

AICI 2021, January 15-16, 2021, Hanoi, Vietnam

AICI 2021

The Second International Conference on Artificial Intelligence and Computational Intelligence

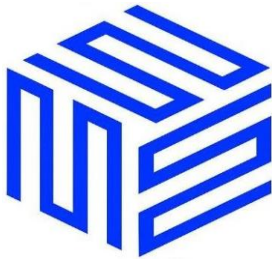
Themes

Artificial Intelligence, Big Data, Deep Learning with
Biomedical & other Applications

January 15-16, 2020, Institute of Information Technology, Vietnam Academy of
Science and Technology, Vietnam

PROGRAM & ABSTRACTS

Organizers:



Sponsor:



Hanoi, December 2020

PREFACE

In the past years, Vietnamese Fuzzy Systems Society (VFSS) organized many fuzzy systems and artificial intelligence conferences such as VJFUZZY'98, MIF'99, VJFUZZY'2001, VJMEDIAMAG'2001, Intech/VJFuzzy'2002, AFSS'2004, VN-KR MEDINFO'2005, AICI 2020... with the great contributions of the leading scientists around the world as Michio Sugeno (Japan), Hung T. Nguyen (USA), V. Kreinovich (USA), K. Hirota (Japan), K.P. Adlassnig (Austria), Ario Ohsato (Japan), R.R. Yager (USA), Zenn Z. Bien (KAIST, Korea), Masao Mukaidono (Japan), Takeshi Yamakawa (Japan), Yutaka Hata (Japan), Junzo Watada (Japan), Hsiao-Fan Wang (Taiwan), Nakaji Honda (Japan), Michinori Nakata (Japan), Hiroaki Kikuchi (Japan), Takahiro Yamanoi (Japan), Elie Sanchez (France), Torao Yanaru (Japan), Seizaburo Arita (Japan), Yuying Yang (China), B. De Baets (Belgium), Burhan Turksen (Canada), Erna Surjadi (Indonesia), Berlin Wu (Taiwan), L. M. Brasil (Brasil), Pratit Santiprabhob (Thailand), Honghua Dai (Australia), Christian Kuhn (Germany), Liya Ding (China), W. Pedrycz (Canada), S. Chandra (India), Hideo Eda (Japan), Tu-Bao Ho (Japan), Nguyen Thanh Thuy (Vietnam), Cao Hoang Tru (Vietnam), Nguyen Hoang Phuong (Vietnam), Bui Cong Cuong (Vietnam), Nguyen Cat Ho (Vietnam), Huynh Van Nam (Vietnam), Anh Nguyen (USA)... This conference will bring together leading professors, researchers, engineers and scientists in Artificial Intelligence and Computational Intelligence for an opportunity to present and discuss theoretical and applied research problems as well as to foster research collaborations. The Second International Conference on Artificial Intelligence and Computational Intelligence (AICI 2021) will take place in the Institute of Information Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam, during 15-16 January, 2021, and be jointly organized by the Institute of Information Technology and VFSS (which belongs to Vietnam Mathematical Society) with the sponsorship of the International Fuzzy Systems Association (IFSA).

There are many directions in Artificial Intelligence and Computational Intelligence which are presented and discussed in this conference. The themes of this conference are “Artificial Intelligence, Big Data, Deep Learning with Biomedical & other Applications”. The Artificial intelligence (AI) is wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is an interdisciplinary science with multiple approaches, but advancements in machine learning and deep learning are creating a paradigm shift in virtually every sector of the tech industry. Fuzzy logic directly translates imprecise knowledge into precise terms. Neural networks (and other machine learning techniques) transform this indirectly: first by observing how people make decisions based on their imprecise knowledge and then by looking for a precise model that would lead to the same decisions. There are other directions. All these directions are presented in this conference. Some of the papers directly deal with applications of soft computing to biomedical problems, other papers deal with technical aspects of soft computing – thus eventually making the corresponding techniques better and hopefully, more adequate for biomedical applications. Several papers deal with applications outside biomedicine with the hope that successful applications to different areas can help find good applications to biomedical problems as well. We hope that this conference will help practitioners and researchers to learn more about the artificial intelligence and soft computing techniques and to further develop this important research direction.

The program of this conference consists of seven keynote talks of the leading scientists in the fields of AI, AI in medicine, computational intelligence and deep learning from USA, Canada, Austria, France, Poland, Japan, Vietnam and 28 presentations of the scientists, researchers and Ph.D. students in AI and AI in medicine, Fuzzy systems and computational intelligence and related topics.

