The First
ISSM AI Solution Contests
To Revolutionalize
Semiconductor Manufacturing

Organized by: International Symposium on Semiconductor Manufacturing: ISSM
Technical Sponsorship : IEEE Electron Devices Society
Sponsored by: Minimal Fab
Supported by:
Semiconductor Equipment Association of Japan (SEAJ)
Semiconductor Equipment and Materials International (SEMI)
Taiwan Semiconductor Industry Association (TSIA)
Japan Industrial Management Association

ISSM is an annual conference of semiconductor manufacturing professionals dedicated to sharing technical solutions and opinions on the advancement of manufacturing science, technologies, and management disciplines. ISSM aims to establish new concepts for semiconductor manufacturing technologies and to promote them as systemized and universalized technologies. ISSM's role has been to challenge the concept of shifting from "know-how" to "science" in semiconductor manufacturing technologies. The past twelve annual symposia have helped to shape the course of development of "manufacturing science," as well as to create new manufacturing technologies.
ISSM 2020 will hold its first "ISSM AI Solution Contests to Revolutionalize Semiconductor Manufacturing" aiming to accelerate to adopt artificial intelligence (AI) technologies in the field of semiconductor manufacturing.
At semiconductor manufacturing fabs, ahead of other industries, enormous amounts of data such as process, equipment, and productivity have been collected, visualized, analyzed, and utilized. On the other hand, there has been a remarkable technological innovation, especially the innovation of AI technologies. ISSM committee hope to discover human resources for artificial intelligence and improve motivation for learning and research that spreads from the excellent technologies and ideas among participants at the contests.
This is an excellent opportunity for students who want to play an active role by applying the latest information technologies to solve various challenges at semiconductor manufacturing fabs. We hope that the students majored in information engineering and management engineering as well as in semiconductor-related fields will participate the contests.
This contest has the following two divisions. It is possible to enter either or both.
ISSM SEM Image Classification AI Algorithm Contest
ISSM Semiconductor Manufacturing Fab Data AI utilization Idea Contest

Along with the shift of ISSM to virtual conference, the final selection and award ceremony will be held online during ISSM 2020.
Share your excellent ideas and methods in our contests for the fusion of semiconductor manufacturing fabs that handle huge amounts of data and AI. We look forward to your application.

Website: https://www.semiconportal.com/issm/ai-contest.html

ISSM SEM Image Classification AI Algorithm Contest

This contest aims to broaden the scope of practical research and development through the trial using actual data generated at the semiconductor manufacturing. This contest competes the algorithm for "defect/particle classification in SEM images" that is essential for improving the yield of semiconductor manufacturing. Approximately 4,00 particle SEM images occurred in actual semiconductor manufacturing will be provided through the cooperation by ISSM committee members. The contest participants are required to create a learning model that automatically classifies about the defect/particle SEM images. The particle area identification and classification accuracy by the applicants will be reviewed comparing with the classified list made by professional engineers in semiconductor manufacturing.

<Requirement>

Qualification: Students (Both individuals and teams can participate)
Kaggle in Class: The participants are required to use Kaggle in Class, a tool used by hundreds of universities around the world to practice data analysis techniques. It is encouraged for those who want to try Kaggle-in-class for the first time.
Language: Python
Criteria: The SEM images of defects and particles are classified into the designated classes. The ranking is competed by the classification accuracy rate of the answers.
Required skills: In addition to the methods of basic image recognition/classification , it is necessary to deal with data/issues that occur during actual operation at semiconductor manufacturing fabs, such as data imbalance, unclear classes, and micro defects.
Submission: The applicants are required to submit the following report and abstract for preliminary experiments.
                   1. Report on algorithm code to be submitted to Kaggle-in-Class
                   2. Abstract (1page of MS Word, template) to be submitted to ISSM secretariat
Data sets: SEM images actually used for semiconductor manufacturing are provided.
                   1. Learning data for preliminary experiments: 3,400-4,000 samples
                   2. Data for final selection: 200-300 samples*
                   (*It may contain the samples misclassified in preliminary experiments.)
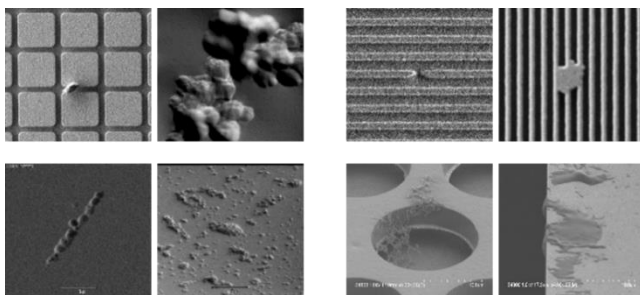
Note: The provided data sets are ONLY allowed to be used for ISSM SEM Image Classification AI Algorithm Contest.

