Table of Contents

Part I Conference Schedule

TUESDAY, NOVEMBER 19, 2019
***Lobby, DongHwa House, NDHU**[*]*

09:00-17:30	Conference Registration

Note: The Registration desk will be moved to the 3F, Science and Engineering Building 2, NDHU on November 20 and 21, 2019.

WEDNESDAY, NOVEMBER 20, 2019
C305, Science and Engineering Building 2, NDHU

09:00-09:10	WELCOME SPEECH *Prof. Sheng-Lung Peng, National Dong Hwa University*
09:10-09:50	**Keynote Speech 1:** Simultaneous Estimation of the Line-of-Sight and Rotational Eye Movement by Tracking of Blood Vessel Images of the Eye *Prof. Kiyoshi Hoshino, University of Tsukuba*
09:50-10:30	**Keynote Speech 2:** Computer-Aided Detection and Diagnosis in Medical Imaging *Dr. Nilanjan Dey, Techno India College of Technology*
10:30-10:40	GROUP PHOTOGRAPH
10:40-11:00	COFFEE BREAK
11:00-11:40	**Keynote Speech 3:** Swarm Intelligence Applied to Machine Learning *Prof. Milan Tuba, Singidunum University*
11:40-12:10	**POSTER PRESENTATIONS**
12:10-13:00	BUFFET LUNCH *Lakeside Restaurant*
13:30-18:10	**Oral Session 1: Machine Learning (I)** *C305, Science and Engineering Building 2*
18:10-19:00	BUFFET DINNER *Lakeside Restaurant*

[*] NDHU (Shoufeng Campus of National Dong Hwa University)

THURSDAY, NOVEMBER 21, 2019

9:00-9:40	**Keynote Speech 4:** Industrial Innovations with Artificial Intelligence *Prof. Wen-Huang Cheng, National Chiao Tung University*
9:40-10:00	COFFEE BREAK
10:00-12:05	**Oral Session 2: Machine Learning (II)** *C305, Science and Engineering Building 2*
12:10-13:00	BUFFET LUNCH *Lakeside Restaurant*
13:30-17:55	**Oral Session 3: Intelligent Systems** *C305, Science and Engineering Building 2*
18:15	Gathering and taking bus to the Promisedland Resort & Lagoon *Gate of Science and Engineering Building 2, NDHU*
18:30-20:30	AWARDING BANQUET *Andalusia Ballroom, Promisedland Resort & Lagoon*

Friday, NOVEMBER 22, 2019

8:55-09:00	Gathering and Depart from Donghwa House
09:00-17:00	Field Visit in Hualien

Part II Keynote Speeches

Keynote Speech 1: Simultaneous Estimation of the Line-of-Sight and Rotational Eye Movement by Tracking of Blood Vessel Images of the Eye

Speaker: Prof. Kiyoshi Hoshino
Graduate School of Systems and Information Engineering, University of Tsukuba

Bio: Prof. Kiyoshi Hoshino received two doctor's degrees: one in Medical Science in 1993, and the other in Engineering in 1996, from the University of Tokyo respectively. From 1993 to 1995, he was an assistant professor at Tokyo Medical and Dental University School of Medicine. From 1995 to 2002, he was an associate professor at University of the Ryukyus. From 2002, he was an associate professor at the Biological Cybernetics Lab of University of Tsukuba. He is now a professor. From 1998 to 2001, he was jointly appointed as a senior researcher of the PRESTO "Information and Human Activity" project of the Japan Science and Technology Agency (JST). From 2002 to 2005, he was a project leader of a SORST project of JST. He served as a member of the "cultivation of human resources in the information science field" WG, Special Coordination Funds for the Promotion of Science and Technology, MEXT, a member of "Committee for Comport 3D Fundamental Technology Promotion", JEITA, and the chairman of the 43rd Annual Meeting of Japanese Society of Biofeedback Research.

Abstract of the speech: The line-of-sight, which rotates around the x and y axes of the eyeball, provides information on what and how long one gaze at. This measurement is also expected to be effective in screening schizophrenia and dementia, and quantifying negative mental and psychological states. For instance, with sick-house syndromes and drug addicts. Moreover, the rotational eye movement, which rotes around the z axis, is expected to be useful in detecting and quantifying visually-induced motion sickness, 3D sickness, car sickness, space sickness, dizziness, sudden development of poor physical condition. Besides, gravitational acceleration may affect the visual system when the line-of-sight is performed with the head or the body trunk tilted, as seen in car driving or athletic sports. To meet these expectations, the author introduces a method focusing on the images of blood vessels in the white part of the eye (the conjunctiva and the sclera), where the blood vessel images are tracked to estimate simultaneously both the sight-line direction and the rotational eye movement with high accuracy. The estimation is carried out mainly based on the intensity gradients of the blood vessels.

Keynote Speech 2: Computer-Aided Detection and Diagnosis in Medical Imaging

Speaker: Dr. Nilanjan Dey
Department of Information Technology, Techno India College of Technology

Bio: Nilanjan Dey is an Assistant Professor in Department of Information Technology at Techno India College of Technology, Kolkata. He has completed his PhD. in 2015 from Jadavpur University. He is a Visiting Fellow of Wearables Computing Laboratory, Department of Biomedical Engineering Univeristy of Reading, UK, Visiting Professor of Duy Tan University, Vietnam. He has held honorary position of Visiting Scientist at Global Biomedical Technologies Inc., CA, USA (2012-2015).

He is the Editor-in-Chief of International Journal of Ambient Computing and Intelligence, IGI Global, series Co-Editor of Springer Tracts in Nature-Inspired Computing, Springer, Advances in Ubiquitous Sensing Applications for Healthcare (AUSAH), Elsevier and the series editor of Intelligent Signal processing and data analysis, CRC Press. He has authored/edited more than 40 books with Elsevier, Wiley, CRC and Springer, and published more than 350 research articles. His main research interests include Medical Imaging, Machine Learning, Bio-Inspired Computing, Data Mining etc. He is a life member of Institute of Engineers (India).

Abstract of the speech: Advancement in medical imaging modalities results in huge varieties of images engaged in the different management phases, namely prognosis, diagnosis, and treatment. In clinical practice, imaging has reserved a vital role to assist physicians and medical expert in decision-making. However, the counterpart that faces the physician is the complexity to deal with a large amount of data and image contents. Mainly, the interpretation is based on the physician's observations, which is tedious, subject to error, and highly depends on the skills and experience of the clinicians. Accordingly, an emerging demand for automated tools become essential for detecting, quantifying and classifying the disease for accurate diagnosis.

Computer-aided Diagnosis (CADx) is an emergent research area that aims to meet the physicians' demands, to speed up the diagnostic process, to reduce diagnostic errors, and to improve the quantitative evaluation. It is based mainly on medical images that provide direct visualization of the bodies and information ranging from functional activities, anatomical information, to the cellular and molecular expressions. Recently, varieties of Computer-aided Detection (CADe) and diagnosis procedures have been established to assist the automated interpretation of the medical images to attain an accurate and reliable diagnosis. Several CADe and CADx approaches can be categorized according to their uses into i) type I for qualitative analysis and visual detection of the objects under concern in the medical images by enhancing the salient features of the objects or suppressing the background noises, ii) type II for assisting objects' extraction for further quantitative analyses for boundary delineation, tree-structure reconstruction, and fiber tracking, iii) type III for automatically detect and

classify the objects using signal processing, medical image analysis and technologies, iv) type VI for estimating the functional and anatomical tissue properties based on mathematical modeling, where such properties are not obviously clear in the medical images, for example, physiology, heat transfer, biomechanics, and so forth.

This talk provides a state-of-the-art sight in medical imaging applied to CAD. It highlights the different imaging modalities, such as magnetic resonance imaging (MRI), Computed Tomography (CT), Positron Emission Tomography (PET), and ultrasound. The talk emphasizes on the CAD ability to improve the diagnostic accuracy and different future directions as an opening that gathers the clinicians and engineers for accurate diagnosis.

Keynote Speech 3: Swarm Intelligence Applied to Machine Learning

Speaker: Prof. Milan Tuba[1,2]
[1]Vice Rector for International Relations, Singidunum University
[2]Department of Mathematical Sciences, State University of Novi Pazar

Bio: Milan Tuba is Vice Rector for International Relations, Singidunum University, Belgrade, Serbia and the Head of the Department for Mathematical Sciences at State University of Novi Pazar. He received B. S. in Mathematics, M. S. in Mathematics, M. S. in Computer Science, M. Ph. in Computer Science, Ph. D. in Computer Science from University of Belgrade and New York University. From 1983 to 1994 he was in the U.S.A. first as a graduate student and teaching and research assistant at Vanderbilt University in Nashville and Courant Institute of Mathematical Sciences, New York University and later as Assistant Professor of Electrical Engineering at Cooper Union School of Engineering, New York. During that time he was the founder and director of Microprocessor Lab and VLSI Lab, leader of scientific projects and theses supervisor. From 1994 he was Assistant Professor of Computer Science and Director of Computer Center at University of Belgrade, from 2001 Associate Professor, Faculty of Mathematics, University of Belgrade, from 2004 also a Professor of Computer Science and Dean of the College of Computer Science, Megatrend University Belgrade and from 2014 Dean of the Graduate School of Computer Science at John Naisbitt University. He was teaching more than 20 graduate and undergraduate courses, from VLSI Design and Computer Architecture to Computer Networks, Operating Systems, Image Processing, Calculus and Queuing Theory. His research interest includes heuristic optimizations applied to computer networks, image processing and combinatorial problems. Prof. Tuba is the author or coauthor of more than 200 scientific papers, cited around 3,000 times, coeditor or member of the editorial board or scientific committee of number of scientific journals and conferences. Member of the ACM, IEEE, AMS, SIAM, IFNA.

Abstract of the speech: Machine learning is a relatively new and very important scientific field that studies algorithms used to execute certain task without being explicitly programmed. Machine learning methods build models based on the sample data that search for patterns that will enable autonomous predictions or decisions when new unknown data are presented. Nowadays, machine learning methods are used in countless areas including economy, biology, medicine, autonomous vehicles, security, and many more. All methods can be divided into three main categories based on the training process: supervised, unsupervised and reinforcement learning. Some of the well-known machine problem tasks are classification, regression, clustering, etc. Due to the extensive need for machine learning in numerous fields, many different methods for solving different tasks were proposed. Support vector machines, artificial neural networks, decision trees and forests were successfully used for solving different classification problems while some of the well-known clustering algorithms include k-means and k-nearest neighbors. The problem with all these methods is that in order to achieve the best possible results, some parameters need to be tuned (e.g. soft margin parameter in support vector machine, initial cluster centers in k-means, activation function, number of hidden layers and nodes in deep artificial

neural networks, etc.). Machine learning parameter tuning is usually a hard optimization problem and it cannot be solved by deterministic methods such as exhaustive search (at least not in a reasonable time frame). For such problems, stochastic population search algorithms, such as nature-inspired algorithms, especially swarm intelligence, were studied and successfully applied. In this talk some applications of the swarm intelligence algorithms to hard optimization problems in machine learning will be presented.

