2019 IEEE CIS Summer School on

Computational Intelligence Techniques for High School Students

Event Report

Date: July. 31-Aug. 2, 2019

National Cheng Kung University, Tainan, Taiwan

By Pau-Choo Chung (Julia)

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Objectives

The wave of AI enthusiasm triggers broad attentions on the "intelligent technology". Many of recently highly attentive AI techniques were in CIS main technology fields. For a long time being, CIS continuously serves as the society leading the advance of the theories and the development of systems. How to make the contributions of CIS well known to the people, and bring more impacts of CIS to a broader society and down to the young generation would be very important in this moment.

Under this consideration, the main objective of this summer school is to bring CIS techniques to talented high school students. The program would avail them to have better understanding of the CIS techniques and potential applications before their entering the college, and therefore invites more students entering this area. It also serves another purpose to have more students familiar CIS in their early stage.

Another main purpose of this summer school is to trigger more female high school students to study in CIS related techniques. As we know, gender imbalance in engineering is a serious issue. In order to interest more female high school students on CIS-related techniques, we particularly invited, and gave higher priority to, the girl high school students to attend this summer school.

Based on such design, we planned the program to contain six lectures and four hand-on experiments. We also allocated 8 graduate students as assistants during the hand-on experiments.

The detailed descriptions of the program is shown in the following Section.

The Program Details

The program was organized on July. 31-Aug. 2, 2019, a three-day summer school on computational intelligence techniques on National Cheng Kung University, Tainan, Taiwan. Forty one students registered and participated in this summer school. Among them 13 were female students.

Computational intelligence techniques and their applications were introduced in this event, and for practice students had a chance to write some programs and experienced the application of Taiwanese speech recognition technology by using Raspberry Pi as platform. Students were amazed by the computational intelligence techniques that can be used in an application of understanding Taiwanese dialog, which is a language that most of the current students are not familiar with.

Nvidia instructor was also invited to guide students on a hand-on experiment on a Generative Adversarial Network (GAN) and its application for creating a variety of cat models. The instructor also showed another application of GAN which transformed a photo provided by students into Picasso-style. The students were amazed by the ability of the algorithm.

This program was co-sponsored by Ministry of Education, Taiwan, and another program (for a total of 6 days) offered for high school teachers was also collocated in a nearby auditorium. Therefore, the high school teachers and students have some interactions during the lunch time. The students who participated in this event were very enthusiastic. In the beginning, due to a total number of hand-on experiment set limitation the system was set to accepting no more than 30 students. In the end, considering the high request and some from rural area of deficient opportunity to be exposed to new techniques, 41 students were finally accepted to this summer school. Among these 41 students, 13 are female. The students were from all over the country and they were arranged to stay in the university dormitory. They had a very positive response to the curriculum and expressed their appreciations of having such an opportunity. The detailed program is shown in Table I.

