

# サレジオ高専情報工学科における教育と研究への 国際的提携の提案

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International initiatives for education and research in department of  
computer science and technology, Salesian Polytechnic

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In order to improve the quality of education, it would be necessary for faculty members to conduct research in their own specialized fields and expand their perspectives. Faculty staff would acquire and deepen the latest academic knowledge by attending international conferences in their field of specialization. This leads to attractive classes and an improved quality of the student's graduation research. Visiting overseas universities will expand the understanding of educational systems outside Japan. Furthermore, in the case of our college, faculty staff will have the possibility to know the Salesian Society operations around the world. This article has the tenacity of introducing the international exchange program which the department of computer science and technology of Salesian Polytechnic has worked on over the last 10 years. In addition, the research subjects of the faculty staff and the student's graduation research are introduced. As well some basic information will be provided for the realization of joint research with universities affiliated with IUS.

## 1. Introduction

In the Department of Computer science and technology at Salesian polytechnic Japan, we encourage exchange programs involving foreign researchers and the participation in international academic conferences. Those actions are in order to improve the actual educational contents and presentation skills of our faculty members and to give them the opportunity to investigate and acquire the latest knowledge concerning their research area and subject. In particular, the educational-research exchange program between faculty members in IUS-related institutions is considered a good opportunity to obtain knowledge about the significance of the Salesian Society and to have an understanding of Don Bosco's educational philosophy.

In this paper, we make a statement on our international cooperation framework and prospects of our department from the viewpoint of education and research. Chapter 2 enlightens the history of international exchange up to date. Chapter 3 introduces the outline of the

curriculum and the department's academic schedule which conciliate with the realization of a half-year study abroad program for students. Chapter 4 presents the research fields and achievements of our faculty members in order to realize collaborative research with faculties of IUS institutions.

We have expectation that many IUS-related institutions and their researchers will work together with our departments in research and education grounds. This article pretends to be the basic material for that achievement.

## 2. Summary of the history of exchange

In the following, we would like to introduce examples of research and educational exchanges conducted by the department in the past.

### 2.1 Don Bosco technical college in Philippines

The Don Bosco technical college, Mandaluyong, Philippines (in the following, referred to as DBTC) is one of the leading engineering colleges in Manila. They have a relatively long history of interaction with our department. DBTC has two

departments analogous to the Department of Information Engineering. Every year in February, the International Exchange Committee in our collage dispatches students and faculty members from Japan to the Philippines for the purpose of international goodwill. Our department has dispatched nine faculty members to the previous mentioned departments since 2007. From then exchanges became active, and we have been exploring the possibilities of exchanges in education and research. Table 1 shows the time of dispatch, names of faculty members, and number of our students. Despite the fact that several of our faculties have been transferred, almost all faculty staff in our department have participated in the project and made their presence at DBTC. Moreover about 2 students from 3rd year in our department are chosen and dispatched every year.

Every October, DBTC staff are sent to Japan. Photo 1 shows a group photo of DBTC staff dispatched to Japan in 2013 joint with our faculty members. At that time, the head of DBTC came to Japan at the request of our department.

Table 1. Faculty staffs dispatched from our department

year	name	Number of student
2007	Yamanobe Motowo	3
2008	Shimakawa Yoichi	4
2009	Uchida Takeshi	2
2010	Shimizu Testuya	4
2012	Ooshima Masaki	3
2013	Osumi Noriko	2
2014	Shimizu Testuya	2
2015	Toma Miyata	2
2016	Kawamura Harumi	2

(In this paper, Japanese names are given in the order of family name, first name.)

The purpose of dispatching students is to provide them with the prospect to experience a different culture. On the other hand, there are two specific purposes for dispatching faculty members. One of the reasons is to make a visit to a higher education related institution of the Salesian Association outside Japan. Another reason is the sighting and proposal of jointly research themes among the institutions. We trust that increasing the international performance of

each faculty in their field is necessary to improve the quality of education. In order to achieve that objective, faculty members of our department would give presentations in English to DBTC staff to improve a collaborative research matching.

Since 2017 we have stopped sending our faculty members, for reason that the DBTC staff has changed significantly. This drastic change, has made DBTC no longer actively engaged in research and the education exchanges with us reached its impossibility.



Photo. 1 Mutual exchange with the head of DBTC

In 2016, we succeeded in partnering with a Japanese company in Manila for international internships. The photo.2 was taken in the occasion of our visit to the company's facilities of Toyota's local branch in Manila. Toyota accepted the idea of this internship. However, the student dispatch was not realized due to poor arrangement of local staffs regarding the student's accommodation.