Keynote Speech 4: Industrial Innovations with Artificial Intelligence

Speaker: Prof. Wen-Huang Cheng[1,2]
[1]Department of Electronics Engineering & Institute of Electronics, National Chiao Tung University
[2]Director of NCTU Artificial Intelligence and Multimedia Laboratory

Bio: Wen-Huang Cheng received the B.S. and M.S. degrees in computer science and information engineering from National Taiwan University, Taipei, Taiwan, in 2002 and 2004, respectively, where he received the Ph.D. degree from the Graduate Institute of Networking and Multimedia in 2008.

He is a Professor with the Institute of Electronics, National Chiao Tung University (NCTU), Hsinchu, Taiwan, where he is the Founding Director with the Artificial Intelligence and Multimedia Laboratory (AIMMLab). Before joining NCTU, he led the Multimedia Computing Research Group at the Research Center for Information Technology Innovation (CITI), Academia Sinica, Taipei, Taiwan, from 2010 to 2018. He has published more than 100 articles in journals and conferences. His research interest includes multimedia, artificial intelligence, computer vision, machine learning, social media, and financial technology.

He has received numerous research and service awards, including the 2018 MSRA Collaborative Research Award, the Outstanding Reviewer Award of 2018 IEEE ICME, the 2017 Ta-Yu Wu Memorial Award from Taiwan's Ministry of Science and Technology (MOST), the 2017 Significant Research Achievements of Academia Sinica, the 2016 Y. Z. Hsu Scientific Paper Award, the Outstanding Youth Electrical Engineer Award from the Chinese Institute of Electrical Engineering in 2015, the Top 10% Paper Award from the 2015 IEEE MMSP, the K. T. Li Young Researcher Award from the ACM Taipei/Taiwan Chapter in 2014. He is APSIPA Distinguished Lecturer.

Abstract of the speech: Artificial intelligence across industries is on the rise. Artificial-intelligence-powered solutions have been actively implemented all the way from product development to customer experience. However, many technical challenges remain to be addressed. For example, virtual try-on of clothes in the fashion industry is a fashionable technology for the user to virtually try a desired outfit but clothing is difficult to render with visually realistic results due to the nature it deforms and reflects light in folds and crevices. This talk shares our experiences in working on innovative artificial intelligence solutions to overcome key technical challenges and turn the innovations into practical industrial applications.

Part III Poster Session

Poster Presentation Guidelines

Materials Provided by the Conference Organizer:

- X Racks & Base Fabric Canvases
- Adhesive Tapes or Clamps

Materials Provided by the Presenters:

- Home-Made Posters
- Posters Printed by Conference

Requirement for the Posters:

- Material: not limited
- Size: 160cm (height) ×60cm (width)

X-Rack

Requirement for the Presenters:

- Stand beside his/her Poster through the Session, and discuss with the readers about his/her paper

Time:

- 11:40-12:10, November 20

Location:

- C305, Science and Engineering Building 2
- **NOTE**: We will keep your poster by **12:30 on November 20**. Please contact us in advance if you want to take it away.

List of Posters

ML1046	Detecting pedestrians and their directions from MY VISION views for a visually impaired person *Mr. Kenta Hori, Kyushu Institute of Technology*
ML1085	Multi-task Mass Classification in Mammography: End-to-end processing with deep convolutional neural network *Ms. Hsin Ya Su, National Yang Ming University*
ML1096	Object tracker with deep reinforcement learning with application to autonomous driving *Prof. Jahng Hyon Park, Hanyang University*

ML1046: Detecting Pedestrians and Their Directions from MY VISION Views for A Visually Impaired Person

Kenta Hori[1] and Joo Kooi Tan[2,*]

[1]*Graduate School of Engineering, Kyushu Institute of Technology*
[2]*Faculty of Engineering, Kyushu Institute of Technology*
**Corresponding author: etheltan@cntl.kyutech.ac.jp*

Introduction: According to the World Health Organization, it is estimated that about 1.3 billion people in the world live with some form of visual impairment. When such a blind person goes out, there is a risk of colliding with moving objects. When walking on a sidewalk or the like, there are many moving objects, and among them, most moving objects are pedestrians.

Conventional pedestrian detection methods are a combination of Histograms of Oriented Gradients (HOG) and Support Vector Machine (SVM) or Light Detection and Ranging (LIDAR) which can measure the distance to an object with high accuracy. However, these methods cannot prevent collision because they only detect pedestrians or are used for vehicles.

Methods: We propose a detection method of pedestrians for a visually impaired person(user) using the images provided from a camera mounted on the head of the visually impaired person. The proposed method extracts the flow area different from the flow generated by the camera motion from the camera images. A pedestrian is detected by calculating a Multiple-Scale-Cell HOG (MSC-HOG) feature quantity that arranges cells along the contour of a person in the region. Also, at the same time, the flow area of the pedestrian is divided into four directions to create a histogram, and the direction is recognized by comparing it with the histograms of the flow learned in advance. This is intended to know from which direction a pedestrian comes toward the user wearing the camera.

Results: We conducted pedestrian detection experiments on a total of three videos: two videos shot in an outdoor environment and videos shot in an indoor environment (Table 1).

Table 1. Pedestrian detection results.

	Recall [%]	***Precision [%]***	***F-measure [%]***
Outdoor1	94.37	88.74	91.47
Outdoor2	98.67	98.67	98.67
Indoor	66.04	53.85	59.32
Average	**86.36**	**80.42**	**83.39**

Conclusions: We experimented the proposed method and showed its effectiveness.

Acknowledgements: This research was supported by JSPS Kakenhi, Grant Number 16K01554.

ML1085: Multi-Task Mass Classification in Mammography: End-to-End Processing with Deep Convolutional Neural Network

Hsin-Ya Su[1], An-Shun Liu[2], Chung-Yueh Lien[3], Chia-Hung Hsiao[4], Shih-Tsang Tang[5] and Woei-Chyn Chu[1,*]

[1]*Department of Biomedical Engineering, National Yang Ming University*
[2]*Taiwan Instrument Research Institute, National Applied Research Laboratories*
[3]*Department of Information Management, National Taipei Univ. of Nursing and Health Sciences*
[4]*Department of medical informatics, Tzu Chi University*
[5]*Department of Biomedical Engineering, Ming Chuan University*
[*]*Corresponding author: wchu@ym.edu.tw*

Aims: In order to reduce heavy loads while maintaining good diagnostic quality in mammography examinations, we have designed an AI-based Computer Aided Diagnosis (CAD) System for the work. Following the Breast Imaging Reporting and Data System (BI-RADS) standard, we adopted the deep learning techniques of computer vision to deal with the three main categories in mass lesion diagnosis — normal or not, shape type and margin type. We used the open source databases, DDSM, CBIS-DDSM and MIAS for this study.

Methods: Image preprocessing, feature extraction and classification are three main parts of a deep learning network of CAD system. We used *ResNet50* pre-trained network to extract mammography features and *softmax classifier* to classify these feature maps. We then used *grad-CAM* algorithm to show regions of interest of deep learning network and use t-*SNE* algorithm to identify which layer of the network can best classify the three targeting classes. Our results are shown below:

Results:

	Accuracy	Sensitivity	Specificity
Normal/Abnormal	0.90	0.85	0.90
Shape type	0.53		
Margin type	0.679		

Conclusions: In this preliminary study, we have shown the feasibility of using CNN and a general image database, ImageNet, to classify mammographic images. Our results show good accuracy (0.90), sensitivity (0.85) and specificity (0.9). Future studies need to be done with more training/testing data to further improve the classification results in particular the shape type and margin type accuracies.

Acknowledgements: This study was supported by the Ministry of Sciences and Technologies (MOST107-2634-F-075-001).

ML1096: Object Tracker with Deep Reinforcement Learning with Application to Autonomous Driving

Jae Soon Baik, Jin Han Jeong and Jahng Hyon Park*

Department of Automotive Engineering Hanyang University
**Corresponding author: jpark@hanyang.ac.kr*

Abstract. Perception is an essential part of Self-driving Car or ADAS (Advanced Driver Assistance System). Recently Object detection and Object tracking task have improved by CNN (convolutional nerural network) and huge data set such as Imagenet and COCO. However, Performance of Object tracking tasks has suffered from insufficient video sequence data set unlike a high resolution large data set for object detection. In this work, we propose tracker model combined with deep reinforcement learning for solving limitation of dataset quantity problem. Proposed model estimates next direction and position of bounding box using raw RGB image data. This model consider the learning process as semi-supervised learning rather than supervised learning. Using this approach, tracker can be learn insuffcient data efficiently. We also consider tracking problme as class-agnostic manner, it is more suitable manner to avoid arbitrary dangerous obstacle in autonomous vehicle field. We prove availability of proposed model using VOT2015, OTB-100 and our diving data.

Acknowledgements: This work was supported by the Technology Innovation Program (10076338, Fault Detection and Diagnosis for ADAS-Sensors and Hazardous Analysis and Development of Fault Management Strategy) funded By the Ministry of Trade, Industry & Energy (MOTIE).

Part IV Oral Sessions

Oral Presentation Guidelines

Devices Provided by the Conference Organizer:

- Laptops (with MS-Office & Adobe Reader)
- Projectors & Screen
- Laser Sticks
- Microphones

Materials Provided by the Oral Presenters:

- PowerPoint or PDF file

For presenters who haven't send the PowerPoint to the Conference Secretary, please have your presentation ready in a memory stick, and copy it to the laptop in the session room about **15 minutes** before the session starts. You also need to tell the Session Chair (before the start of your session) that you are going to present your talk.

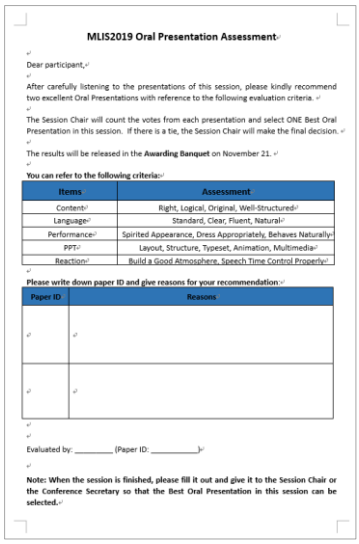
****

Best Oral Presentations Selection Guidelines

Selection Criteria:

ONE best presentation will be selected from EACH session based on the following items:

- Research Quality
- Presentation Performance
- Presentation Language
- Interaction with Listeners
- PowerPoint Design



MLIS2019 Oral Presentation Assessment

Dear participant,

After carefully listening to the presentations of this session, please kindly recommend two excellent Oral Presentations with reference to the following evaluation criteria.

The Session Chair will count the votes from each presentation and select ONE Best Oral Presentation in this session. If there is a tie, the Session Chair will make the final decision.

The results will be released in the **Awarding Banquet** on November 21.

You can refer to the following criteria:

Items	Assessment
Content	Right, Logical, Original, Well-Structured
Language	Standard, Clear, Fluent, Natural
Performance	Spirited Appearance, Dress Appropriately, Behaves Naturally
PPT	Layout, Structure, Typeset, Animation, Multimedia
Reaction	Build a Good Atmosphere, Speech Time Control Properly

Please write down paper ID and give reasons for your recommendation:

Paper ID	Reasons

Evaluated by: _____ (Paper ID: _____)

Note: When the session is finished, please fill it out and give it to the Session Chair or the Conference Secretary so that the Best Oral Presentation in this session can be selected.