The organization of this conference and the publication of this Program & Abstracts were supported by the Institute of Information Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam. Our thanks to the leadership and staff of the Institute of Information Technology, VAST for providing crucial support. Our special thanks to Prof. Hung T. Nguyen for his valuable advice and constant support.

Editors: Nguyen Truong Thang, Nguyen Long Giang,
Nguyen Hoang Phuong and Vladik Kreinovich

GREETING FROM THE SCIENTIFIC COMMITTEE

Dear Friends,

On behalf of the Scientific Committee of the Second International Conference on Artificial Intelligence and Computational Intelligence AICI'2021 (Hanoi, Vietnam, January 15-16, 2021), I would like to welcome you to this conference.

This conference would not be possible without a generous help from the Institute of Information Technology, Vietnam Academy of Science and Technology in Hanoi, Vietnam.

Our thanks to the leadership and staff of this institution for providing crucial support, especially, Dr. Nguyen Truong Thang, Director and Assoc. Professor Nguyen Long Giang – Deputy Director of the Institute of Information Technology, VAST, Vietnam. Our thanks to Dr. Ngo Hai Anh – the Secretary of the organizing committee of the conference for his help with organizing the conference.

Our special thanks to Professor Hung T. Nguyen for his valuable advice and constant support.

We would also like to thank Professor Janusz Kacprzyk – Editor of the Springer book series that publishes the selected papers of the conference, and Doctor Thomas Ditzinger – Springer's Senior Editor, Engineering/Applied Sciences -- for their support of and cooperation on this publication.

We want to thank all the authors for their contributions, all anonymous referees for their thorough analysis and helpful comments, and of course, all the participants.

We want to thank also all the plenary speakers, namely Professor Marek Reformat, IFSA President, University of Alberta, Canada, Professor Vladik Kreinovich Vice President of IFSA, University of Texas at El Paso, USA, Professor Klaus-Peter Adlassnig Medical University of Vienna, Austria, Professor Junzo Watada, IPS Research Center, Waseda University, Japan, Professor Hung Son Nguyen, Institute of Mathematics, Warsaw University, Poland, Professor Nguyen Tien Zung, University of Toulouse, France, and all chairs of the sessions of the conference and panelists of the round table discussions. Their contributions are very important for the success of the conference.

We hope that this conference will help practitioners and researchers to learn more about computational intelligence techniques and their biomedical applications -- and to further develop this important research direction.

Once again, many thanks to everyone, and enjoy the conference !

Nguyen Hoang Phuong

OBJECTIVE AND TOPICS

AICI 2021 is the Second International Conference on Artificial Intelligence and Computational Intelligence. The main objectives are outlined as follows:

- To bring together researchers working on artificial intelligence and computational intelligence and related topics.
- To present and discuss theoretical and applied research problems as well as to foster research collaborations.

Topics of interest include but are not limited to, the following:

ARTIFICIAL INTELLIGENCE

- AI Algorithms
- Artificial Intelligence tools & Applications
- Automatic Control
- Bioinformatics
- Data science
- Natural Language Processing
- CAD Design & Testing
- Computer Vision and Speech Understanding
- Data Mining and Machine Learning Tools
- Heuristic and AI Planning Strategies and Tools
- Computational Theories of Learning
- Hybrid Intelligent Systems
- Information Retrieval
- Intelligent System Architectures
- Knowledge Representation
- Knowledge-based Systems
- Mechatronics
- Multimedia & Cognitive Informatics

- Neural Networks
- Parallel Processing
- Pattern Recognition
- Pervasive computing and ambient intelligence
- Programming Languages
- Reasoning and Evolution
- Recent Trends and Developments
- Robotics
- Semantic Web Techniques and Technologies
- Soft computing theory and applications
- Software & Hardware Architectures
- Web Intelligence Applications & Search
-

COMPUTATIONAL INTELLIGENCE

- Fuzzy Systems
- Neural Networks
- Machine learning
- Deep learning
- Fuzzy logic and mathematical foundation of fuzzy logic.
- Big data
- Internet of things
- Probabilistic Reasoning
- Evolutionary Computing
- Hybrid intelligent systems
- Software agents
- Image processing

- E-commerce, e-medicine
- Rough Sets
- Symbolic machine learning
- Wavelet
- Signal or Image Processing
- Vision Recognition
- Biomedical Engineering
- Telecommunications
- Reactive Distributed AI
- Nano & Micro-systems
- Data - Visualization

