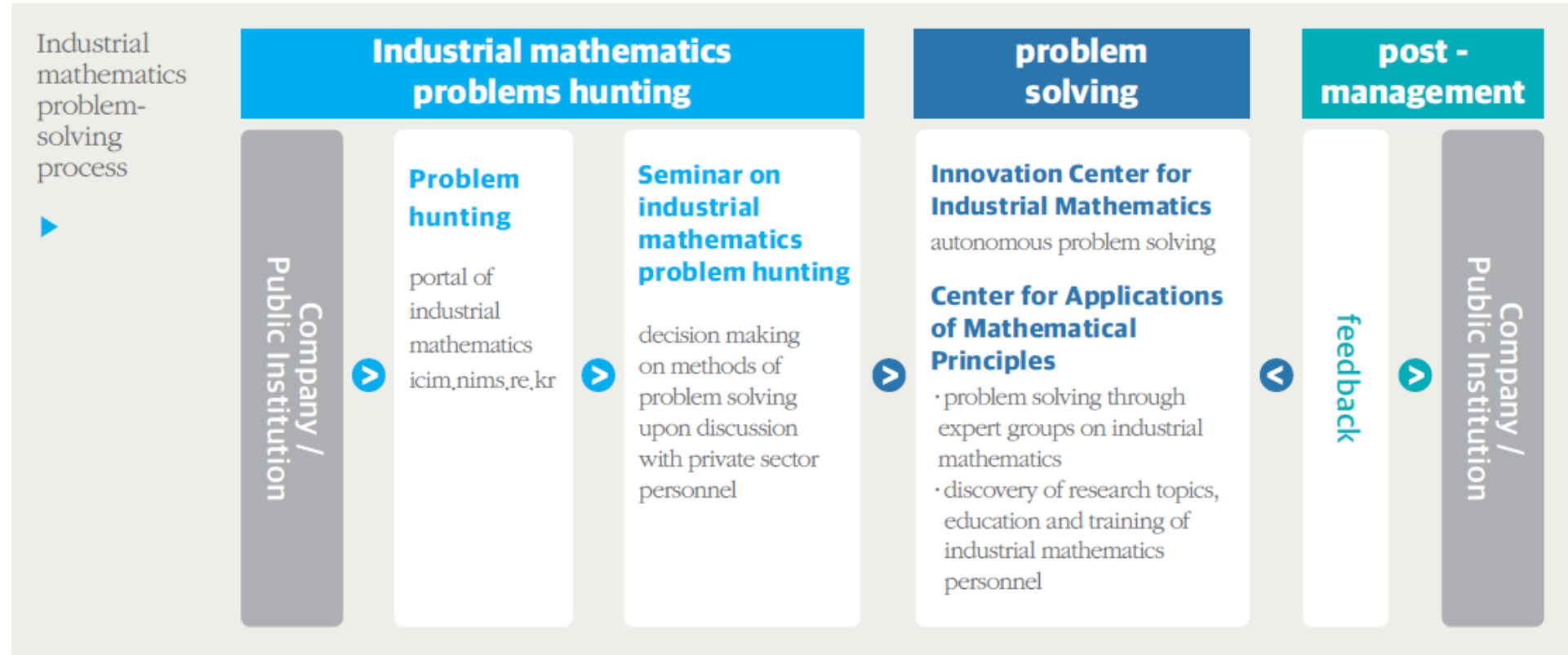
Center for Medical Mathematics

- Biomedical Imaging/Computing Research
- Medical Data Analytics and Machine Learning-based Prediction Model Research

3. Major activities and achievement of NIMS



01. Problem Solving Process



02. Problem-solving Workshop



03. Industrial Mathematics Academy



04. Moderator Training Program



05. Industrial Mathematics Workshop with Companies






06. Video



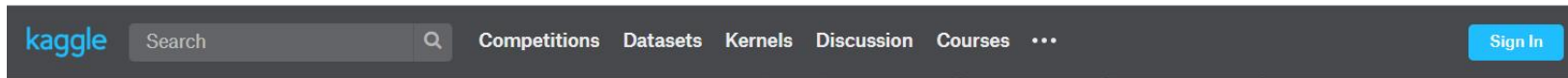
07. Industrial Problem Solving Cases

	Gori 1 Power Plant, Korea Hydro & Nuclear Power Co., Ltd (Public company)	
	Industrial problem	The optimization for efficient moving path of 'nuclear fuel insert' performed during scheduled preventive maintenance on the nuclear power plant is required
	Problem solving	Suggestion of the moving path optimization solution by using linear programming
	Smart Social Co., Ltd (Startup)	
	Industrial problem	Analysis on the data from National Competency Standards(NCS) based matching solution and mathematical advancement of matching algorithm
	Problem solving	Matching analysis by comparison based on assignment problem, suggestion of visualization method and system segmentation, and check the work similarity through analyzing NCS
	Tachyon Tech Co., Ltd (Startup)	
	Industrial problem	The enterprise is developing the software for sensing and forecasting defect specialized to CNC process. The types of the defect to be detected from the process data are limited
	Problem solving	The issue of process data synchronization is solved and the defect detection rate is improved on the basis of the mathematical modeling (Definition on the sample data feature, time series data synchronization) during data analysis