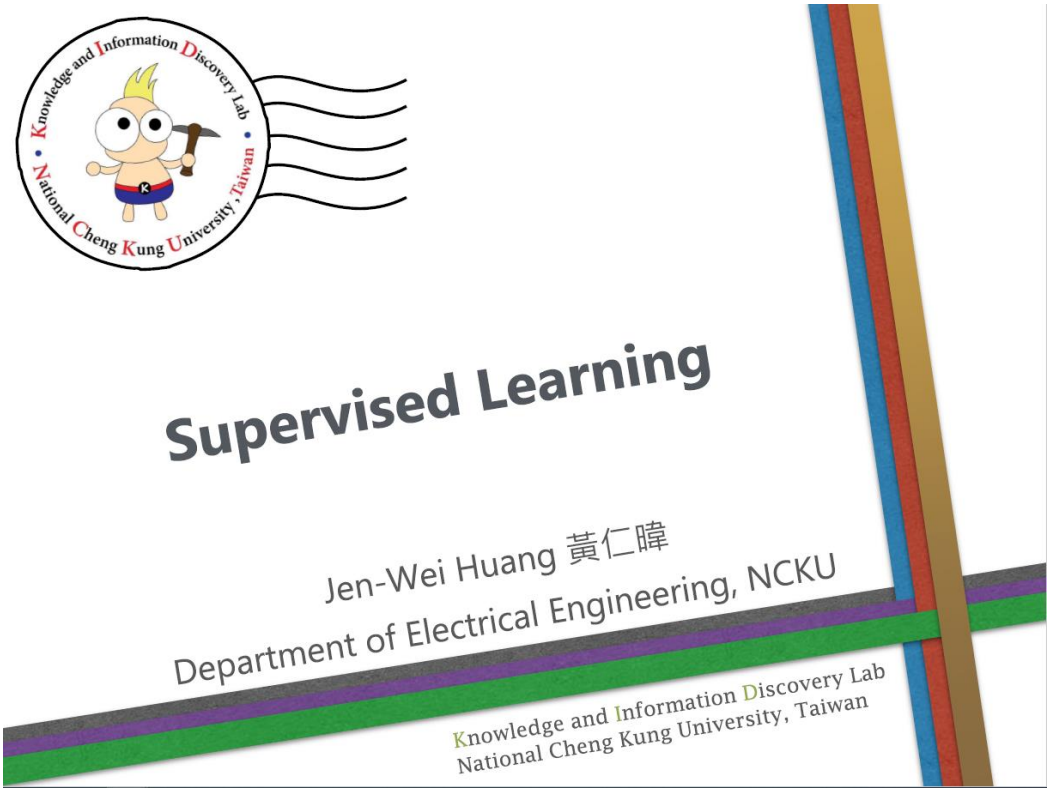
Table I: The detailed program of the summer school

<table>
<tr><td>Time / Date</td><td>7/31</td><td>8/1</td><td>8/2</td></tr>
<tr><td>09:00 –10:00</td><td colspan="1">Registration</td><td rowspan="2">Deep Neural Networks for Image Analysis</td><td rowspan="2">Introduction to Evolutionary Computing</td></tr>
<tr><td>10:00 –10:40</td><td rowspan="2">Opening ceremony</td></tr>
<tr><td>10:20 –10:40</td><td colspan="2">Break</td></tr>
<tr><td>10:40 –12:20</td><td>Supervised Learning VS Unsupervised Learning</td><td>Multilingual and Crosslingual Information Analysis</td><td>Evolutionary Computing in Music Arts and Creativity</td></tr>
<tr><td>12:20 –14:00</td><td colspan="3">Lunch</td></tr>
<tr><td>14:00 - 15:00</td><td>Decision Trees and Random Forest</td><td>Hand-on experiment 2：Convolutional Neural Networks</td><td>Hand-on experiment 4：Ensemble Classifier</td></tr>
<tr><td>15:00 –15:30</td><td colspan="3">Break</td></tr>
<tr><td>15:30 –17:30</td><td>Hand-on experiment 1：Linear classifier</td><td>Hand-on experiment 3：Generative Adversarial Network</td><td>Culture visiting
&
Departure</td></tr>
<tr><td>17:30 –18:00</td><td rowspan="2">Dinner</td><td rowspan="2">Dinner/Banquet</td><td rowspan="2"></td></tr>
<tr><td>18:00 - 21:00</td></tr>
</table>

Lecture 1: Supervised Learning VS Unsupervised Learning

Jen-Wei Huang
Professor
Affiliation: Department of Electrical Engineering, National Cheng Kung University, Tainan, Taiwan

Jen-Wei Huang received the B.S. and Ph.D. degrees in electrical engineering from National Taiwan University, Taiwan, in 2002 and 2009, respectively. He was a Visiting Scholar with the IBM Almaden Research Center from 2008 to 2009, an Assistant Professor with Yuan Ze University from 2009 to 2012, and a Visiting Scholar with the University of Chicago in 2016. He is currently an Assistant Professor with the Department of Electrical Engineering, National Cheng Kung University, Taiwan. He majors in computer science and is familiar with data mining. His research interests include data mining, mobile computing, and bioinformatics. Among these, social network analysis, spatial-temporal data mining, and multimedia information retrieval are his special interests. In addition, some of his research is on data broadcasting, privacy preserving data mining, e-learning, and Fin-tech.