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Nguyen Truong Thang

Institute of Information Technology, VAST, Vietnam

Organizing committee chairs

Nguyen Long Giang

Institute of Information Technology, VAST, Vietnam

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Ngo Hai Anh

Institute of Information Technology, VAST, Vietnam

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Vladik Kreinovich,

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Nguyen Hoang Phuong,

Thang Long University, Vietnam

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- Pasi Luukka (Lappeenranta – Lahti University of Technology LUT, Finland)
- Patricia Melin, (Tijuana Institute of Technology, Tijuana, Mexico)
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- Luis Magdalena, (School of Computing Engineering, Technical University of Madrid, Spain)
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- Van-Hai Pham (Hanoi University of Science and Technology, Vietnam)
- Van-On Phung (University of Transportation Technology, Vietnam)
- Marek Reformat (University of Alberta, Canada)
- Frank Chung-Hoon Rhee (Korean Institute of Intelligent Systems, Korea)
- Vijay V. Raghavan, (University of Louisiana, Lafayette, USA)
- Junzo Watada (Universiti Teknologi PETRONAS, Malaysia, Waseda University, Japan)
- Berlin Wu (National Chengchi University, Taipei)
- Martin Stepnicka, (University of Ostrava, Czech Republic)
- Osvaldo Saavedra (Federal University of Maranhão, São Luís, Brazil)
- Shun-Feng Su (National Taiwan University of Science and Technology, Taiwan)
- M. Sugeno (Tokyo Institute of Technology, Japan)
- Antonio Terceño, University Rovira i Virgili, Spain)
- I. Burhan Turksen (Economy and Technology University, Turkey).
- Mohammad-R. Akbarzadeh-T. (Ferdowsi University of Mashhad, Iran)
- Ching-Chih Tsai, (National Chung Hsing University, Taiwan)
- Chin-Wang Tao (National Ilan University).
- Dinh-Khang Tran (Hanoi University of Science and Technology, Vietnam)
- Dinh-Que Tran (Posts and Telecommunications Institute of Technology, Vietnam)
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- Minh-Phuong Tu (Posts and Telecommunications Institute of Technology, Vietnam)
- Van-Lang Tran (VAST, Vietnam)
- Duc-Thi Vu (Thang Long University, Vietnam)
- Nhu-Lan Vu (Thang Long University, Vietnam)
- Dinh-Lam Vu (Graduate University of Science and Technology, VAST, Vietnam)
- Dinh-Bay Vo (HUTECH, Vietnam)
- Takahiro Yamanoi, (Hokkai Gakuen University, Japan)
- Koichi Yamada (Graduate School of Engineering, Japan)

Program

The Second International Conference on Artificial Intelligence and Computational Intelligence (AICI 2021)

Themes: Artificial Intelligence, Big Data, Deep Learning with Biomedical & other Applications.

Organized by Institute of Information Technology, Vietnam Academy of Science and Technology

January 15-16, 2021, Hanoi, Vietnam

Add: 18 Hoang Quoc Viet Road, Cau Giay District, Hanoi, Vietnam

(Website: <http://aici2021.ioit.ac.vn>)

January 15 (Friday)

7:30-8:30	Registration	Conference Hall
8:30-9:00	Opening Ceremony	Conference Hall
8:30-8:40	Greetings from Vietnam Academy of Science and Technology	
8:40-8:50	Greetings from Director of Institute of Information Technology, VAST by Nguyen Truong Thang	
8:50-9:00	Greetings from Scientific Committee by Nguyen Hoang Phuong	
9:00-9:15	Group Photo	Main Entrance
9:15-9:30	Coffee Break	In front of Conference Hall
9:30-10:05	Keynote Talk 1 : Chair: Nguyen Hoang Phuong	Conference Hall
	Title: Linguistic Terms and Summarization of Information Retrieved from Knowledge Graphs Mared Reformat President, University of Alberta, Canada Email: reformat@ualberta.ca	
10:05-10:40	Keynote Talk 2 : Chair: Thai Quang Vinh	Conference Hall
	Title: White- and Black-Box Computing and Measurements under Limited Resources: Cloud, High Performance, and Quantum Computing, and Two Case Studies -- Robotic Boat and Hierarchical Covid Testing (Co-authors: Vladik Kreinovich, Martine Ceberio, and Olga Kosheleva) Vladik Kreinovich Vice President of IFSA, University of Texas at El Paso, USA Email: vladik@utep.edu	
10:40-11:15	Keynote Talk 3 : Chair: Nguyen Long Giang	Conference Hall