Assessment Sheet

Selection Procedure:

- An assessment sheet will be delivered to listeners before the session;
- When the session is finished, each listener is required to fill the sheet (he/she can vote for two excellent presentations) and give it to the Session Chair after the session;
- The Session Chair will count the votes from each presentation and select one best oral presentation with more votes. If there is a tie, the Session Chair will make the final decision.

Nature of the Award

- This award consists of free registration to the next conference and a certificate;
- The awards will be given during the Awarding Banquet on November 21.

Oral Session 1: Machine Learning (I)

Session Chairs:

13:30-16:00 *Dr. Vaclav Kratochvil, Czech Academy of Sciences*
16:15-18:10 *Dr. Ying-Hsuan Huang, National Chung-Shan Institute of Science and Technology*

Time: 13:30-18:10, Wednesday, November 20
Location: C305, Science and Engineering Building 2

13:30-13:55	ML1029 *(Invited Talk)*	A general approach to probabilistic data mining *Prof. Radim Jiousek, Czech Academy of Sciences*
13:55-14:20	ML1084 *(Invited Talk)*	An idea of affective language learning support with haiku considering cross-cultural communication *Dr. Masami Suzuki, KDDI Research, Inc.*
14:20-14:45	ML1097 *(Invited Talk)*	New generation of social media behavioral analysis: from semantic network to machine learning *Prof. Adela S. M. Lau, Madonna University*
14:45-15:00	ML1016	Performance of probabilistic approach and artificial neural network on questionnaire data concerning Taiwanese ecotourism *Assoc. Prof. Vladislav Bína, University of Economics*
15:00-15:15	ML1019	AC operation hardware learning neural circuit using V-F converter system *Prof. Masashi Kawaguchi, National Institute of Technology, Suzuka College*
15:15-15:30	ML1022	An inequality for linear canonical transform *Prof. Ryuichi Ashino, Osaka Kyoiku University*
15:30-15:45	ML1023	Image separation based on multiwavelet analysis *Prof. Akira Morimoto, Osaka Kyoiku University*
15:45-16:00	ML1028	Thrust prediction of turbofan engine using multilayer perceptron *Dr. Ying-Hsuan Huang, National Chung-Shan Institute of Science and Technology*
16:00-16:15		**COFFEE BREAK**
16:15-16:30	ML1042	Compositional models: iterative structure learning from data *Dr. Vaclav Kratochvil, Czech Academy of Sciences*
16:30-16:45	ML1073	Data classification by using smooth generalized pinball-loss functions in Support Vector Machines *Prof. Rabian Wangkeeree, Naresuan University*
16:45-17:00	ML1092	The large scale instance selection using heterogeneous value difference matrix *Dr. Chatchai Kasemtaweechok, Kasetsart University*

17:00-17:15	ML1045	Tuning of double link flexible robotic manipulator by artificial bee colony algorithm *Dr. Annisa Binti Jamali, Universiti Malaysia Sarawak*
17:15-17:30	ML1043	Consciousness detection in complete locked-in state patients using electroencephalogram coherency and artificial neural networks *Dr. Volafidy Sophie Adama, Leipzig University*
17:30-17:45	ML1056	Computer vision based demersal fish length measurement technology *Dr. Sheng-Wen Jeng, Industrial Technology Research Institute Southern Region Campus*
17:45-18:10	ML1051 *(Invited Talk)*	Some innovation IoT systems integration and applications *Prof. Wen-Tsai Sung, National Chin-Yi University of Technology*

ML1029: A General Approach to Probabilistic Data Mining

Radim Jiroušek*

Institute of Information Theory and Automation, Czech Academy of Sciences
**Corresponding author: radim@utia.cas.cz*

Aims: A probability distribution can be (among others) considered a general tool to represent knowledge, which is, as a rule, loaded by uncertainty. The aim of the lecture is to explain two important inseparable parts of knowledge that can be distilled from a multidimensional probability distribution: the quantitative part expressing type and strength of dependence of events, and the structural part, which often reveals that the considered relationship is not direct but mediated through other, more closely connected mediators.

Methods: The described data mining approach is based on a simple idea: the available data are used to reconstruct a probabilistic generator in the form of a probabilistic compositional model. The basic idea of compositional models is very simple and copies what humans do: to express knowledge from an application area, one always expresses only pieces of local knowledge from which total knowledge must be set up. Therefore, to represent a multidimensional probability distribution one should assemble it from a number of low-dimensional ones. This analogy also explains why the compositional models are (relatively) easily understandable to specialists from the area of application – non-mathematicians. And it is also the reason why this technique is, like Bayesian networks, included among the methods of data-mining.

Results: The proposed method is not a deterministic algorithm but a user-controlled process. This allows for merging the knowledge from data and the expert knowledge of a user, which increases the power of the proposed data mining technique.

Conclusions: The described data mining technique can be realized with the help of a web application that will be made available to the conference participants.

Acknowledgements: This research was financially supported by the bilateral Czech-Taiwanese project *Compositional models for data mining* awarded by the Ministry of Science and Technology, and by the Czech Academy of Sciences under the grant number MOST-18-04.

ML1084: An Idea of Affective Language Learning Support with Haiku Considering Cross-Cultural Communication

Masami Suzuki*

KDDI Research, Inc.
**Corresponding author: msuzuki@kddi-research.jp*

Abstract. Haiku is a Japanese literary art that is regarded as the smallest poetry, and is now spreading all over the world through various languages. Because of its shortness, haiku can be thought of as a communication medium that gives readers an intuitive image, ie, arouses imagination, rather than descriptive expression (explanation).

Recently automatic translation (interpretation) systems that help dialogue between speakers of different languages are becoming practical. However, it would be difficult to understand each other about culture-dependent topics. In this way, certain communication support with ICT equipment would be desirable in order to alleviate the cultural gaps as well as language difference.

On the other hand, in the field of language education, an interesting attempt has been examined in an English language learning classroom, where students were encouraged to create their own haiku and talk together with co-participants. In such a circumstance, students are asked to spontaneously give their own view and to listen to others' opinion. This can be good experiences for the students from a perspective of foreign language learning as well as being conscious to their own culture.

From the viewpoint of learning through haiku, vocabulary is very important, while students' individual abilities are divergent for the aspect. In this presentation I will discuss about possible ICT-based support, especially on enhancement of vocabulary, to such a style of learning through haiku creation and appreciation will be proposed with concluding remarks.

ML1097: New Generation of Social Media Behavioral Analysis: From Semantic Network to Machine Learning

Adela S. M. Lau[1,*] and Liege Cheung[2]

[1]*School of Business, Madonna University*
[2]*A&A Research, Training and Consultancy Ltd*
[*]*Corresponding author: slau@madonna.edu*

Aims: As the growth of social media usages, social media become a new data channel for collecting people's opinions and comment. Since social media data is unstructured and opinions may change dramatically, how we can analyze the social media data for behavioral prediction. Although there are many studies on analyzing user behaviors of using social media, the problem is its incapability of

analyzing users' behaviors with a learning capability to adapt human behavioral change for analysis. Therefore, this paper is aimed to design an information architecture for analyzing the social media posts with a self-learning capability and the research question is how to updating the social media analytical rules for post analysis.

Methods: A novel approach of ontology-based Bayesian network was proposed in this study for identifying behaviors of social media users in terms of their groups of discussion, frequency of discussion, time stamps of discussion, responses of various types of posts. A neural network model was used for improving the Bayesian network analysis.

Results: Some simulated Instagram data was used to assess the feasibility of the novel method. An Instagram ontology, which defined the attributes of the posts including types of posts, frequency of discussion, stakeholders of the posts, time stamps of discussion, was built. Bayesian network and neural network model were used for Instagram posts analysis. The simulated data showed that the neural network model improved the predictive errors in the Bayesian network analysis.

Conclusions: Since this paper only used simulated data to assess the feasibility of this novel social media analysis method, a real case study has been used in the next stage of the project and will be presented in another paper.

ML1016: Performance of Probabilistic Approach and Artificial Neural Network on Questionnaire Data Concerning Taiwanese Ecotourism

Vladislav Bína[1,2,*], Václav Kratochvíl[1,2], Tsong-Ru Lee[3] and Lucie Váchová[1,2]

[1]*Faculty of Management, University of Economics*
[2]*Institute of Information Theory and Automation, Academy of Sciences of the Czech Republic*
[3]*Department of Marketing, National Chung Hsing University*
**Corresponding author:* bina@fm.vse.cz

Aims: The aim of the study is to perform modelling of Taiwanese farm and ecotourism data using compositional models as a probabilistic approach and to compare its results with performance of artificial neural network approach.

Methods: Authors use the theory of probabilistic compositional models together with artificial neural network as a classifier and compare the accuracy of both approaches. Probabilistic model structure is learned using hill climbing (and its tabu search generalization), the parameters of multi-layer feedforward artificial neural network are learned using an R implementation of H_2O library for deep learning approach. Both above mentioned approaches employ the training part of dataset for structure learning and testing part of data for its validation.

Results: The main result includes a pair of different models of Taiwanese farm and ecotourism data. The results of performance and accuracy testing on validation part of data set are provided together with the structure of compositional model and characterization of resulting artificial neural network.

Conclusions: The resulting models are compared and authors present the differences in performance and accuracy. As expected, the compositional models show significant advantages in interpretability of results and (probabilistic) relations between variables (together with the categories of answer variables), whereas the artificial neural network approach provides more accurate, yet "black box" model.

Acknowledgements: The research was supported by Academy of Sciences of the Czech Republic and Ministry of Science and Technology (Taiwan) under project MOST-18-4 (Compositional models for data mining).

ML1019: AC Operation Hardware Learning Neural Circuit Using V-F Converter System

Masashi Kawaguchi[1,*], Naohiro Ishii[2] and Masayoshi Umeno[3]

[1]*Department of Electrical & Electronic Engineering, National Institute of Technology, Suzuka College*
[2]*Department of Information Science, Aichi Institute of Technology*
[3]*Department of Electronic Engineering, Chubu University*
**Corresponding author: masashi@elec.suzuka-ct.ac.jp*

Aims: In the machine learning field, many application models such as pattern recognition or event prediction have been proposed. Neural Network is typically basic methods of machine learning. Previous analog neural network models were composed of the additional circuit and solid resistance. Additional circuit was realized by operational amplifier. Connecting weights means the solid resistance of circuits. As the reason of the resistance is fixed, changing resistance value and connecting weight is quite difficult. However, in the case of using variable resistance, we have to adjust the resistance value by our hands. In this study, we used analog electronic circuits using alternative current to realize the neural network learning model.

Methods: These circuits are composed by a rectifier circuit, Voltage-Frequency converter, amplifier, subtract circuit, additional circuit and inverter. The connecting weights describe the frequency, converted to direct current from alternating current by rectifier circuit. The connection weights are able to change easily compare with another hardware neural model. This model's architecture is on the analog elements.

Results: The learning time and working time are very short because this system is not depending on clock frequency. Moreover, we suggest the realization of the deep learning model about proposed analog hardware neural circuit.

Conclusions: At first, we designed analog neural circuit using multiple circuits. We confirmed the operation of this network by SPICE simulation. Next, we constructed basic analog neural network by alternative current operation circuit. The input signal and connecting weight generate the Alternative current by the Amplifier circuit. Two Alternative currents are added by an additional circuit. Moreover, a deep learning model has been proposed recently and developed in many applications such as image recognition and artificial intelligence. In the future, this hardware learning ng system is expected in the field of robotics, conversation system and the artificial intelligence.