Knowledge and Information Discovery Lab
National Cheng Kung University, Taiwan
Supervised Learning
Jen-Wei Huang 黃仁暐
Department of Electrical Engineering, NCKU
Knowledge and Information Discovery Lab
National Cheng Kung University, Taiwan


The Goal of AI

Lecture 2: Decision Trees and Random Forest

Jiann-Shu Lee
Professor
Affiliation: Department of Computer Science and Information Engineering, National University of Tainan, Tainan, Taiwan

Jiann-Shu Lee received the Ph.D. degree in electrical engineering from National Cheng Kung University. He is specialized in multimedia signal analysis, image processing, medical image processing, and computational intelligence, and he has authored many academic articles, including publications in journals, such as the IEEE Transactions on Image Processing, the IEEE Transactions on Information Technology in Biomedicine, and Pattern Recognition. He has served as Session Chair and Program Committees Member in many domestic and international conferences. He has also received numerous awards and certificates from organizations such as Cisco, Acer, IAENG, IIHMSP, and Xerox. He is currently a Professor and the Chairman of the Department of Computer Science and Information Engineering, National University of Tainan.

Decision Trees and Random Forest

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MMIP

Lecture 3: Deep Learning Networks for Image Analysis

Pau-Choo (Julia) Chung
Professor
Affiliation: Department of Electrical Engineering, National Cheng Kung University, Tainan, Taiwan

Pau-Choo (Julia) Chung (S'89–M'91–SM'02–F'08) is currently a Full Professor with the Department of Electrical Engineering, National Cheng Kung University (NCKU), Taiwan. She was an elected Distinguished Professor of NCKU in 2005 and received the Distinguished Professor Award from the Chinese Institute of Electrical Engineering in 2012. She also served as the Program Director of the Intelligent Computing Division, Ministry of Science and Technology, Taiwan, from 2012 to 2014. She is currently the Director General of the Department of Information and Technology Education, Ministry of Education.,Her research interests include computational intelligence, medical image analysis, video analysis, pattern recognition, and biosignal analysis. She applies most of her research results to healthcare and medical applications.,Dr. Chung served two terms as an ADCOM Member of the IEEE CIS from 2009 to 2011 and from 2012 to 2014. She has been a member of the Phi Tau Phi Honor Society since 2008. She was a member of BoG of the CAS Society from 2007 to 2009 and from 2010 to 2012 and the Founder of Women in CAS. She is currently serving as the Vice President for Members Activities of IEEE CIS. She served as an Associate Editor for the IEEE Transactions on Neural Networks and Learning Systems from 2013 to 2015 and the IEEE Transactions on Biomedical Circuits and Systems.

Deep Learning Networks for Image Analysis

Reporter: Pau-Choo Chung

詹寶珠 成大電機

IEEE 智慧運算學會 (CIS)