Title: Decision support in clinical laboratory medicine

-Peter Adlassnig

Medical University of Vienna, Austria

Email: kpa@medexter.com

11:15-12:00 **Keynote Talk 4 : Chair: Nguyen Truong Thang**

Conference Hall

Advanced Approaches of Artificial Neural Network- From A Hybrid Double Layered Neural Network to Deep Learning

Junzo Watada

IPS Research Center, Waseda University, Japan

Email: junzo.watada@gmail.com

12:00-13:30

Lunch

13:30-15:30

Parallel Session 1

(2 sessions)

13:30-15:20

Conference Hall

FRII-A: Computational Intelligence in Bio-Medicine

Chair: **Quang H. Nguyen**

Bilattice CADIAG-II: Theory and Experimental Results

Paolo Baldi, Agata Ciabattoni and Klaus-Peter Adlassnig (Austria)

paolo.baldi@unimi.it; agata@logic.at; klaus-peter.adlassnig@meduniwien.ac.at

FRII-A1

13:30-13:50

FRII-A2

13:50-14:20

A Combination Model of Robust Principal Component Analysis and Multiple Kernel Learning for Cancer Patient Stratification

Thanh Trung Giang, Thanh Phuong Nguyen, Quang Trung Pham and Dang Hung Tran (Vietnam)

trunggt@utb.edu.vn; phuong5780@gmail.com; trungpq@utb.edu.vn; hungtd@hnue.edu.vn;

FRII-A3

14:20-14:40

Attention U-Net with Active Contour based Hybrid Loss for Brain Tumor Segmentation

Dang-Tien Nguyen, Thi-Thao Tran and Van-Truong Pham (Vietnam)

aiseelab@gmail.com; thao.tranthi@hust.edu.vn; truong.phamvan@hust.edu.vn

FRII-A4

15:40-15:00

Refining Skip Connections by Fusing Multi-scaled Context in Neural Network for Cardiac MR Image Segmentation

Nhu-Toan Nguyen, Minh-Nhat Trinh, Thi-Thao Tran, and Van-Truong Pham (Vietnam)

truongpvnuc@gmail.com; aiseelab@gmail.com; thao.tranthi@hust.edu.vn; truong.phamvan@hust.edu.vn

FRII-A5

15:00-15:20

End-to-end Hand Rehabilitation System with Single-shot Gesture Classification for Stroke Patients

Quang H. Nguyen, Wai Kin Koh, Youheng Ouyang, Tianma Xu, Binh P. Nguyen and Matthew Chin-Heng Chua (Vietnam, Singapore)

quangnh@soict.hust.edu.vn; isskwk@nus.edu.sg; youheng@gmail.com; tim.xu@singaporetech.edu.sg; binh.p.nguyen@vuw.ac.nz; mattchua@nus.edu.sg

13:30-15:20

FRII-B: Artificial Intelligence and Computational Intelligence

Meeting Room

Chair: **Thi Thuy Van Le**

FRI1-B1

13:30-13:50

Fine-grained network traffic classification using machine learning: evaluation and comparison

Tuan Linh Dang and Van Chuong Do (Vietnam)
linhdt@soict.hust.edu.vn; chuongdv98@gmail.com

FRI1-B2

13:50-14:10

Soil Moisture Monitoring System Based on LoRa Network to Support Agricultural Cultivation in Drought Season

Tien Cao-Hoang, Kim Anh Su, Trong Tinh Pham Van (Vietnam, Japan)
Viet Truyen Pham, Duy Can Nguyen and Masaru Mizoguchi
chtien@ctu.edu.vn; skanh@ctu.edu.vn; pvtinh@ctu.edu.vn;
pvtruyen@ctu.edu.vn; ndcan@ctu.edu.vn; amizo@mail.ecc.u-tokyo.ac.jp;

FRI1-B3

14:10-14:30

Towards parallel NSGA-II: An island-based approach

Huy Hoang Le, Viet Long Nguyen, Ngoc Thu Phuong Nguyen, Minh Hoang Ho, and Thanh Tho Quan (Vietnam)
1652212@hcmut.edu.vn; long.nguyen1702k60@hcmut.edu.vn;
phuong.nguyennngocthu@hcmut.edu.vn; hoang.ho.010699@hcmut.edu.vn;
qttho@hcmut.edu.vn

FRI1-B4

14:30-14:50

A radial basis neural network approximation with extended precision for solving partial differential equations