ML1022: An Inequality for Linear Canonical Transform

Mawardi Bahri[1] and Ryuichi Ashino[2,*]

[1]*Department of Mathematics, Hasanuddin University*
[2]*Mathematics and Informatics, Osaka Kyoiku University*
**Corresponding author: ashino@cc.osaka-kyoiku.ac.jp*

Abstract. In recent years, the linear canonical transformation (LCT) has been widely discussed in a number of papers. It is a three-parameter class of linear integral transformations, which is effectively used in many field of applied mathematics, optics, digital information processing, and so on. The LCT can be looked as a generalization of the classical Fourier transform, so most of the properties of the Fourier transform are modified in the LCT domain. Because of the benefits of LCT, there are many general transformations, which are built using LCT, that is, by merging existing kernel with LCT kernel. In this study we focus on investigating some properties of the LCT, which are missing in the literature. Based on the properties, we establish an inequality related to the LCT.

Acknowledgements: This work was partially supported by JSPS KAKENHI Grant Numbers JP16K05216, JP17K05298, JP17K05363 and by the Research Institute for Mathematical Sciences, an International Joint Usage/Research Center located in Kyoto University.

ML1023: Image Separation Based on Multiwavelet Analysis

Akira Morimoto[1,*], Ryuichi Ashino[1] and Takeshi Mandai[2]

[1]*Mathematics and Informatics, Osaka Kyoiku University*
[2]*Center for Physics and Mathematics, Osaka Electro-Communication University*
**Corresponding author: morimoto@cc.osaka-kyoiku.ac.jp*

Aims: We observe weighted superpositions of rotations and translations of original images. Our aim is to estimate the number of original images, relative rotation angles, relative translation parameters

and relative weights from two observed images. Our goal is to separate observed images to original images.

Methods: We estimate the number of original images and relative rotation angles, using correlation of wavelet transforms of observed images. We roughly estimate relative translation parameters by the inverse Fourier transform of the correlation. We precisely estimate relative translation parameters and weights using multiwavelet transforms of observed images.

Results: We proposed several algorithms to estimate parameters using wavelet analysis.

Conclusions: We have presented new algorithms to estimate parameters. By numerical simulations, the algorithms worked well.

Acknowledgements: This work was partially supported by JSPS KAKENHI Grant Numbers JP16K05216, JP17K05298, JP17K05363 and by the Research Institute for Mathematical Sciences, an International Joint Usage/Research Center located in Kyoto University.

ML1028: Thrust Prediction of Turbofan Engine Using Multilayer Perceptron

Yung-I Lin[1], Yu-Fu Lin[2,*], Der-Chen Huang[2] and Ying-Hsuan Huang[1]

[1]*Aeronautical Systems Research Division, National Chung-Shan Institute of Science and Technology*
[2]*Department of Computer Science and Engineering, National Chung Hsing University*
**Corresponding author: yufu35@gmail.com*

Aims: Traditional engine's malfunction rules were defined by experts. To solve this problem, Chen *et al*. used a nonlinear regression model to establish a thrust prediction model. However, they cannot effectively calculate the coefficient of the regression model and the number of order. Therefore, this research proposed a multilayer perceptron to predict the thrust of the turbofan engine, where the research object is TFE731.

Methods: The proposed method consists of one input layer, *N* hidden layers and one output layer. Different from the seven features of Chen *et al*.'s nonlinear regression model, the proposed method only used five features as input values. The number of hidden layer is determined rapidly by our searching strategy, which assures high prediction accuracy and reduces the construction time of the prediction model.

Results: In order to obtain an appropriate structure of multilayer perceptron, this research searched several appropriate parameters from massive experiments. Experimental results showed that the root-mean-square deviation (RMSD) of the double-layer perceptron with logistic-sigmod function is 15.60, which is smaller than Chen *et al*.'s RMSD (26.868).
Conclusions: The proposed method is superior to than Chen *et al*.'s method.

ML1042: Compositional Models: Iterative Structure Learning from Data

Václav Kratochvíl[1,*], Vladislav Bína[1], Radim Jiroušek[1], Lucie Váchová[1] and Tzong-Ru Lee[2]

[1]*Institute of Information Theory and Automation, Czech Academy of Sciences*
[2]*National Chung Hsing University*
**Corresponding author: velorex@utia.cas.cz*

Abstract. The basic idea of compositional models is very simple: it is beyond human capabilities to describe global knowledge from an application area - one always works only with pieces of local knowledge. Such a local knowledge can be, within probability theory, easily represented by low-dimensional distributions and the multidimensional distribution is (in a special way) composed from the local pieces. This analogy also explains why the compositional models are (relatively) easily understandable to specialists from the area of application - non-mathematicians. And it is also the reason why this technique is, like Bayesian networks, included among the methods of data-mining.

The compositional model has two parts – pieces of local information stored in low-dimensional probability distributions, and a way how these pieces are composed together – the so-called model structure. Because various structures have various space requirements and also various abilities to reflect the real data, it is of special importance to have a good method to reveal an independence relations structure hidden in data and use it to construct a structure of the corresponding compositional model. The aim of the study is to introduce a new iterative algorithm to do that.

Acknowledgements: This work was supported by the bilateral Czech-Taiwanese project Compositional models for data mining financially supported by the Ministry of Science and Technology, and by the Czech Academy of Sciences under the grant number MOST-18-04.

ML1073: Data Classification by Using Smooth Generalized Pinball-Loss Functions in Support Vector Machines

Wachiraphong Ratiphaphongthon and Rabian Wangkeeree[*]

Department of Mathematics, *Faculty of Science, Naresuan University*
**Corresponding author: rabianw@nu.ac.th*

Aims: To propose a novel smooth-type support vector machine with generalized pinball loss function which is better generalization performance, noise insensitivity and re-sampling stability for the noise corrupted datasets and is generalization problem for convex loss SVMs.

Methods: We have considered the usual SVMs as its equivalent form, the unconstrained SVMs, then constructed two smooth functions in different ways to replace the non-smooth original loss. After verified and analyzed these approximations as theorem, we have evaluated our algorithms by

experiment with 12 benchmark datasets with and without noise corrupted in term of speed and computational time.

Results: Two families of smoothing approximation of the generalized pinball loss function are constructed together with theorems that guarantee convergent of approximation functions. In term of accuracy, our proposed performs better than SVM for some datasets and also better in the noise corrupted data and the computational performs in large scale data is effective.

Conclusions: We obtained a generalized framework which can be reduced to existing convex loss SVM. In addition, their generalization performance gives us to achieve a method that can be used for noise corrupted data and have stability for re-sampling. Since their performance is dependent on the hyper parameters, by applying gradient descent algorithm, the overall processing time is shorter.

Acknowledgements: I would like to acknowledge associate professor Dr. Rabian Wangkeeree for his valuable and constructive suggestions during the planning and development of this research work. This research was supported by the DPST scholarship and department of Mathematics, Naresuan university.

ML1092: The Large Scale Instance Selection Using Heterogeneous Value Difference Matrix

Nitiporn Sukkerd, Chatchavin Hathorn and Chatchai Kasemtaweechok*

Kasetsart University
**Corresponding author: chatchai.kase@ku.th*

Abstract. The data classification on large scale dataset is one of common prob-lem in this decade because the classifier model take overwhelming time to learn all data completely. To solve this issue, the instance selection algorithm is a well-known technique to reduce size of training set. The instance selection methods decrease the difficulty of data classification and improve quality of training data. This study proposed the novel instance selection method using heterogeneous value difference matrix (HVDM) distance function. The proposed method se-lected a set of median of HVDM values in each partition as reduced training set. We compare the proposed method with Condensed Nearest Neighbor (CNN) and Instance Based Learning (IB3) method. The five large scale datasets from UCI data repository were tested with three classifier model: decision tree (J48), neural net, and support vector machine (SVM). The accuracy and Cohen's kappa of pro-posed method are better than those of two compared methods while the propose method has moderate reduction rate. However, the accuracy and kappa of the proposed method are nearly equal to those of original training set.

ML1045: Tuning of Double Link Flexible Robotic Manipulator by Artificial Bee Colony Algorithm

Annisa J.[1], Mat Darus I. Z.[1] and M. O Tokhi[2]

[1]*Universiti Teknologi Malaysia*
[2]*London South Bank University*
**Corresponding author:* annisajamali@gmail.com

Abstract. This study discusses the control of the two-link flexible manipulator (TLFRM) utilizing PID with Artificial Bee Colony (ABC) algorithm technique. The essential objective of designing the controller is to improve the performance of favored position executed and vibration suppression of TLFRM. The MATLAB environment is utilized to verify the accomplishment of the recommended control system. An assessment is conducted to illustrate the efficiency of PID-ABC controller in terms of input tracking and vibration suppression. The system is capable to achieve preferred angle at decrease overshoot using the recommended method and the settling time is exceptionally much quicker. In the meantime, the vibration reduction indicates considerable enhancement for each links. Overall, the two-link flexible manipulator was successfully move to the preferred position with vibration suppression in the entire system.

ML1043: Consciousness Detection in Complete Locked-In State Patients Using Electroencephalogram Coherency and Artificial Neural Networks

Adama V. S.* and Bogdan M.

Leipzig University
**Corresponding author:* adama@informatik.uni-leipzig.de

Abstract. In this study, a method to uncover levels of consciousness using electroencephalogram (EEG) coherency and artificial neural net- work is presented. The subjects of interest are complete locked-in patients (CLIS). These patients are characterized by complete paralysis and sufficiently intact cognition. Consequently, there are aware of themselves and their surroundings, but are unable to produce speech. A great challenge in the study of consciousness in patients with CLIS is that there are no certainty regarding their level of awareness at all time. In this study, a method using EEG coherence matrices as input to a convolutional au- toencoder to determine a patients level of consciousness is presented. The ultimate goal of the research is to build a brain-computer interface-based communication device to allow interactions with CLIS patients.

ML1056: Computer Vision Based Demersal Fish Length Measurement Technology

Sheng-Wen Jeng*, Chih-Kai Chiu and Kai-Siang Gan

Industrial Technology Research Institute Southern Region Campus, Smart Microsystems Technology Center, Visual Interaction Department
**Corresponding author: itriA40264@itri.org.tw*

Aims: The aim of this study is developing a real time measuring system for demersal fish to monitor the growing trend (includes fish size and fish activity) of fishes in fishpond for fish farmers.

Methods: Computer vision based algorithm processes and analyzes the captured image to locate a fish inside a bounding box. Sophisticated shape analysis and machine learning technique were then applied to the bounding box region of image to identify and extract the shape contour of the fishes on the image. Next, this contour was used to obtain the location and length of the fishes in image coordinates. Then, by using the spatial information provided to the system earlier (calibration), the scaling information (mm/pixel) can be used to transform the image length to physical scale. Besides, the fish activity also can be calculated based on the difference between current and previous image frame.

Results: A computer vision based software system which has user friendly graphic UI with kernel fish size and fish activity measurement algorithms is build.

Conclusions: The fish length measurement technology developed in this study is suitable applied to demersal fish (for example, Epinephelus lanceolatus or so called giant grouper) in fishpond. The purpose of this system is long-term monitoring the growing process of fishes with non-disturb way. So, passive measurement is adapted with simple hardware configuration including a camera, support mechanism and white color background plate.