Photo. 2 Company accepting internship

## 2.2 Thai-Nichi Institute of Technology in Thailand

Thai-Nichi Institute of Technology is a technical university in Bangkok, Thailand, aiming to be a “Japanese-style manufacturing university”. It has exchange programs in education and research not only with the Salesian Polytechnic, but also with other national technical colleges in Japan.

In 2016, we proposed joint research on the theme of environmental impact estimation in Bangkok, Thailand, and applied for a public research grant in cooperation with a faculty member of the Department of Information Science at the Thai-Nichi Institute of Technology. Unfortunately, the application for the scientific research funding based on that research proposal was not accepted. However, working together for the proposal has provided us mutual and more accurate understanding with regards to the research on environment field of each department, as well the specialization of its members. Although, the collaborative research has not been realized, the student exchange project continues. Photo 3 was taken when the author visited the Institute of Technology to discuss research cooperation in 2016. The person on the left in the photo is the head of the Faculty of Informatics at the Thai-Nichi Institute of Technology.



Photo. 3 Visit to the Thai-Nichi Institute of Technology

## 2.3 Escola Universitaria Salesiana de Sarria in Barcelona, Spain

Escola Universitaria Salesiana de Sarria in Barcelona, Spain, is a small university that plays an essential role in the IUS. Sarria does not have

the undergraduate department related to information technology. In 2018, Shimakawa visited the university and presented a proposal for an educational research joint project, however, for the insufficiency of common interest there is no significant progress at present moment.

## 3. Our response to internationalization

### 3.1 Characteristics of curriculum currently used

At the time that our department introduced the current curriculum in 2005, we introduced the summer and winter semester system in all subjects except regarding the graduation studies. We designed this system on the assumption that IUS institutions and our college would start exchange programs in the future. In the Japanese academic calendar, the academic year begins in April and ends in March of the following year. IUS related organizations are from September to August. In the case of subjects that earn credits in one year, students are unable to take classes for half a year after September, so credits cannot be obtained and a one-year delay occurs when returning to Japan. If students earn credits in the spring semester, they will be able to earn credits for all classes they attend in Japan. Although this curriculum has been used for 14 years, no international students have been accepted from other IUS institutions, nevertheless the system will be maintained and applied in the next curriculum.

### 3.2 New curriculum features and academic calendar

In 2020 we have the plan for introducing the same credit system as universities. Up to now, we have applied a credit system specific to colleges of technology. Stipulating that the technical college credit system would be the same as that of Japanese universities, it would be possible to transfer classes with other higher education institutions as well as technical colleges, and students would be able to smoothly exchange and transfer credits. The new credit system will be applied to our fresh man students of next year.

Through the introduction of this system, a new curriculum will be taking place in our department. Within this new curriculum, we have the objective of revising the current curriculum and decades ahead give the proper training to engineers who would be capable to deal with IT technology in the near future. Currently, the Japanese government is developing a training program for engineers specializing in artificial intelligence and data science. This new curriculum is consistent with the Japanese government program.

Conversely, there are still some future problems in conducting student exchange programs. Accreditation of a subject would be difficult if the subject that earned the credit abroad would not consistent with the educational policy of the institution in the home country. Presently, we are examining the cases of other institutions in order to see if this certification system would be possible to apply. Currently, only a week-long student exchange project such as the one with the Philippines is being conducted. We would like to continue exploring the possibility of conducting credit exchange programs in the future.

Student exchange program is considered to be extremely beneficial for Asian IUS institutions. Job hunting and graduation studies are the biggest events for students in the final year. In Japan, the unemployment rate for young people is not very large, but in countries where IUS educational institutions are located, employment of students is a severe problem. Our college has an employment rate of almost 100%, and our department has more than 500 jobs for about 50 fifth graders. We believe that the companies that recruit our students also provide opportunities for international students. Japanese companies are becoming global companies and want to hire excellent foreigners. We can give IUS students the opportunity to find a job at a Japanese company. This is a big benefit of studying abroad at our college.

There is also possibility of transferring to a national university in Japan after graduating from our collage.

Undauntedly, if IUS institution's student study at our collage, it will be possible to return to work in the local subsidiary of the company in the future. Even if they wouldn't have the possibility to come to Japan, the fact of doing the jointly graduation with us give them opportunities to get a job at a Japanese company. Our department is highly trusted by Japanese industry. Furthermore, we are able to affirm that the employment rate of our department is almost 100%. For exchange programs, all international students can use the Career Center to provide a career path where they can find employment at a Japanese company.

Table 2 shows the general academic schedule of the Salesian Polytechnic in 2019. Each semester is composed of 15 times class with a time of 90 minutes per class. In addition, midterms and final exams are held in each semester. The grade will be determined by these two tests and additional reports. Classes will not be held in February, instead graduation-related proceedings such as evaluation of graduation studies and grade determination for each grade will be held in that period.