Thi Thuy Van Le, Cao Khoa Le and Duc Hieu Tran (Vietnam, Singapore)
thuyvanleusq@gmail.com; khoa@u.nus.edu; tranduchieu@gmail.com

FRI1-B5

14:50-15:20

Construct An Intelligent Navigation System For AGV Robot Based On Deep Learning

Van Nguyen Thi Thanh, Tien Ngo Manh, Cuong Nguyen Manh, Duyen Ha Thi Kim and Duy Nguyen Duc (Vietnam)
van.nguyenthithanh@phenikaa-uni.edu.vn; nmtien@iop.vast.ac.vn;
manhcuong313.ng@gmail.com;
duyndfx01662@funix.edu.vn

15:20 - 15:40

Coffee Break

In front of Conference Hall

15:40 - 17:20

Parallel Session 2

(2 Sessions)

15:40 - 17:20

SAT2-A: AI and CI in Medicine

Meeting Room B 504

Chair: **Dao Nam Anh**

FRI2-A1

15:40 - 16:00

Feature Selection based on Shapley Additive Explanations on Metagenomic Data for Colorectal Cancer Diagnosis

Thanh Hai Nguyen, Toan Tran, Nhi Phan Kim Yen, Dien Tran Thanh and Thai-Nghe Nguyen (Vietnam)
nthai@cit.ctu.edu.vn; tranbaotoan@dtu.edu.vn; nhipky.cto@gmail.com;
thanhdien@ctu.edu.vn; ntnghe@cit.ctu.edu.vn

FRI2-A2

16:00 - 16:20

Clinical Decision Support Systems for Pneumonia Diagnosis using Gradient-weighted Class Activation Mapping and Convolutional Neural Networks

Nguyen Minh Thao Phan and Thanh Hai Nguyen (Vietnam)
pnmthaoct@gmail.com; nthai@cit.ctu.edu.vn;

FRI2-A3

16:20 - 16:40

Improving 3D Hand Pose Estimation with Synthetic RGB Image Enhancement using RetinexNet and Dehazing

Alysa Tan, Bryan Kwek, Kenneth Anthony, Vivian Teh, Yifan Yang, Quang H. Nguyen, Binh P. Nguyen, and Matthew Chin-Heng Chua (Singapore, Vietnam)

e0267379@u.nus.edu; e0267376@u.nus.edu; e0267860@u.nus.edu; e0267731@u.nus.edu; yyang@kaisertrading.com; quangnh@soict.hust.edu.vn; binh.p.nguyen@vuw.ac.nz; mattchua@nus.edu.sg**FRI2-A4**

16:40 - 17:00

Imbalance in Learning Chest X-ray Images for COVID-19 Detection

Dang Xuan Tho and Dao Nam Anh (Vietnam)

thodx@hnue.edu.vn; anhdn@epu.edu.vn**FRI2-A5**

17:00 - 17:20

Deep Learning based COVID-19 Diagnosis by Joint Classification and Segmentation

Tien-Thanh Tran, Thi-Thao Tran and Van-Truong Pham (Vietnam)

thao.tran@hust.edu.vn; truong.phamvan@hust.edu.vn

15:40 - 17:00

FRI2-B: Artificial Intelligence and CI**Meeting Room**Chair: **Quoc Dinh Truong****FRI2-B1**

15:40 - 16:00

HDBSCAN: Evaluating the performance of Hierarchical Clustering for big data

Tat-Huy Tran, Tuan-Dung Cao and Thi-Thu-Huyen Tran (Vietnam)

trantathuy.hust@gmail.com; dungct@soict.hust.edu.vn; tranhuyen@utehy.edu.vn**FRI2-B2**

16:00 - 16:20

Applying Deep Reinforcement Learning in Automated Stock Trading

Hieu Nguyen Trung and Ngoc Hoang Luong (Vietnam)

18520750@gm.uit.edu.vn; hoangln@uit.edu.vn;**FRI2-B3**

16:20 - 16:40

Telecommunications Services Revenue Forecast using Neural Networks

Quoc Dinh Truong, Nam Van Nguyen, Thi Thuy Tran, and

Thanh Hai Nguyen (Vietnam)

tqdingh@cit.ctu.edu.vn; namnv.travinh@gmail.com; tranthithuy@mku.edu.vn; nthai@cit.ctu.edu.vn;**FRI2-B4**

16:40-17:00

Product Recommendation System using Opinion Mining on Vietnamese Reviews

Quoc Dinh Truong, Trinh Diem Thi Bui, and Thanh Hai Nguyen (Vietnam)

tqdingh@cit.ctu.edu.vn; trinhbtd1090@gmail.com; nthai@cit.ctu.edu.vn;