Acknowledgements: This study is supported by cooperation project of Industrial Technology Research Institute Southern Region Campus, Smart Microsystems Technology Center and Fisheries Research Institute.

ML1051: Some Innovation IoT Systems Integration and Applications

Wen-Tsai Sung[1,*] and Sung-Jung Hsiao[2]

[1]*Department of Electrical Engineering, National Chin-Yi University of Technology*
[2]*Department of Electrical Engineering, National Taipei University of Technology*
**Corresponding author: songchen@ncut.edu.tw*

Aims: IoT (Internet of Things) System is a rapidly developing area, a combination of Network, mathematics and computing technology, in order to enhance the complex sensors network and data

aggregation. Traditional Wireless Sensors Networks method does not have the ability to process hung amounts sensors signals that is why the Wireless Sensors Networks design often only one cluster or one-layer framework. This speech issue brings together some of the optimal fusion of innovative information technology and methods and it provides to the listeners on this issue have further improved System Integration and Applications in Wireless Sensors Networks. This will allow scientists to develop smarter process strategies for multi-sensors signals and data.

Oral Session 2: Machine Learning (II)

Session Chair: ***Prof. Intan Zaurah Mat Darus, University of Technology***

Time: 10:00-12:05, Thursday, November 21
Location: C305, Science and Engineering Building 2

10:00-10:25	ML1033 *(Invited Talk)*	Influence of the optical aspects of photographic composition on the user experience in the issues related to decision making, choices and level of visual comfort *Dr. Marcia Campos, Unicap - Catholic University of Pernambuco*
10:25-10:50	ML1030 *(Invited Talk)*	Bio-inspired algorithms for modeling and control of underwater flexible single-link manipulator *Prof. Intan Zaurah Mat Darus, University of Technology*
10:50-11:05	ML1082	Mining high utility itemsets of generalized quantity with pattern-growth structures *Assoc. Prof. Ming-Yen Lin, Feng Chia University*
11:05-11:20	ML1076	Vehicle detection based on area and proportional prior with Faster-RCNN *Mr. Hao Yuan, Xi'an Jiaotong University*
11:20-11:35	ML1072	A haze removal method based on additional depth information and image fusion *Ms. Tian Tian, Xi'an Jiaotong University*
11:35-11:50	ML1047	Self-walking posture estimation of pedestrian employing Convolutional Neural Network *Mr. Tomoyuki Kurosaki, Kyushu Institute of Technology*
11:50-12:05	ML1091	Application of Synthetic Minority Over-Sampling Technique (SMOTE) and feature selection for unbalanced data in predicting phishing sites based on random forest algorithms *Dr. Didi Rosiyadi, Universitas BSI*

ML1033: Influence of the Optical Aspects of Photographic Composition on the User Experience in the Issues Related to Decision Making, Choices and Level of Visual Comfort

Marcia Campos[1,*] and Fabio Campos[2]

[1]*Institute Universidade Católica de Pernambuco*
[2]*Institute UFPE – Ddesign*
**Corresponding author:* spot4m@gmail.com

Aims: This article investigates the level of influence of the optical aspects of photographic composition on the issues and consequent problems of the user experience. This work is part of the research project "Virtual environments: influence of the optical aspects of photographic composition on the quality of user experience". The objective was to collect data relative to the perception / reaction of the user versus levels of optical contrasts of the photograph composition / image.

Methods: Therefore, to investigate this level of influence, an experiment was carried out in two stages: The first step consisted of producing 18 photographic images with specific characteristics of visual representation covering various levels of contrasts of the optical aspects for each image. The second step was the accomplishment of questionnaires with users, with questions based on the photos produced in the first stage of this experiment.

Results: The results indicate evidences of the influence of the optical aspects of photographic composition of the image with the reactions and choices of the users. Such as, time spent for decision making, motivation of the choice of things in the scene and level of visual and physical discomfort.

Conclusions: The level of influence of the optical aspects of photographic composition/image is relevant through the representation of its levels of contrasts, in the quality of the user experience both in physical and psychological perceptual issues.

ML1030: Bio-Inspired Algorithms for Modeling and Control of Underwater Flexible Single-Link Manipulator

Intan Z. Mat Darus* and Ali A.M. Al-khafaji

Universiti Teknologi Malaysia
**Corresponding author: intan@utm.my*

Abstract. This research focuses on intelligent control system of an underwater flexible manipulator system (UFM). A laboratory sized UFM experimental rig has been designed, developed and fabricated to represent the actual dynamics of the system. This experimental rig was later used as a platform for the development and verification of the controller algorithms. The dynamic behaviour of the UFM was first modelled using system identification (SI) methods utilizing Bio-Inspired Algorithms. The input-output data used for identification were acquired directly from the experimental rig. For the controllers of the UFM, proportional-integral-derivative (PID) controllers tuned using metaheuristic algorithms were developed using Cuckoo Search Algorithm (CSA) and Flower Pollination Algorithm (FPA). These algorithms were utilized to obtained the optimal values of controller parameters for trajectory tracking control of rigid-body motion of the UFM system. The PID controller is tuned offline based on the identified SI model. The performance of these control schemes were analysed via real-time PC-based control and observed in terms of trajectory tracking and error. The overall result of UFSLMS described in this research revealed the superiority of the PID controllers tuned using intelligent Cuckoo Search Algorithm (CSA). It was found that the percentage of improvement achieved experimentally by the controller for rise time and settling time of positive pulse of bang-bang set point are 4.65 % and 75.43 % respectively. Meanwhile, for negative pulse the decreasing time, settling time, maximum undershoot and steady state error are improved by 1.42 %, 90.85 %, 69.01 % and 83.33 % respectively.

ML1082: Mining High Utility Itemsets of Generalized Quantity with Pattern-Growth Structures

Ming-Yen Lin[1], Tzer-Fu Tu[1] and Sue-Chen Hsueh[2,*]

[1]*Depatment of Information Engineering and Computer Science, Feng Chia University*
[2]*Depatment of Information Management, Chaoyang University of Technology*
Corresponding author: schsueh@cyut.edu.tw

Abstract. High utility mining is an important issue in pattern discovery. Quantitative high utility mining further discovers quantitative itemsets that contribute high utility to the database. In this study, we address the issue of generalized quantity in mining quantitative high utility itemsets. The relaxation on quantity counting enables novel and generalized findings on quantity-combinations of itemsets. We propose an algorithm called QHIM to find out all of the high utility itemsets of generalized quantity. QHIM maintains a pattern-growth based structure to store generalized quantity information for the final discovery. The experimental results show that QHIM may efficiently discover these high utility

itemsets. A level-wise method is compared in the experiments. In average, QHIM outperforms the compared algorithm by 4 times faster for small data and is two orders of magnitude faster than the compared algorithm when the minimum threshold is very small.

ML1076: Vehicle Detection Based on Area and Proportional Prior with Faster-RCNN

Hao Yuan[1], Bin Zhang[1] and Ming Liu[2]

[1] *School of Software, Xi'an Jiaotong University*
[2] *Command and Dispatch Section of Science and Technology Branch of Traffic Police, Branch of Xi'an Public Security Bureau*
**Corresponding author: bzhang82@mail.xjtu.edu.cn*

Abstract. From Rcnn to Fast-Rcnn and Faster-Rcnn, detection accuracy and speed of network for different targets are constantly improving. However, for some special scenario such as vehicle in traffic environment, network is still slightly insufficient, and the recognition accuracy and efficiency still need to be improved. Therefore, in order to improve the recognition effect of neural network in vehicle detection, this study combines neural network with prior knowledge to improve the accuracy of neural network in vehicle detections. Experimental results show that after add the prior knowledge, network as the sample in this study increased the recognition effect for vehicle in traffic environment by 6.56% only slightly affects the recognition time.

ML1072: A Haze Removal Method Based on Additional Depth Information and Image Fusion

Tian Tian and Bin Zhang*

School of software, Xi'an Jiaotong University
**Corresponding author: bzhang82@xjtu.edu.cn*

Abstract. To address the problem of image degradation in foggy days, we propose a haze removal method based on additional depth information and image fusion. With recent advances in depth sensing technology, it has been realized that sensing devices can produce depth images in which the depth value are quite accurate. We adopt the depth estimation dataset of Karlsruhe Institute of Technology and Toyota Technological Institute (KITTI) which contains images collected from different real-world environments. The additional information includes the LiDaR scanning points and original depth images which can be used to estimate the optical depth of each point in the scene. In this study, we investigate how to use additional depth information to remove haze for a single image. Our method focuses on LiDaR depth imaging, image fusion and the atmospheric scattering model. We use LiDaR scanning points as input and then deduce a rough depth image with prominent features. The rough

depth image is then combined with original depth image to improve reliability of depth estimation by image fusion. Using the atmospheric scattering model, we can remove haze for a single image. Experimental results show that our proposed approach provides better performance of dehazing under different fog conditions and holding the details of remote sensing images than current research methods.

ML1047: Self-walking Posture Estimation of A Pedestrian Employing Convolutional Neural Network

Tomoyuki Kurosaki[1] and Joo Kooi Tan[2,*]

[1]*Graduate School of Engineering, Kyushu Institute of Technology*
[2]*Faculty of Engineering, Kyushu Institute of Technology*
**Corresponding author: etheltan@cntl.kyutech.ac.jp*

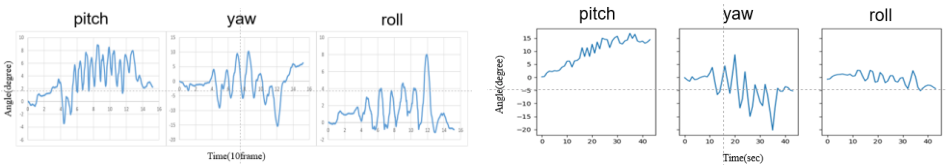
Introduction: With the recent rise in the aging rate, fatal falls by elderly people aged 65 and over have become a serious problem. If one analyzes his/her own walking posture and improves it by feed-backing the result of the analysis, it may lead to prevention of fall. Aiming at realizing such a fall prevention system, in this study, a method is proposed for analyzing a self-walking posture from a video provided by a self-mounted camera. The employment of a self-mounted camera discriminates the present method from other existent methods in that a user's walking posture is analyzed by analyzing a video images of his/her frontal scene provided by the camera, and that the system can easily be used by aged people in real environment.

Methods: In this study, we aim at developing a system that can be used easily even by elderly people; thus the use of a single wearable camera, resulting in an inexpensive system. Walking posture of a user equipped with a self-mounted camera is estimated using a pair of images obtained from the camera. Because the parallax of the image pair obtained from the chest-mounted camera is normally small when walking straight, it is difficult to estimate camera motion. So we employ a convolutional neural network in this research. It consists of three networks; a bootstrap net, an iterative net and a refinement net. In the bootstrap net and the iterative net, optical flows, camera motion and a depth image are alternately estimated to improve accuracy. In the refinement net, the resolution of the depth image is increased.

Results: The experiment on walking posture estimation of a person was conducted in an indoor environment. We assume that a human walking posture is represented by pitch, yaw and roll motions of a camera mounted on the chest of a user. The results on the obtained camera motions are shown in Figure 1. The results suggest effectiveness of the proposed method.

Conclusions: The posture estimation experiment of the pedestrian was performed using the chest mounted camera image, and the effectiveness of the proposed method was confirmed.