Sample of SEM image data:
left-upper: particle adhesion, right-upper: pattern defect, left-bottom: surface bump, right-bottom: contamination

<Schedule>

Entry due date:	October 31, 2020
	*It is highly recommended to complete entry sheet so that you can get the data with Kaggle-in-class ID.
Kaggle User application date:	From September 15, 2020
Report on Algorithm code due date:	November 30, 2020
Abstract due date:	November 30, 2020

<Award and Award Examination Guidelines>

Award: The Best Excellent Award and The Technical Awards will be recognized at the Award Ceremony during ISSM 2020 conference period (December 15-16, 2020).

ISSM Semiconductor Manufacturing Fab Data AI utilization Idea Contest

The solution ideas applying AI for the huge amount of data accumulated at the semiconductor manufacturing fabs are expected at this contest. For example, how to stabilize the yield of semiconductor chips, reduce factory costs, and increase profits, how to remotely manufacture semiconductor chips in consideration of with and after COVID-19, etc.

<Requirement>

Qualification: Students (Both individuals and teams can participate)

Evaluation: ISSM Program Committee will review the proposal of solution ideas applying AI for the challenges related to big data accumulated in semiconductor manufacturing fabs. The originality and feasibility will be reviewed.
The applications that have passed the preliminary selection will be publicized at ISSM conference period and evaluated based on the number of "like" points by ISSM2020 participants. The top three will be awarded.

Submission: The applicants are required to submit video presentation in mp4 up to 5-minute to ISSM secretariat. Embed video, audio, and subtitles are allowed. Use the contest template (PowerPoint). The first page covers presentation title, name of author(s) or team, and selected category(see table below).

Category for ISSM Semiconductor Manufacturing Fab Data AI utilization Idea Contest

Category	Category #	Management areas	Sample of expected areas where AI technologies are applied
Business	1-1	Investment scale	ROI, location,transportation, employment, tax system, investment timing
	1-2	Fab design	Factory design concept, rocket start-up, scale-up plan
	1-3	Production type	Manual manufacturing, automation
	1-4	Fexible manufacturing	Number of products, production quantity
Facility Management	2-1	Power management	Energy saving, cogeneration
			CO_2 emission
	2-2	Cleanliness management	Cleanliness (air filter), airborne particles, cleanware management (cleaning)
	2-3	Air condition	Temperature, humidity
	2-4	Compressed air	Compressor (electric power, operating status)
	2-5	Raw material management	Process gas (fluorocarbon gas, helium, etc.)
			Chemicals (resist, slurry, chemical liquid, etc.)
			Pure water
			Waste water/liquid treatment, exhaust gas treatment
Production Control	3-1	Lot management	Lot status/record, number of lots, product lot/test lot
	3-2	Wafer management	Process record/number of products, product wafer, dummy wafer, monitor wafer
	3-3	Process design	Number of steps, lead time setting, etc.
	3-4	Wafer manufacturing	Front-end/back-end manufacturing, packaging, recipe setting, advanced process control(APC)
			Dispatch, lead time
			Product schedule/TAT (time required for production), WIP（Work In Process)
	3-5	Logistics in the fabs	Person transfer/automatic transfer: route, number of people per unit, capacity
	3-6	Fab warehouse	Shelves and stockers, number, layout
Equipment Control	4-1	Occupancy rate	MTBF (Average failure time), MTTR (Average repair time), MTBA (Average time between assists)
	4-2	Failure prediction	Built-in sensor, incidental facility (vacuum pump/scrubber)
	4-3	Maintenance	PM scheduling
			Storage parts management
Process Control	5-1	Front-end process	Photolithography, etching, deposition, CMP, cleaning, furnace, heat treatment, etc.
	5-2	Inspection process	Film thickness, line width, mask overlay, electrical resistance, etc. Cp/Cpk (process capability index)
	5-3	DC/AC test	TEG design, tester
Workers	6-1	Workers	Vital data etc.
			Incentive, communication
	6-2	COVID-19	Infection prevention, hygiene management
Quality Control	7-1	Yield	Learning, quality prediction analysis, Weibull distribution
	7-2	Quality	ZeroDefects, Automotive quality, Taguchi method
	7-3	Variation	Line load factor/line balance
Application from other industries	8-1	Application of numerical analysis and optimization, which has been researched and put into practical use in other industries, to the semiconductor industry	Food industry, machinery (automobile industry), chemistry (petrochemical), steel, etc.