18:00 - 20:00

Banquet

JANUARY 16 (Saturday)

8:30-9:05

Keynote Talk 5 : chair: Ngo Thanh Long**Conference Hall****Title: Rough sets and Big Data Analysis**

Hung Son Nguyen

Institute of Mathematics, Varsaw University, Poland

Email:hungson@gmail.com

9:05-9:40

Keynote Talk 6 : Chair: Nguyen Viet Dung**Conference Hall**

14

**Title: Computer-Aided Skin Cancer Detection:
from practical problems to theoretical questions**

Nguyen Tien Zung

University of Toulouse, France

Email: ntzung@gmail.com

9:40-10:15 **Keynote Talk 7: Chair: Dang Quang A**

Conference Hall

Title: Fuzzy Expert Systems in Western and Eastern Medicine

Nguyen Hoang Phuong

Thang Long University, Vietnam

Email: phuongnh@thanglong.edu.vn

10:15 - 10:30

Coffee Break

SAT1-A0

10:30-10:50

Deep Neural Networks for Mammograms Classification for Breast Cancer Screening

My Hanh Bui, Tuan Linh Le, Ngoc Cuong Nguyen, Thanh Binh Nguyen, Tien Doan Luu, Duy Chung Le, Tat Giao Vu, Thi Ly Ly Ngo, Thi Hong Xuyen Hoang, Duc Thang Nguyen, Tu Anh Nguyen, Huy Phu Phan, Duc Dan Nguyen, Hoang Phuong Nguyen, Viet Dung Nguyen, Vinh Duc Tran, Quang H. Nguyen, Anh Nguyen (Vietnam, USA)

buimyanh@hmu.edu.vn; linhdhyhn2017@gmail.com; cuongcdha@hmu.edu.vn; binhbvdhy@yahoo.com.vn; doantienluu@gmail.com; leduychungbg@gmail.com; vutatgiao@gmail.com; ngolyly2111.hmu@gmail.com; hongxuyen@hmu.edu.vn; thangdn.tlu@outlook.com; ntanhtm@gmail.com; phuhuyphan@gmail.com; nddan02@gmail.com; nhphuong2008@gmail.com; nvdung.bme@gmail.com; tranvinhduc@gmail.com; quangnh@soict.hust.edu.vn; anh.ng8@gmail.com;

10:50 - 12:00

Round Table Discussion:

Conference Hall

Solutions for Research and Education and Application of New AI of industry revolution 4.0 including Machine Learning, DNNs, Big Data, Internet of Things, icloud in Vietnam

Panelists: Dang Quang A, Nguyen Long Giang, Nguyen Hoang Phuong, Nguyen Viet Dung, Le Hoang Son

12:00 – 13:30

Lunch

13:30-15:10

Sessions

Conference Hall

SAT1-A: Fuzzy systems and CI

Chair: **Ngo Thanh Long**

SAT1-A1

13:30-13:50

Why Some Power Laws Are Possible And Some Are Not

Edgar Daniel Rodriguez Velasquez, Vladik Kreinovich, Olga Kosheleva, and Hoang Phuong Nguyen (Peru, USA, Vietnam)

edgar.rodriguez@udep.pe, edrodriguezvelasquez@miners.utep.edu, vladik@utep.edu, olgak@utep.edu, nhphuong2008@gmail.com

SAT1-A2

13:50-14:10

How to Estimate the Stiffness of the Multi-Layer Road Based on Properties of Layers: Symmetry-Based Explanation for Odemark's Equation

Edgar Daniel Rodriguez Velasquez, Vladik Kreinovich, Olga Kosheleva, and Hoang

Phuong Nguyen (USA, Vietnam)
edgar.rodriguez@udep.pe, edrodriguezvelasquez@miners.utep.edu, vladik@utep.edu,
olgak@utep.edu, nhphuong2008@gmail.com

SAT1-A3

14:10-14:30

**Need for Diversity in Elected Decision-Making Bodies:
Economics-Related Analysis**

Nguyen Ngoc Thach, Olga Kosheleva, and Vladik Kreinovich (Vietnam, USA)
thachnn@buh.edu.vn, olgak@utep.edu, vladik@utep.edu