Acknowledgements: This research was supported by JSPS Kakenhi, Grant Number 16K01554.



(a) (b)

Figure 1. Obtained camera motions: (a) Ground truth obtained from an IMU. (b) Measured value

ML1091: Application of Synthetic Minority Over-Sampling Technique (SMOTE) and Feature Selection for Unbalanced Data in Predicting Phishing Sites Based on Random Forest Algorithms

Didi Rosiyadi[1,*] and Deni Rusdiaman[2]

[1]*Research Center for Informatics LIPI, Universitas BSI, STMIK Nusa Mandiri*
[2]*Magister of Computer Science, STMIK Nusa Mandiri*
**Corresponding author:* didi.rosiyadi@lipi.go.id*

Abstract. Phishing is a form of fraud characterized by attempts to obtain confidential information such as passwords and credit cards, by disguising themselves as trusted people or businesses in official electronic communications, such as electronic mail or instant messaging. Phishing sites are the places most often used to retrieve personal data and other confidential information. The high number of phishing sites is what makes this research done so that it can find out the best feature selection that can be applied in classifying phishing sites based on random forest algorithm. This research begins with balancing class data using Synthetic Minority Over-Sampling Technique (SMOTE). Then make a comparison of information gain (IG), particle swarm optimization (PSO), genetic algorithms and chi-square based on random forest algorithms. The results of the fourth comparison feature selection found that modeling with the SMOTE + IG + random forest process got the best accuracy value of 0.975405163 or 97.54% and was the best performing feature selection with an AUC value of 0.975395214 to classify phishing sites.

Methods: We objectively analyze the degree of concentration using brain waves, GSR and blinks as biomedical signals. In this report, we repeatedly give concentrated and non-concentrated scenes and analyze each biological signal in that case.

Results: Although it was difficult to determine the degree of concentration with each of the biosignals alone, it was found that it is possible to analyze the degree of concentration using GSR, blinks and brain waves.

Conclusions: It is possible to analyze the degree of concentration objectively in the developed system. In the future, we will confirm that it can be determined in the Active Learning attendance state.

Oral Session 3: Intelligent Systems

Session Chair: Dr. Borek Puza, Australian National University, Australia

Time: 13:30-17:55, Thursday, November 21
Location: C305, Science and Engineering Building 2

13:30-13:55	ML1086 *(Invited Talk)*	Distributed NSGA-II for improving accuracy and achieving speed-up *Prof. Yuji Sato, Hosei University*
13:55-14:20	ML1025 *(Invited Talk)*	An intelligent search result clustering model *Dr. Shashi Mehrotra, K L University*
14:20-14:45	ML1007 *(Invited Talk)*	An evacuation support system using multi-agent system based on ad hoc communications *Dr. Yasushi Kambayashi, Nippon Institute of Technology*
14:45-15:10	ML1099 *(Invited Talk)*	Pattern retrieval on the game of go *Prof. Shi-Jim Yen, Department of Computer Science and Information Engineering*
15:10-15:25	ML1070	Insensitive stochastic sub-gradient support vector machine with generalized pinball loss function for large scale problem *Ms. Wanida Panoup, Naresuan University*
15:25-15:40	ML1013	Improved confidence estimation via tail functions *Dr. Borek Puza, Australian National University*
15:40-16:00		**COFFEE BREAK**
16:00-16:15	ML1031	On a convergence for the approximation of the gradient flow curve to the non-convex and singular functional *Prof. Yoshihiko Yamaura, Nihon University*
16:15-16:30	ML1075	Twin support vector machine with generalized pinball loss for large scale classification problem *Ms. Dawrawee Makmuang, Naresuan University*
16:30-16:45	ML1044	Application of sample entropy to analyze consciousness in CLIS patients *Ms. Shang-Ju Wu, Leipzig University*
16:45-17:00	ML1077	Detecting DNS tunneling and exfiltration from DNS traffic *Dr. Yi-Chung Tseng, Acer Cyber Security Inc.*
17:00-17:15	ML1048	The degree of concentration analysis using biometric information *Dr. Kuniaki Yajima, National Institute of Technology Sendai College*

17:15-17:30	ML1014	Unsupervised anomaly detection for unmanned aerial vehicles health monitoring *Dr. Samir Khan, University of Tokyo*
17:30-17:55	ML1060 *(Invited Talk)*	Smart logistics: a combinatorial auction paradigm for the transportation e-procurement *Dr. Chefi Triki, Sultan Qaboos University*

ML1086: Distributed NSGA-II for Improving Accuracy and Achieving Speed-up

Yuji Sato*

Hosei University
**Corresponding author: yuji@k.hosei.ac.jp*

Abstract. Various algorithms, such as NSGA-II by Deb et al., SPEA2 by Zitzler et al., MOEA/D by Zhang et al. have been proposed to solve the multi-objective optimization problem. When evaluating some algorithms accuracy, efficiency and diversity of solutions, we often use conventional benchmark problems. Basically, in multi-objective optimization problems, algorithm is evaluated based on the Hyper volume value and how distribution is close to Pareto optimum front. However, each benchmark problem has its own characteristics, and it's difficult to comprehensively evaluate multiple algorithms with one benchmark problem. In this study, considering bird song imitation game as dynamic two objective optimization problem and propose the benchmark problem which can compare comprehensively. We have evaluated using NSGA-II and SPEA2 which are representative evolutionary multi-objective optimization algorithms based on Pareto dominance. As a result, we show that our proposed method is effective and NSGA-II is better than SPEA2 in convergence speed while SPEA2 is better than NSGA-II in maintaining diversity.

ML1025: An Intelligent Search Result Clustering Model

Shashi Mehrotra*

Department of Computer Science and Engineering, KL University
**Corresponding author: sethshashi11@gmail.com*

Abstract. With the advent of the internet, there is an enormous increase in the digital documents that may be news articles, research papers, some scientific papers, or health care information, etc. The web is the largest repository to store all human knowledge, either explicitly or implicitly. Search engines are universally used to search for information from the web. A search engine returns a relevant list of web documents, against a query. However, most of the results produced by search engines are not appropriate and relevant to the user, especially for ambiguous queries. Therefore, in addition to the problem related to the ranking the result, an additional problem is related to polysemy, where the results belong to multiple meanings associated with the query. Indeed, polysemy queries are the cause of ambiguities in search engines and affect the relevancy of document retrieval. A user may not be interested in all the documents returned in response to the search, and may want to focus on a coherent group similar documents. To identify the relationship of interest among web data is the main challenge. Moreover, search engines have some limitations such as Google, Yahoo, etc. adopt a list paradigm. The search results are displayed in the form of the ranked list, and it is very tedious for a user to identify relevant document from the long list, as well as it is time-consuming. Therefore, it is required to converge on a focused subset of the result.

Specifically, our research address result retrieval issue for polysome query and clustering is being used as a tool. The primary objective of search result clustering is to make it easy for the user to find the relevant information. Organizes the result into easily browsable folders may helpful for the user to search relevant results quickly. The research proposed an intelligent clustering approach for search result by utilizing traditional and evolutionary approach.

ML1007: An Evacuation Support System Using Multi-Agent System Based on Ad Hoc Communications

Yasushi Kambayashi*

Department of Computer and Information Engineering, Nippon Institute of Technology
**Corresponding author: yasushi@nit.ac.jp*

Abstract. We propose a multi-agent base evacuation support system based on ad-hoc communication systems. When a disaster occurs, we anticipate that the current popular wireless communication based on the Internet may not be very reliable. In order to accommodate such a problem, our proposed system employs multiple mobile agents and static agents on smartphones that use a mobile ad hoc network (MANET). The proposed system collects information by mobile agents as well as diffuses information by mobile agents so that the system provides an optimal evacuation route for each user in a dynamically changing disaster environment. In simulations, our system successfully guides evacuation user to safe area. The system also considers the altitude of the evacuation routes. When a tsunami or a high wave occur, low altitude location may be under water. Therefore, evacuees need to move along high altitude route. In this talk, we propose how to take account of the altitude information for constructing evacuation route.

ML1099: Pattern Retrieval on the Game of Go

Shi-Jim Yen* and Yu-Chie Ho

Department of Computer Science and Information Engineering, National Dong Hwa University
**Corresponding author: sjyen@gms.ndhu.edu.tw*

Abstract. Computer Games is the drosophila of Artificial Intelligence. Interesting games and specific life-and-death board situation variations in Go game are recorded in SGF (Smart Game Format). Valuable information hides in these records. This ar-ticle firstly proposes a sequential algorithm to handle searching process in record database, but time costs of these sequential searching methods increase linearly with the number of game records. It is necessary to construct an index structure in database when the number of game record is too large. Therefore, this article also proposes an index structure for Go game record database by integrating methods of information retrieval and domain

knowledge of Go Game; Four ap-plications of proposed structure based on user needs. Besides, a Go game records information retrieval system using above approaches.

ML1070: Insensitive Stochastic Sub-Gradient Support Vector Machine with Generalized Pinball Loss Function for Large Scale Problem

Wanida Panoup and Rabian Wangkeeree*

Department of Mathematics, *Faculty of Science, Naresuan University*
**Corresponding author:* rabianw@nu.ac.th

Aims: The standard support vector machine (SVM) uses the hinge loss function which leads to feature noise sensitivity and unstable. Within the large scale classification problem, we propose an efficient stochastic sub-gradient generalized pinball support vector machine (SG-GPSVM) and we show that the proposed method is less sensitive to noise and more stable for re-sampling.

Methods: We have considered the standard SVM as its equivalent form, the unconstrained SVM with hinge loss, then we use generalized pinball loss function in the standard SVM instead of the hinge loss function. After that, we use stochastic sub-gradient descent method for solving this problem and we study the convergence of SG-GPSVM and the approximation between GPSVM and SG-GPSVM in theory.

Results: A novel SG-GPSVM is proposed in this work and we compared to the original SVM and PEGASOS. Numerical experiments with three different noise levels are performed on UCI datasets and benchmark datasets and their results are compared with PEGASOS, our proposed SG-GPSVM is noise insensitive than PEGASOS for some datasets. Further, the classification accuracy of our SG-GPSVM outperforms the accuracy of SVM and PEGASOS in most of the datasets.

Conclusions: We notice its hinge loss function has noise sensibility. To further improve the generalization performance, we provide a stable SG-GPSVM, especially for the noise-corrupted data. In addition, its performance is depend on the different dataset since for some dataset may be solve by original SVM and their have more accuracy than SG-GPSVM such as the dataset have a small-size but a lot of them our method have more accuracy.

Acknowledgements: I would like to thank associate professor Dr. Rabian Wangkeeree for his valuable comments that helped us to enormously improve the quality of the work. This research was supported by the DPST scholarship and department of Mathematics, Naresuan university.

ML1013: Improved Confidence Intervals for the Exponential Mean via Tail Functions

Borek Puza[1,*] and Mo Yang[2,3]

[1]*Research School of Finance, Actuarial Studies and Statistics, ANU College of Business and Economics*
[2]*Australian National University*
[3]*School of Finance, Dongbei University of Finance and Economics*
**Corresponding author:* borek.puza@anu.edu.au

Abstract. The method of tail functions is applied to confidence estimation of the exponential mean in the presence of prior information. It is shown how the "ordinary" confidence interval can be generalized using a class of tail functions and then engineered for optimality, in the sense of minimizing prior expected length over that class, whilst preserving frequentist coverage. It is also shown how to derive the globally optimal interval, and how to improve on this using tail functions when criteria other than length are taken into consideration. Probabilities of false coverage are reported for some of the intervals under study, and the theory is illustrated by application to confidence estimation of a reliability coefficient based on some survival data.