08. Industrial Problem Solving Cases (cont.)

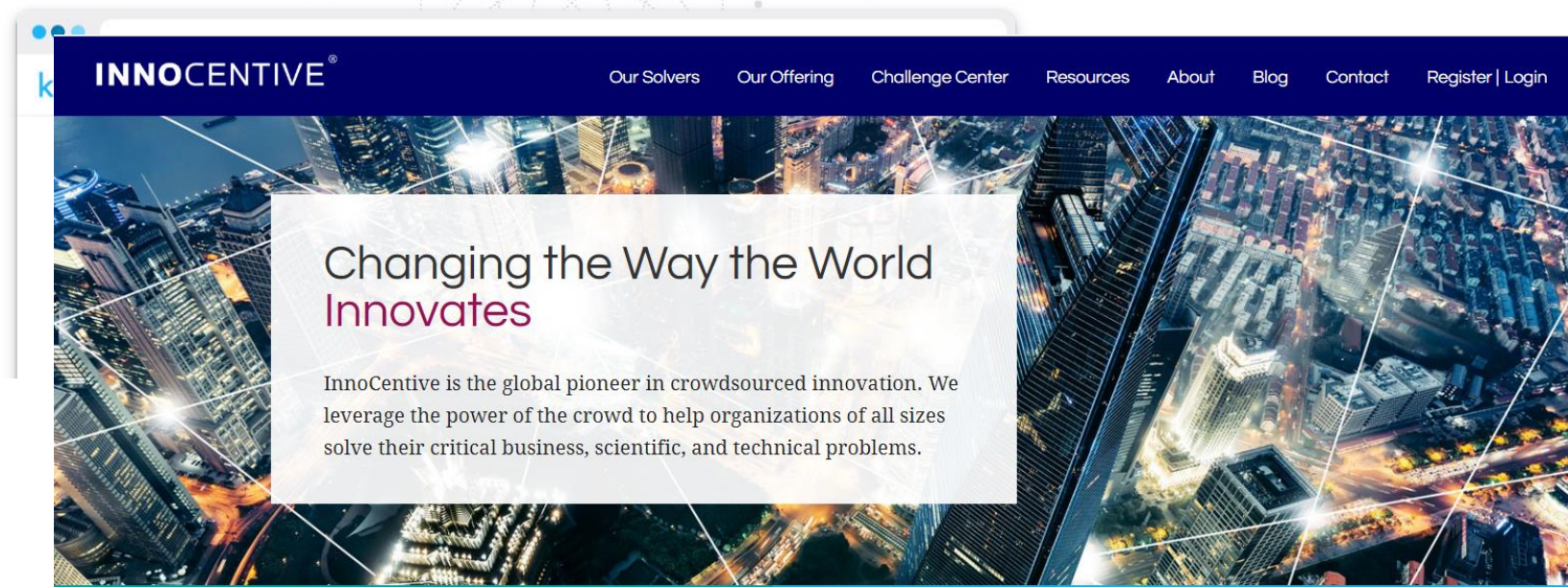
	MTOV Co., Ltd (Startup)	
	Industrial problem	The algorithm which determines the safe and economic driving through mathematical analysis on the data collected from OBD of vehicle is required
	Problem solving	Suggestion of the safe driving index calculation formula by using the statistical analysis on the OBD data
	CNCITY Energy Co., Ltd	
	Industrial problem	Verification on the appropriateness of the regression analysis model used for estimating the amount of the used city gas and development of new forecasting model
	Problem solving	Developing the gas consumption volume estimation model in use of the LSTM which is one of the deep learning methods and ARIMA for short term estimation
	Seoul Metro (Public Institution)	
	Industrial problem	Development of algorithms to improve SAMBA(Smart Automatic Mechanical Big data Analysis) System for the safety of the passengers
	Problem solving	Development of mathematical algorithms to detect anomalies of air handling system in subway stations

09. Open Problem-solving Platform



Start with more than
a blinking cursor

Kaggle Kernels is a no setup, customizable,
Jupyter Notebook environment. Access



Solution Seekers

Benefit from diverse perspectives,
shared risk, increased stakeholder



Problem Solvers

Earn cash awards, tackle real-world
problems, and raise your profile as a



4. Suggestions



01. NIMS Industrial Mathematics Experts & Cooperation

- NIMS has secured a large number of experts from universities and institutions in Korea who are cooperating with us to solve problems
- These experts are referred to as 'Industrial Mathematics Experts'
- From now on, we wish to secure 'Industrial Mathematics Experts' from abroad rather aggressively
- We hope many experts here will take an interest in what we do.
- Also, NIMS is planning programs that promote cooperation in industrial mathematics with distinguished institutes and universities abroad and we hope you take great interest in them.

Thank you