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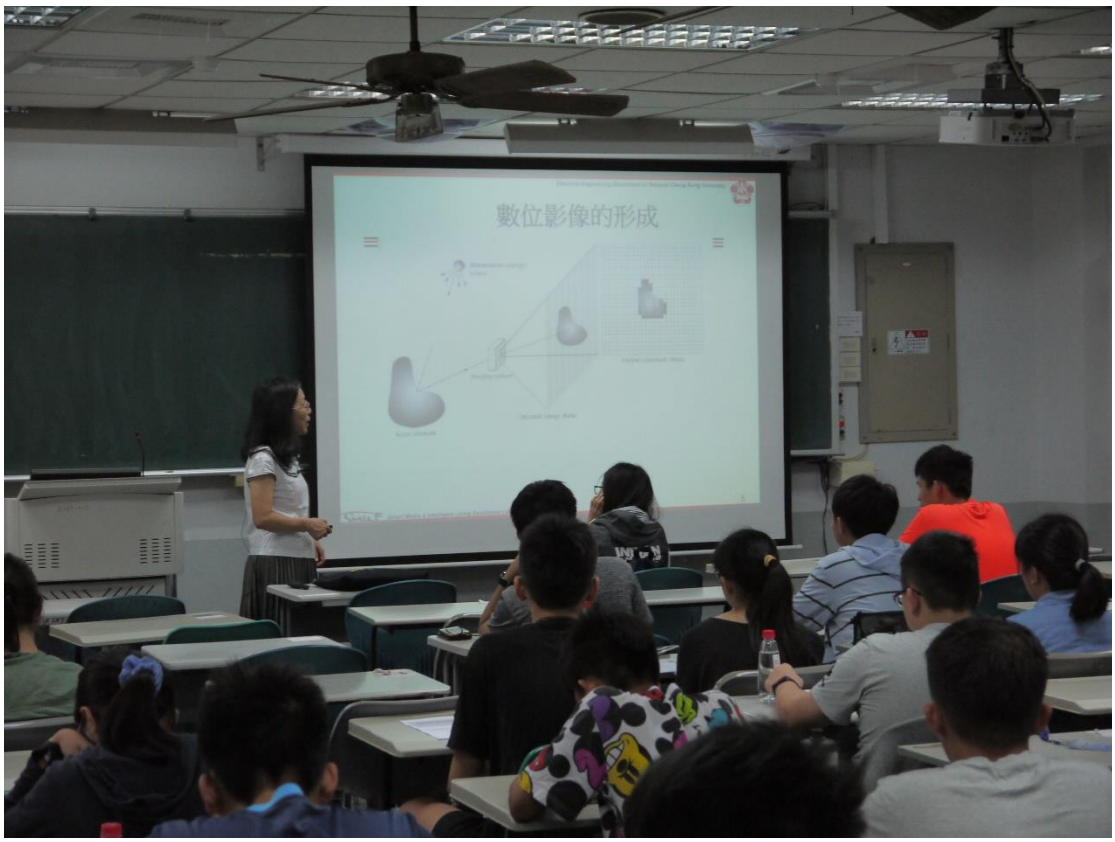

Lecture 4: Multilingual and Crosslingual Information Analysis

Wen-Hsiang Lu
Professor
Affiliation: Department of Computer Science and Information Engineering, National Cheng Kung University, Tainan, Taiwan

Dr. Lu received Ph.D. degree from the Department of Computer Science and Information Engineering at National Chiao Tung University in November, 2003. Since February, 2004 he joined the Department of Computer Science and Information Engineering, National Cheng Kung University, and is currently an assistant professor. His current research interests include Web Mining, Text Mining, Information Retrieval, Cross-Language Information Retrieval, Natural Language Processing, Machine Translation, Digital Libraries, and Medical Knowledge Discovery.

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2019/08/14

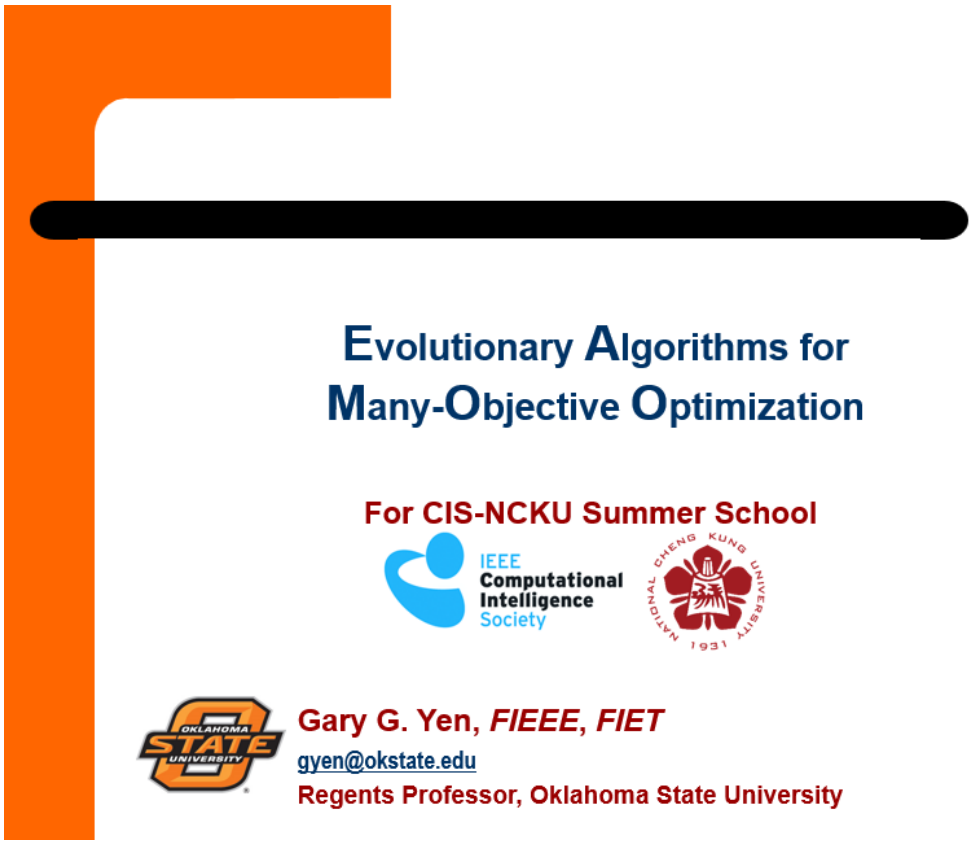
Lecture 5: Introduction to Evolutionary Computing