ML1031: On A Convergence for the Approximation of the Gradient Flow Curve to the Non-Convex and Singular Functional

Yoshihiko Yamaura*

Nihon University
**Corresponding author:* yamaura@math.chs.nihon-u.ac.jp

Aims: We investigate a time-evolutional problem based on the variational functional with a certain singularity which may cause a free boundary in the interior of the domain.

The mathematical study is originated by Alt and Caffarelli in 1980's for the aim of investigating a cavitation flow problem. The functional is the usual Dirichlet integral whose first variation is the Laplace equation together with an area of the set where the unknown function takes a positive value. Because of the area-term the functional is very non-convex and is also non-differentiable. Therefore, the usual convex analysis in mathematics is not valid, and even the Euler-Lagrange equation is not formulated. Taking such a difficulty into account, it is reasonable that we try to seek a gradient flow curve for the functional.

Methods: We adopt the minimizing movement method which is known as an effective way to construct a gradient flow for the variational functional. This method is based on the discretization of the time-variable. Besides we apply the regularization of the singular term in the sense of Gamma-

convergence which is known as a method of the variational approximation. For such approximations it is expected to be applied to the numerical experiments.

Results: We establish a convergence associated to the approximations. More precisely, the square-integral convergence for the gradient of the approximate functions is obtained.

Conclusions: We can obtain a convergence for approximate solutions which is expected to be useful to construct a curve of maximal slope to the singular functional.

ML1075: Twin Support Vector Machine with Generalized Pinball Loss for Large Scale Classification Problem

Dawrawee Makmuang and Rabian Wangkeeree*

Department of Mathematics, Faculty of Science, Naresuan University
**Corresponding author: rabianw@nu.ac.th*

Aims: To enhance the performance of The Twin support vector machine (TSVM), we present a stochastic sub gradient Twin support vector machine using the generalized pinball loss (SG-GPTSVM) for large scale classification. Furthermore, we prove the convergence of SG-GPTSVM and study the relation between GPTSVM and SG-TSVM.

Methods: The research is organized as follows:
1. We introduce the stochastic sub gradient algorithm for solving linear TSVM.
2. Show the theoretical analysis for the SG-TSVM.
3. Lists the experimental results of the SG-TSVM by comparing with another method.

Results: The proposed method leading to insensitivity from noise and more stable for re-sampling. The result has shown that performance of our method is better than other baseline method in terms of accuracy.

Conclusions: A novel SG-GPTSVM is proposed in this research. Compared to another method, our proposed SG-GPTSVM is noise insensitive, sparseness and stable for re-sampling. The validity of our proposed SG-GPTSVM is demonstrated by numerical experiments performed on several UCI benchmark and KEEL datasets for linear case. Numerical experiments show that classification accuracy of our SG-TSVM outperforms the accuracy more than other method.

Acknowledgements: The authors would like to thank my advisor Associate professor Rabian Wangkeeree whose helped me to improve the content and presentation of this research.

ML1044: Application of Sample Entropy to Analyze Consciousness in CLIS Patients

Shang-Ju Wu* and Martin Bogdan

Leipzig University
**Corresponding author: shanglu@informatik.uni-leipzig.de*

Abstract. In this study, an approach using sample entropy in order to detect the consciousness in two complete locked-in syndrome (CLIS) patients is presented. The typical symptom of CLIS patients is complete paralysis, but internal brain activities are supposed to be still available. There is no certainty about the actual state of consciousness of CLIS patients. It is an important problem in researching consciousness in CLIS patients. Brain-computer interface potentially provides the family members a method to communicate with CLIS patients. There are arguments whether the CLIS patients are conscious or not. As consciousness is required to use BCI correctly, this study proposes to use sample entropy to un-cover awareness from electroencephalography signals in CLIS patients. In a first proof of concept, data from 2 patients have been used. The results for these two patients indicate that the use of sample entropy might be helpful to uncover awareness and thus to detect consciousness in CLIS patients.

ML1077: Detecting Domain Name System Tunneling and Exfiltration from Domain Name System Traffic

Yi-Chung Tseng*, Ming-Kung Sun and Wei-An Chen

Acer Cyber Security Incorporation
**Corresponding author: bruce.tseng@acercsi.com*

Abstract. In this study, we present a framework to detect a Domain Name System (DNS) tunnel and DNS exfiltration network traffic by using both unsupervised and supervised learning algorithms. In general, considerable time is required to learn the structure of the data before clustering when using an unsupervised learning algorithm. Therefore, in this study, we leveraged the power of mathematical algorithms for calculating the optimal number of clusters and reducing the time required for understanding the data structure. Conversely, we used a supervised learning method to learn the data leakage behavior for detecting DNS exfiltration traffic. We used an open-source tool to generate testing data, and the experimental result proved the robustness of the proposed framework.

ML1048: The degree of Concentration Analysis Using Biometric Information

Kuniaki Yajima[1,*], Yoshihiro Takeichi[2] and Jun Sato[2]

[1]*National Institute of Technology Sendai College*
[2]*National Institute of Technology Tsuruoka College*
**Corresponding author: yajima@sendai-nct.ac.jp*

Aims: we examined the development of concentration measurement system for AL from biological signals such as electrical and magnetic vital signs and brain waves. We measured the degree of concentration using EEG and blinks, and biomedical sig-nals such as GSR. Since the relationship between EEG and GSR was confirmed, it could be possible to confirm the concentration state of students in AL and to support the teacher's class attitude evaluation method.

ML1014: Unsupervised Anomaly Detection for Unmanned Aerial Vehicles Health Monitoring

Samir Khan* and Takehisa Yairi

Department of Aeronautics and Astronautics, University of Tokyo
**Corresponding author: khan@ailab.t.u-tokyo.ac.jp*

Aims: The work is concerned with the implementation of unsupervised anomaly detection using isolation forest for aerospace applications. Having a real-time anomaly detection solution indicates a continuous stream of operational and labelled data that must satisfy a number of resource and latency requirements.

Methods: This work examines current literature for solutions that can be used to detect known and unknown anomalous instances whilst functioning as an out-of-the-box approach. The presented literature takes into account anomaly detection in the spatial context and the practicality of the isolation forest is investigated for an engineering application.

Results: The current trends for anomaly detection systems in UAVs reveals the need for an unsupervised anomaly detection within the application to detect unknown (and known) instances in a multivariate time series; as one of the most important properties of any detection system. As a result, the use of isolation forest is as an out-of-the-box approach that does not require expert knowledge for configuration and yet it still addresses dimensionality and correlation challenges found in most traditional anomaly detection systems.

Conclusions: The results provide requirements for unsupervised anomaly detection for UAV applications and demonstrated a real-time implementation of the isolated forest. The effort highlights the importance of how sliding windowed data (across a multivariate time-series) can be used for

anomaly detection. It is not necessary to know which observations are anomalies ahead of time. The algorithm uses only the training data to build the forest that is able to identify which observations are anomalies and which are not. Further, in order to avoid benign deviations and faulty measurements, a post analysis stage is also implemented to calculate an anomaly likelihood metric with various window sizes.

Acknowledgements: This project has been funded by Japan Society for the Promotion of Science (JSPS): P1609.

ML1060: Smart Logistics: A Combinatorial Auction Paradigm for the Transportation E-Procurement

Chefi Triki[1,2,*]

[1]*Department of Mechanical and Industrial Engineering, Sultan Qaboos University*
[2]*Department of Engineering for Innovation, University of Salento*
**Corresponding author: chefi.triki@unisalento.it*

Aims: We investigate here the feasibility of designing and running internet-based spot markets for the e-procurement of transportation services. The spot market will use Combinatorial Auctions (CAs) as a trading mechanism. CAs have shown to be very efficient in logistics and supply chains. Indeed, the literature has reported several successful experiences of companies using smart CAs designs to procure their transportation needs and achieve remarkable cost savings.

Methods: Our approach is based on the use of computational intelligent methods that makes use of mathematical formulations. We will provide guidelines on how to design and solve the optimization models that should be solved by the different actors operating in the spot market.

Results: We carried out extensive computational experiments both on benchmarking test problems and on real-life applications and our results show how CAs can represent an effective tool to design smart logistics network. Moreover, the experiments show also the validity of the proposed models and developed approaches.

Conclusions: Smart logistics can represent a promising field of research for the machine learning and intelligent systems. We are convinced that this talk will be a seminal input to solve many challenges in the near future.

Part V Conference Venue

1. Conference Venue

The MLIS2019 will be held in one of the campuses--Shoufeng Campus of National Dong Hwa University.

Address: No. 1, Sec. 2, Da Hsueh Rd., Shoufeng, Hualien 97401

A. Taipei to Hualien Railway Station

Either you fly to Taipei Taoyuan International Airport (TPE) or Taipei Sung Shan Airport (TSA), the best way to Hualien is by train, it takes nearly 3 hours to Hualien Railway Station. The following is how to get to Taipei Railway Station and Train Timetable from Taipei to Hualien.

Taipei Taiyuan International Airport (TPE) → Taipei Railway Station

There are three ways to Taipei Railway Station from Taipei Taoyuan International Airport (TPE).

a) Metro: take Metro to Taipei Railway Station; it will take 30 minutes and NT$ 160/RMB 35/ USD 5.

b) Airport bus: take bus 1819 (1819 國光客運) to Taipei Railway Station directly, it will take one hour and NT$ 125/RMB 27/ USD 4.

c) Taxi: take taxi to Taipei Railway Station, it will take 40 minutes and NT$ 1500/RMB 300/ USD 50.

Taipei Sung Shan Airport (TSA) → Taipei Railway Station

If you arrive at Taipei Sung Shan Airport (TSA), there are two ways to Taipei Railway Station

a) Metro: take Metro line 1 first, get off from Zhongxiao Fuxing Station, and change to line 5, it will take 20 minutes and NT$ 25/RMB 5/ USD 1 to get to Taipei Railway Station.

b) Taxi: take taxi to Taipei Railway Station, it will take 20 minutes and NT$ 170/RMB 37/ USD 6.

Train Timetable from Taipei to Hualien					
Train No.	Train Type	Departure time from Taipei	Arrival time to Hualien	Price (NT$)	Children /Elderly (NT$)
402	Taroko	6:14	8:20	NT$440.00	NT$220
204	Tze-Chiang	6:23	9:29	NT$440.00	NT$220
406	Puyuma	6:40	8:55	NT$440.00	NT$220
74	Chu-Kuang	7:05	10:05	NT$340.00	NT$170
272	Tze-Chiang	7:27	10:32	NT$440.00	NT$220
408	Taroko	7:40	9:40	NT$440.00	NT$220
410	Tze-Chiang	7:57	10:19	NT$440.00	NT$220
412	Puyuma	8:48	10:59	NT$440.00	NT$220
170	Tze-Chiang	10:00	12:30	NT$440.00	NT$220
218	Puyuma	10:25	12:38	NT$440.00	NT$220
Remark: Train tickets could be reserved from https://www.railway.gov.tw/tra-tip-web/tip?lang=EN_US					

B. Kaohsiung to Hualien Railway Station

If you fly to Kaohsiung International Airport (KHH), the best way to Hualien is by train, it takes nearly 6 hours to Hualien. The following is how to get to Kaohsiung Railway Station and Train Timetable from Kaohsiung to Hualien.