<Schedule>

Entry due date: October 31, 2020
                                    *It is highly recommended to complete entry sheet so that you can get the data with Kaggle-in-class ID.
Video due date: November 30, 2020

<Award and Award Examination Guidelines>

Award: The best three applicants passed the final selection based on the number of "like" points by ISSM 2020 participants will be recognized at the Award Ceremony during ISSM 2020 conference period (December 15-16, 2020).

Qualification of applicants:

Both contests can be applied by those who are enrolled in the school (high school, college, university) for the period from the time of entry to the contest (August 31, 2020) through the date of the final selection (December 15th to 16th, 2020).   Both individuals and teams can apply.

Entry

Entry period is from August 31, 2020 through October 31, 2020.
There is no maximum number of team members. The number of members may be one.
Click here for entry of each contest (click the applicable contest)
        Entry for ISSM SEM Image Classification AI Algorithm Contest
        Entry for ISSM Semiconductor Manufacturing Fab Data AI utilization Idea Contest

Copyright Issues

Only original unpublished works can be submitted.
Entries will not be returned.
The personal information provided when applying will be properly managed by the organizer and will not be used for anything other than selection and announcement. When we announce the award winners, we will announce the name, school name, etc.
Please be careful not to infringe the rights of third parties by copyright, trademark right, portrait right etc. If any trouble occurs with a third party, the applicant will be responsible for resolving it. In such cases, we may cancel the award.
The organizer has the right to announce and publicize the award winners' works.
The applicants must agree that the organizer can use the submitted works to the extent necessary for the purpose of promotion of the contest as well as the future contests without charge to the organizer.

Chairman/Vice chairman of ISSM Committees:
ISSM Organizing Committee
        Chairman: Shozo Saito, Device & System Platform Development Center Co., Ltd.
        Vice Chairman: Shuichi Inoue, ATONARP INC.
ISSM Executive Committee:
        Chairman: Ayako Shimazaki, TOSHIBA NANOANALYSIS CORPORATION
ISSM Program Committee:
        Chairman: Shin-ichi Imai, Hitachi High-Tech Solutions Corporation

Task Force Members of ISSM AI Solution Contests
        Leader: Tsuyoshi Moriya, Tokyo Electron, Ltd.
        Member: Ayako Shimazaki, TOSHIBA NANOANALYSIS CORPORATION
                Shin-ichi Imai, Hitachi High-Tech Solutions Corporation
                Takahito Matsuzawa, Tokyo Electron, Ltd.
                Katsutoshi Ozawa, OMRON Corporation
                Sumika Arima, University of Tsukuba

Contacts:
ISSM 2020 Secretariat
e-mail : issm_2020@emiconportal.com
Tel: +81-3-6807-3970
www.semiconportal.com/issm