Table 2 General academic schedule in 2019

Event	Schedule
Summer semester start date	April 8
Summer semester midterm exam	June 3-7
Summer semester final exam	July 22-26
Summer vacation starts	August 3
Winter semester start date	September 9
Winter semester midterm exam	November 4-8
Year-end vacation period	December 24 to January 5
Winter semester final exam	January 15-21
Winter Semester end date	January 29

In many cases, September is the beginning of the academic year for IUS institutions. There is a gap of about half a year in the academic schedule comparing with our collage's schedule. Related to this gap, institutions could offer for example

language training. Supposing that students use this half year effectively without thinking, it would be time wasted. However, if used well this lapsed time, studying abroad could be effective. The expectation would be that each IUS institution would give proposes on how to use effectively this period of time.

#### 4. Research cooperation

##### 4.1 Research field and achievements of our faculty member

There are currently 8 full-time faculty members who belong to our department, of which 5 are doctoral degree holders. Table 3 shows the specialization fields of our faculty members. With the exception of new faculty members, all faculty members mentor about 7 graduation research students and around 2 advanced course students.

Table 4 shows the different international conferences in which our faculty members participated in the past few years. This as well shows what kind of field is being studied by each faculty member. In the table, 2, 9, and 12 are image processing, and 6 is an international conference focusing on signal processing. 7 is on algorithms. In number 4 of the table, displays advanced course students who have graduated from our department who have won awards in poster sessions.

Table.3 Our faculty information and specialties (2018)

Name	Position/Degree, Specialties
Shimakawa Yoichi	Professor/Doctor Mathematical Engineering, Operations Research
Yamanobe Motowo	Professor/Doctor Theoretical physics
Utsugi Shuichi	Lecturer/Master Image measurement, image processing
Sushida Takamichi	Lecturer/Doctor Numerical analysis, applied mathematics
Uchida Takeshi	Professor/Master Computer architecture
Ooshima Masaki	Associate Professor/Master Control engineering
Miyata Toma	Associate Professor/Doctor Signal processing
Kawamura Harumi	Associate Professor/Doctor Image processing

##### 4.2 Proposal of mutual exchange by graduation research

Some of our faculty members also have extended experience of collaboration with industries, government and academia, also are currently in a collaborative progression with companies and universities. Grounded on this practice, we believe that joint research with IUS researchers would be possible. Table 5 shows the themes of graduation research in 2018. Graduation research in our department has numerous fields and different directions depending on the specialization field of each supervisor. There are also ambitious research themes which challenge new fields of research. A particular feature of our graduation research program is the fact that there are many studies which apply IT technology to engineering issues in various fields and as well as basic IT technology. This topic is considered to be a prodigious possibility of joint graduation research with IUS institutions.

There is another point that would be positive to emphasize. IUS faculty members who would collaborate with our faculty members need not necessarily be specialized in information engineering or computer engineering. Rather, it is desirable to have a field that is different from information engineering. We hope the field provides applications. If we set up a study that applies artificial intelligence to the theme of a student in the partner engineering department, there is a possibility that it can be presented internationally as a cross-sectoral study. Meanwhile research facilities and funds are not sufficient, we should aim for researches that are characterized by its fusion with these different fields. This is the strength of IUS-related institutions with a global network of professionals. We would like to invite joint research that proposes the application of IT technology to such specific applications. In addition, it would be of our interest to obtain proposals for joint research not only from technology departments but also from diverse departments and fields including

education.

Alternatively, the Japanese government has begun to execute a policy that emphasizes artificial intelligence and data science-based education. Correspondingly, the research subjects related to artificial intelligence, machine learning, and data science are increasing in our department.

The department of Computer Science and Technology department, Salesian Polytechnic has specialists in areas where AI is currently applied, such as signal processing, image processing, and image measurement. Some researches lead to elemental technology of automatic driving technology. Various applications are possible.

At the outset, graduation researches will be conducted with IUS affiliated institutions. Based on this, cross-sectoral researches would be developed and published, and gradually the number of submissions to journals could be increased. We strongly recommend this strategy to IUS institutions in Asia.

## 5. Conclusions

In this article, the international collaboration of the Salesian Polytechnic Department of Computer Science and Technology since 2005 was elucidated focusing on the international relationship with IUS related institutions. We systematized the possibilities and issues of credit exchange for students, and proposed international joint researches based on graduation research.

We impertinently insist that we would like to build a cooperative relationship with researchers and research themes other than information engineering. If we could collaborate in interdisciplinary fields through graduation researches, our research achievements would increase and teachers at IUS institutions would be able to earn degrees. We want to assist young faculty members from Asian IUS institutions to obtain additional degrees. In some cases we could possibly assist them in applying for a doctoral degree in Japan. It would be possible also to consider accepting sabbatical staffs from exterior

to the field of information engineering.