Gary Yen
Professor
Affiliation: Department of Electrical Engineering, Oklahoma University, USA

Gary G. Yen received the Ph.D. degree in electrical and computer engineering from the University of Notre Dame in 1992. He is currently a Professor in the School of Electrical and Computer Engineering, Oklahoma State University. His research interest includes intelligent control, computational intelligence, evolutionary multiobjective optimization, conditional health monitoring, signal processing and their industrial/defense applications.

Gary was an associate editor of the IEEE Transactions on Neural Networks and IEEE Control Systems Magazine during 1994-1999, and of the IEEE Transactions on Control Systems Technology, IEEE Transactions on Systems, Man and Cybernetics and IFAC Journal on Automatica and Mechatronics during 2000-2010. He is currently serving as an associate editor for the IEEE Transactions on Evolutionary Computation and IEEE Transactions on Cybernetics. Gary served as Vice President for the Technical Activities, IEEE Computational Intelligence Society in 2004-2005 and is the founding editor-in-chief of the IEEE Computational Intelligence Magazine, 2006-2009. He was the President of the IEEE Computational Intelligence Society in 2010-2011 and is elected as a Distinguished Lecturer for the term 2012-2014. He received Regents Distinguished Research Award from OSU in 2009, 2011 Andrew P Sage Best Transactions Paper award from IEEE Systems, Man and Cybernetics Society, 2013 Meritorious Service award from IEEE Computational Intelligence Society and 2014 Lockheed Martin Aeronautics Excellence

Teaching award. Currently he serves as the chair of IEEE/CIS Fellow Committee and General Co-Chair of 2016 IEEE World Congress on Computational Intelligence to be held in Vancouver, Canada. He is a Fellow of IEEE and IET.



Lecture 6: Evolutionary Computing in Music Arts and Creativity

Chuan_Kang Ting
Professor
Department of Power Mechanical Engineering
National Tsing Hua University
Taiwan

Chuan-Kang Ting is currently a Professor with the Department of Power Mechanical Engineering, National Tsing Hua University, Taiwan. His research interests include evolutionary computation, computational intelligence, machine learning, and their applications in machinery, manufacturing, networks, music and arts.

Prof. Ting is an Associate Editor of the IEEE Computational Intelligence Magazine and the IEEE Transactions on Emerging Topics in Computational Intelligence. He is also an Editorial Board Member of Soft Computing and Memetic Computing journals. He serves as the IEEE CIS Chapters Chair, Chair of Creative Intelligence Task Force, and Vice Chair of Intelligent Network Systems Task Force, all in IEEE Computational Intelligence Society (CIS). He has been involved in organization of many international conferences, symposiums, workshops, and special sessions. He serves as the Special Session Chair of IEEE WCCI 2016, WCCI 2018, and CEC 2019. He was the IEEE CIS Newsletter Editor (2017-2018), Chair of IEEE Symposium on Computational Intelligence for Creativity and Affective Computing 2013, Program Chair of TAAI (2012, 2015, 2019), and Organizing Chair of AI Forum 2012. He is an Executive Board Member of Taiwanese Association for Artificial Intelligence.