Kaohsiung International Airport (KHH) → Kaohsiung Railway Station

If you arrive at Kaohsiung International Airport (KHH), there are two ways to Kaohsiung Railway Station.

a) Metro: take Metro to Kaohsiung Railway Station, get on from Kaohsiung International Airport (R4) and get off from Kaohsiung Main Station, it will take 20 minutes and NT$ 35/RMB 8/ USD 1.

b) Taxi: take taxi to Kaohsiung Railway Station.

Train Timetable from Kaohsiung to Hualien					
Train No.	Train Type	Departure time from Kaohsiung	Arrival time to Hualien	Price (NT$)	Children /Elderly (NT$)
301	Tze-Chiang	7:14	11:49	NT$705.00	NT$353
303	Tze-Chiang	8:45	13:52	NT$705.00	NT$353
307	Tze-Chiang	10:35	15:53	NT$705.00	NT$353
562	Chu-Kuang	10:44	20:23	NT$990.00	NT$495
172	Tze-Chiang	11:12	19:10	NT$1284.00	NT$642
1	Chu-Kuang	11:20	16:44	NT$544.00	NT$273
554	Chu-Kuang	13:46	00:45	NT$990.00	NT$495
317	Tze-Chiang	16:23	21:51	NT$705.00	NT$353
Remark: Train tickets could be reserved from https://www.railway.gov.tw/tra-tip-web/tip?lang=EN_US					

C. Hualien Railway Station to NDHU

When you take a train from Taipei Railway Station/ Kaohsiung Railway Station to Hualien railway station, get off at Hualien railway station.

a) Take No.301 bus (right side) directly to Shoufeng Campus, National Dong Hwa University. No. 301 bus will terminate at Library of Shoufeng Campus.

b) Take No.1121 bus (left side) directly to Shoufeng Campus, National Dong Hwa University. No.1121 bus will terminate at Guangfu Station.

c) You can also take taxi from the Hualien railway station; it will take 20 minutes and NT$ 400/RMB 87/ USD 13 to get to Shoufeng Campus.

Timetable of No. 301 bus			
Departure time from National Dong Hwa University		Departure time from Hualien railway station	
06:30	14:40	07:20	16:30
07:10*	15:30*	08:10*	17:00*
07:50*	16:30	09:10	17:30
08:20	17:30	10:00*	18:00*

09:00*	18:00*	11:00	18:20
10:00	18:30*	12:00*	19:10
11:20	19:10	13:00	20:10
12:40	20:10	14:10*	21:10
13:40	21:30	15:10	22:20
Note: Asterisk marked holidays suspended.			

Timetable of No. 1121 bus			
Departure time from National Dong Hwa University		Departure time from Guangfu Station	
06:00	13:10	06:10	14:10
07:10	14:30	07:20	15:50
07:40	15:40	08:50	16:40
09:10	17:10	09:50	17:40
10:30	18:00	11:20	19:30
12:00	20:20	13:20	20:00

D. Hualien Airport (HUN) to NDHU

If you fly to Hualien Airport (HUN), which is a little far from downtown area, you can only take taxi to Shoufeng Campus, National Dong Hwa University, it will take 35 minutes and NT$ 600/RMB 130/ USD 20 to get to Shoufeng Campus.

Part VI Field Visit

Schedule

09:00	Depart from DongHwa House
09:30-12:00	Taroko National Park (太魯閣國家公園)
	Chueilu Tuanyah Precipice (清水斷崖)
	Swallow Grotto (燕子口)
12:00-13:00	Lunch
13:00-17:00	Water Curtain (水濂洞)
	Baiyang Waterfalls Trail (白楊步道)
	Chihsingtan Beach (七星潭)

Attractions

Taroko National Park (太魯閣國家公園)

Taroko National Park is one of the nine national parks in Taiwan and was named after the Taroko Gorge, the landmark gorge of the park carved by the Liwu River. The park spans Taichung Municipality, Nantou County, and Hualien County.

Taroko and its surrounding area are well known for their abundant supply of marble, leading to its nickname, "The Marble Gorge". The rock now seen in Taroko began over 200 million years ago as sediment on the bottom of the ocean. As the sediment collected, it was subject to increasingly large amounts of pressure which eventually hardened it into limestone. Over the past 100 million years, tectonic compression between the Philippine Sea Plate and the Eurasian Plate supplied additional pressure that metamorphosed the limestone into marble. Uplifting forces from the plate collision pushed this rock above the surface of the ocean to where we see it today. The region is still being uplifted by approximately 0.5 cm (half-centimeter) per year.

Chueilu Tuanyah Precipice (清水斷崖)

Chueilu Tuanyah Precipice is famous for the precipice normal to Pacific Ocean with nearly 90°. The steep hills with average height over 800m, and turbulent waves makes it the second precipice in the

world.

Swallow Grotto (燕子口)

The best place to view the Taroko Gorge inside the national park is Swallow Grotto, which is near the middle of the park and located just after Buluowan. The walls on each side of the river contain caves which form natural nesting places for spring swallow birds, bringing life to the area nearby the roaring river, with locals naming it Swallow Grotto. There are three spots you should make sure to focus on when visiting Swallow Grotto: the pothole on the cliff faces, the Zhuilu Cliff, and Rock of the Indian Chief.

Water Curtain (水濂洞)

"Water Curtain" is a must for those who go to the national park, which created by spring water falling from the tunnel roof. It's a naturally preserved cave where there are no construction being done to this cave. It's dark inside, clear cold water, pouring water curtains. Make sure to prepare clothing or raincoat to walk into this cave in case of getting wet.


Baiyang Waterfalls Trail (白楊步道)

The Baiyang Trail (白楊步道) features valleys, cliffs, waterfalls, rivers, tunnels, and a huge range of flora and fauna along the way. At first glance, Baiyang may appear to be a mini version of the main gorge above Liwu River, but surprises waiting for the adventuresome. The two-step Baiyang Waterfall and Water Curtain are the must-see spots while hiking this trail.

On the way to the Baiyang Waterfall, there are several tunnels you need to pass through. A flashlight is needed, otherwise you may find the pitch-black tunnels a bit too spooky and disorientating.

Beyond the tunnels, the spectacular Baiyang Waterfall comes into view with its two-step drop from a 200 meter high cliff. Nearby is an observation deck reached by bridge where you can fully enjoy the majesty of the falls. Suspension bridges abound in the Taroko region, and although those of you with a fear of heights may be hesitant, they are perfectly safe to cross.


Chihsingtan Beach (七星潭)

Chishingtan Beach sits on a beautiful part of the Taiwanese coastline, a crescent bay to the north of Hualien City. The rocky and pebbly beach faces the Pacific and is flanked by green-covered mountains. The northern part of Chihsingtan Beach is located close to the eastern entrance of Taroko Gorge National Park. Due to located in a half moon-like shape gulf, the beach is famous for its beautiful natural landscape.

Part VII Acknowledgements

On behalf of the Organizing Committee of MLIS2019, we would like to take this opportunity to express our sincere thanks to the support and contributions of participants from all over the world. We would also like to express our sincere acknowledgements to the Technical Program Committee members who have given their professional guidance and valuable advice to the conference. Below are the lists of the Technical Program Committee members. For those who contribute to the success of the conference organization without listing the name here, we would love to say thanks as well.

Honorary Chairs:
Han-Chieh Chao, National Dong Hwa University
Lakhmi C. Jain, University of Canberra

General Chairs:
Cheng-Chin Chiang, National Dong Hwa University
Chun-Shien Lu, Academia Sinica

Organization Chair:
Prof. Sheng-Lung Peng, National Dong Hwa University

Local Arrangement Chairs:
Shi-Jim Yen, National Dong Hwa University
Mau-Tsuen Yang, National Dong Hwa University
I-Cheng Chang, National Dong Hwa University

Program Chairs:
Sheng-Lung Peng, National Dong Hwa University
Nilanjan Dey, Techno India College of Technology

Programme Committee:
Mohamed Awad Awad Allah, Al-Aqsa University
R. J. Anandhi, New Horizon College of Engineering
Dinesh Kumar Anguraj, Koneru Lakshmaiah (KL) University
Luis Anido Rifon, University of Vigo
Chaodit Aswakul, Chulalongkorn University
Chawalit Benjangkaprasert, King Mongkut's Institute of Technology
Giuseppe Bonifazi, University of Rome
Noureddine Bouhmala, University of South-Eastern Norway
Aleksander Cariow, West Pomeranian University of Technology
Elena Casiraghi, University of Milan
Cristina Cervelló-Pastor, Polytechnic University of Catalonia
Ricardo Chalmeta Rosaleñ, Jaume I University
I-Cheng Chang, National Dong Hwa University

Qiang (Shawn) Cheng, University of Kentucky
Cheng Siong Chin, Newcastle University in Singapore
Claudio Cuevas, Federal University of Pernambuco
Antonio d'Acierno, Universita degli Studi di Salerno
Tolga Ensari, Istanbul University
Solomiia Fedushko, Lviv Polytechnic National University
Feng Feng, Xi'an University of Posts and Telecommunications
R. U. Gobithaasan, University Malaysia Terengganu
Du Huynh, University of Western Australia
Dmitry Kravchenko, Ben-Gurion University of the Negev
Ryong Lee, Korea Institute of Science and Technology Information (KISTI)
Kian-Guan Lim, Singapore Management University
Songsong Liu, Swansea University
Edwin Lughofer, Johannes Kepler University Linz
Syed Tauseef Mohyud-Din, HITEC University Taxila Cantt Pakistan
Josefa Mula, Polytechnic University of Valencia
Fusaomi Nagata, Sanyo-onoda City University
Idelfonso Nogueira, University of Porto
Leonardo Barbosa e Oliveira, Stanford University
Ong Pauline, Universiti Tun Hussein Onn Malaysia (UTHM)
R.M. Chandima Ratnayake, University of Stavanger
B. S. Daya Sagar, Indian Statistical Institute-Bangalore Centre
Mohammad Salah, Hashemite University
Ahm Shamsuzzoha, University of Vaasa
Kittiwat Sirikasemsuk, King Mongkut’s Institute of Technology Ladkrabang
Abdulhamit Subasi, Effat University
Yuriy Syerov, Lviv Polytechnic National University
Ze Tang, Jiangnan University
Gabriella Trucco, University of Milan
Hung-Hsu Tsai, National Formosa University
Athanasios V. Vasilakos, Luleå University of Technology
Anoop P. Verma, NextEra Energy
Bing Wang, Anhui University of Technology
Chia-Hung Wang, Fujian University of Technology
Zezhong Xu, Changzhou Institute of Technology
Qingzheng Xu, National University of Defense Technology
Jun-Juh Yan, Shu-Te University
Jasy Liew Suet Yan, Universiti Sains Malaysia
Selma Yilmazyildiz, Vrije Universiteit Brussel
Seung H. Baek, Hanyang University
Wen-Tsai Sung, National Chin-Yi University of Technology
Md Hasinur Rahaman Khan, University of Dhaka
Oleksii Tyshchenko, University of Ostrava
Shin-Jer Yang, Soochow University

Memo Pages