Alternatively, the quality of researches and education itself would be improved by the internationalization of researches on the Japanese prospect. In order to develop an internationalization of researches and educational system would be necessary to increase the number of international applicants to Salesian Polytechnic. This is also the branding strategy of the Salesian name.

According to Don Bosco's philosophy, regarding many aspects one of the greatest assets would be that faculty members of IUS institutions grow throughout their researches in their own specialized fields. Salesian institution's teacher network could for sure cultivates the growth of their students. We believe that the development of the Salesians is to develop their educational skills and expertise. We also propose joint projects to assist the personal development of students. We sincerely hope for your visit to our collage in Tokyo.

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Table 4 International conference where our faculty members published their papers

City, Host country	Conference name
1. Lisbon, Portugal	IEEE 45th Annual Conference of the Industrial Electronics Society (IECON 2019)
2. San Francisco, USA	Electronic Imaging 2019
3. Valencia, Spain	The 9th International Congress on Industrial and Applied Mathematics (ICIAM2019)
4. Bangkok, Thailand	The 9th International Conference on Industrial Engineering and Operations Management(IEOM2019)
5. Ireland, Dublin	30 <sup>th</sup> European Conference on Operational Research(EURO2019)
6. Shanghai, China	The 23rd International Conference on Digital Signal Processing (DSP 2018)
7. Tokyo, Japan	13th SIAM East Asian Section Conference 2018 (EASIAM2018)
8. Valencia, Spain	29 <sup>th</sup> European Conference on Operational Research(EURO2018)
9. San Francisco, USA	Electronic Imaging 2018
10. Singapore	International Conference on Industrial Engineering and Engineering Management (IEEM2017)
11. Québec, Canada	21st Conference of the International Federation of Operational Research Societies (IFORS 2017)
12. Santiago, Chile	AIC(International Colour Association) 2016

Table 5 List of graduation research themes (2018)

Restoration of image based on the stochastic model
A comment on a motion of dropping object using parachute
"Discussion of the Black-Scholes formula for call/put option value based on an approximate expression"
Automatic evaluation of Japanese brush character in calligraphy
Effect of Pre-processing Filters in Detection of Burrs on Wood Using SVM
A Study on overexposure and blackout correction
A Study on Automatic Removal of Target Objects in an Image
Auto classification of character images with Keras
A Congestion Prediction Method using Microblogging Data
A study on accuracy improvement for burr detection using machine learning with Population Based Training
Orbital calculation of planetary probe
A study on automatic generation of audible alarms using an interactive genetic algorithm
A study on a system for suggesting feasible layered clothing using thermal resistance values
A Study on Stock Market Indexes Prediction with Time Series Analysis
A Study on the Influence of Noise in OFDM
Heuristic approaches to Rectangle Packing Problem
"The Dirac brackets of canonical variables of a particle constrained on a spherical surface
—A difference according to initial constraint conditions—"
Removing Shadow from Taken Document Picture Covered with Shadow
Accuracy of Leap Motion in 3D space

A Study on Investment Strategy for Cryptocurrency with Statistical Methods
Development of a program to expand expressions related to big numbers
Recognition of drawing lines on three dimensional space
A study on finding the optimal route for a theme park using a genetic algorithm
Detection of Reverse Running
A performance evaluation method of football players based on Markov Model
A study on congestion forecast for exhibition booths using an ant colony optimization method
Verification the number of war death of Mimase-Battle
Relationship between reverse perspective illusion and stereoscopic perception
AI of Incomplete information game for Game Algorithms
A teaching material of SAGAMIHARA for local patriotism using 3D Models
Simulations of a gravitational lensing
A Study on Handwriting Classification based on Black-White Density Pattern
A mathematical model of average travel distance for a shared-taxi
Simulation of pop out of books by earthquake
Some Considerations on a flight trajectory of a spear
A Study on the Detection Method of Burrs in Drilling of CFRP
Develop the system that prevents heavy use of conjunction in novels
A Studies of Assisting Smile Detection with Conversation Content
A Study on the Feature Extraction from Strike Sound in Kendo Using Wavelet Transform
A forecasting System for Traffic Congestion on QGIS
A time of being tired of automatic composition music using Cadence
Estimate of required time to calculate using parallel computation on 6 x 5 reversi board
A Study on Golf's Prize Ranking Prediction Using Regression Analysis
Simulation of a motion of a particle around a black hole
Applying a genetic algorithm to a signboard layout problem based on a flow captured location-allocation problem
A study on finding top k shortest paths using a slime mold algorithm
Investigation of the Implementation of Variable Digital Filters on Raspberry Pi
Real-Time Detection of Indoor Person Position
Teaching materials using Matumoto-castle 3D model
Simulation of a motion of a particle around a black hole