演化式計算應用於音樂藝術與創造力

Evolutionary Computation in Music, Art, and Creativity

丁川康 **Chuan-Kang Ting**, Prof. Dr. rer. nat.

Computational Intelligence Lab
Department of Power Mechanical Engineering
National Tsing Hua University
中華民國人工智慧學會 常務理事

Photos

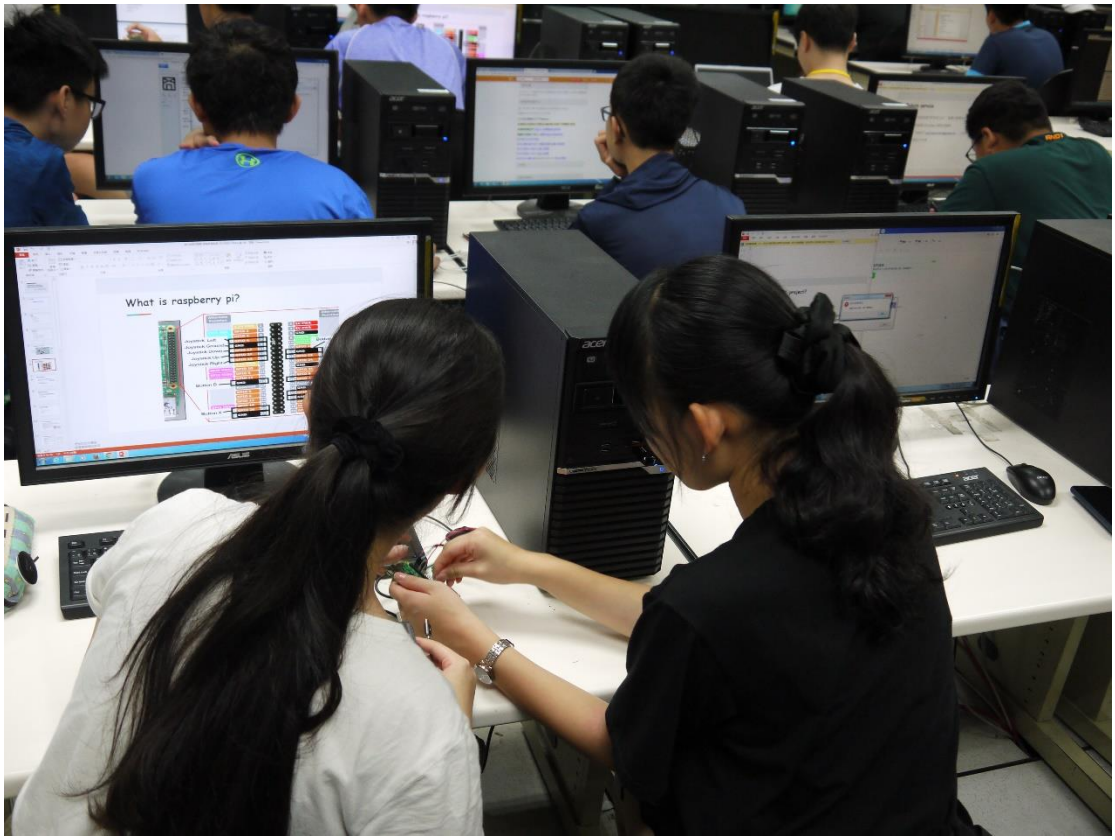
Vice President of National Cheng Kung University, Dr. Fong-Chin Su gave the opening remark for the Summer School

Group photo for 2019 IEEE CIS Summer School on Computational Intelligence Techniques for High School Students, held on Tainan, Taiwan

Dr. Jen-Wei Huang on Lecture 1

Dr. Jiann-Shu Lee on Lecture 2

Dr. Pau-Choo Chung on Lecture 3



Dr. Wen-Hsiang Lu on Lecture 4

Dr. Gary Yen on Lecture 5

Dr. Chuan_Kang Ting on Lecture 6

The Banquet for the attendees and speakers for the summer school.

A group photo taken in the closing ceremony.

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