SAT1-A4

14:30-14:50

**Why It Is Sufficient to Have Real-Valued Amplitudes in Quantum
Computing**

Isaac Bautista, Vladik Kreinovich, Olga Kosheleva, and Hoang Phuong Nguyen
(USA, Vietnam)
ibautista@miners.utep.edu, vladik@utep.edu, olgak@utep.edu,
nhphuong2008@gmail.com

SAT1 – A5

14:50-15:10

**Optimization under Fuzzy Constraints: Need to Go Beyond Bellman-Zadeh Approach
and How It Is Related to Skewed Distributions**

Olga Kosheleva, Vladik Kreinovich, and Hoang Phuong Nguyen (USA, Vietnam)
olgak@utep.edu, vladik@utep.edu, nhphuong2008@gmail.com

15:10 - 15:30

Coffee Break

15:30 - 16:30

***SAT1-B: Artificial Intelligence I
and Computational Intelligence***

Conference Hall

Chair: **Le Hoang Son**

SAT1-B1

15:30-15:50

**On an application of lattice-valued integral transform to
multicriteria decision making**

Viec Bui and Michal Holcapek (Czech Republic)
bqviec@gmail.com; michal.holcapek@osu.cz

SUN1-B2

15:50-16:10

**Symmetry-Based Explanation for Odemark's Equation directory
Fuzzy Transform for Fuzzy Fredholm Integral Equation**

Irina Perfilieva and Tam Pham (Czech Republic)
irina.perfilieva@osu.cz; p19171@student.osu.cz

SUN1-B3

16:10-16:30

**One-Class Support Vector Machine and LDA Topic Model Integration - Evidence for
AI Patents**

Anton Thielmann, Christoph Weisser and Astrid Krenz (Germany, UK)
anton.thielmann@stud.uni-goettingen.de;
c.weisser@stud.uni-goettingen.de; a.m.krenz@sussex.ac.uk

16:30 - 16:40

Closing

Conference Hall

Keynote Talk 1

Title: Linguistic Terms and Summarization of Information Retrieved from Knowledge Graphs

Marek Reformat
IFSA President, University of Alberta, Canada



Biography: Marek Reformat received his MSc degree (with honors) from Technical University of Poznan, Poland, and a PhD degree from University of Manitoba, Canada.

His initial research projects involved different aspects related to computer networks, especially in the area of management and performance measurement. He co-authored several papers and reports regarding this topic. During his PhD studies, his research interests included distributed computing, with emphasis on fault-tolerant systems in such frameworks as Parallel Virtual Machine (PVM) and Message Passing Interface (MPI); optimization methods; and fuzzy sets and systems. His principle interest was related to evolutionary computing and its application to optimization problems. He proposed a new methodology for design of control systems, which relied on a combination of advanced system simulators and genetic computation. He applied this concept to the control design problem in the area of power systems. In 1997 he joined the Manitoba HVDC Research Centre, where he was a member of a simulation software development team. He was involved in improvement and development of an electromagnetic transients program for time-domain simulation, performed functional and structural testing of the software, and provided expert consulting services in the area of simulation and modeling internationally.

Marek has been with the Department of Electrical and Computer Engineering at University of Alberta since July 2000. He is Professor and Associate Chair of Graduate Studies in the Department. In addition, he is an Associate Editor of a number of journals related to computational intelligence and software engineering. He has been a member of program

committees of several conferences related to those areas. He is actively involved in North American Fuzzy Information Processing Society (NAFIPS). He is a member of the IEEE and ACM.

Research

Research Interests

The goal of Marek Reformat's research activities is to develop methods and techniques for modeling data and knowledge, as well as design systems that possess abilities to imitate different aspects of human behavior. In this context, he uses concepts of computational intelligence — granular (fuzzy) computing, neuro computing, and evolutionary computing - as key elements necessary for capturing relationships between pieces of data and knowledge, as well as for mimicking human ways of reasoning about opinions and facts. He combines these methods with techniques capable of dealing with uncertainty - Bayesian systems, and Dempster-Shafer's evidence theory. These activities focus on introduction of human aspects to software systems, and development of more human-aware and human-like systems.

Current Research

The current research projects embrace the following areas:

Knowledge extraction and knowledge representation: application of fuzzy, neurofuzzy and evolutionary computing methods to discovery and representation of knowledge.

Decision support: application of different forms of knowledge representation to construction of systems supporting decision-making processes; integration of uncertainty — expressed using probability theory (Bayesian networks), Dempster-Shafer theory, and fuzzy measures — with decision support systems.

Semantic-based intelligent systems: development of intelligent systems capable of providing more human-like outcomes based on ontologies and reasoning engines; applications include computing with words, semantic web, and systems for information analysis.

Software quality and maintenance: development of models for estimation and prediction of quality and maintenance related aspects of software components.

Keynote Talk 2

Title: White- and Black-Box Computing and Measurements under Limited Resources: Cloud, High Performance, and Quantum Computing, and Two Case Studies -- Robotic Boat and Hierarchical Covid Testing

Vladik Kreinovich

Vice President of IFSA, University of Texas at El Paso, USA

Abstract: In many practical problems, it is important to take into account that our computational and measuring resources are limited. In this talk, we overview main resource limitations for different types of computers, and we provide two case studies explaining how to best take this resource limitation into account.



Biography: Vladik Kreinovich received his MS in Mathematics and Computer Science from St. Petersburg University, Russia, in 1974, and PhD from the Institute of Mathematics, Soviet Academy of Sciences, Novosibirsk, in 1979. From 1975 to 1980, he worked with the Soviet Academy of Sciences; during this time, he worked with the Special Astrophysical Observatory (focusing on the representation and processing of uncertainty in radioastronomy). For most of the 1980s, he worked on error estimation and intelligent information processing for the National

Institute for Electrical Measuring Instruments, Russia. In 1989, he was a visiting scholar at Stanford University. Since 1990, he has worked in the Department of Computer Science at the University of Texas at El Paso. In addition, he has served as an invited professor in Paris (University of Paris VI), France; Hannover, Germany; Hong Kong; St. Petersburg and Kazan, Russia; and Brazil.

His main interests are the representation and processing of uncertainty, especially interval computations and intelligent control. He has published eight books, 24 edited books, and more

than 1,500 papers. Vladik is a member of the editorial board of the international journal "Reliable Computing" (formerly "Interval Computations") and several other journals. In addition, he is the co-maintainer of the international Web site on interval computations <http://www.cs.utep.edu/interval-comp>.

Vladik is Vice President of the International Fuzzy Systems Association (IFSA), Vice President of the European Society for Fuzzy Logic and Technology (EUSFLAT), Fellow of International Fuzzy Systems Association (IFSA), Fellow of Mexican Society for Artificial Intelligence (SMIA), Fellow of the Russian Association for Fuzzy Systems and Soft Computing; he served as

Vice President for Publications of IEEE Systems, Man, and Cybernetics Society 2015-18, and as President of the North American Fuzzy Information Processing Society 2012-14; is a foreign member of the Russian Academy of Metrological Sciences; was the recipient of the 2003 El Paso Energy Foundation Faculty Achievement Award for Research awarded by the University of Texas at El Paso; and was a co-recipient of the 2005 Star Award from the University of Texas System.

Keynote Talk 3:

Title: Decision support in clinical laboratory medicine

Klaus-Peter Adlassnig
Medical University of Vienna, Austria



Biography: Klaus-Peter Adlassnig received his MSc degree in Computer Science from the Technical University of Dresden, Germany, in 1974. He joined the Department of Medical Computer Sciences of the University of Vienna Medical School, Austria, in 1976. In 1983, he obtained his PhD degree in Computer Sciences from the Technical University of Vienna, Austria, with a dissertation on “A Computer-Assisted Medical Diagnostic System Using Fuzzy Subsets”. Dr. Adlassnig was a postdoctoral research fellow with Professor Lotfi A. Zadeh at the Computer Science Division at the Department of Electrical Engineering and Computer Sciences of the University of California at Berkeley, U.S.A., from 1984–86. He received his Venia docendi for Medical Informatics from the University of Vienna in 1988 and became Professor of Medical Informatics in 1992. In 1987, he received the Federal State Prize for excellent research in the area of rheumatology, awarded by the Austrian Federal Ministry for Health and Environmental Protection. From 1988–2015, he was head of the Section on Medical Expert and Knowledge-Based Systems at the Department of Medical Computer Sciences of the University of Vienna Medical School (now: Section for Artificial Intelligence and Decision Support at the Center for Medical Statistics, Informatics, and Intelligent Systems, Medical University of Vienna). In 2014, he has been elected to Fellow of the American College of Medical Informatics (ACMI), and in 2018 to Fellow of the International Academy of Health Sciences Informatics (IAHSI).

Prof. Adlassnig was a Visiting Professor at the Department of Medicine, Section on Medical Informatics, at the Stanford University Medical Center, U.S.A., in summer 1993, and a guest lecturer and guest professor at the Department of Electrical and Biomedical Engineering in the Technical University of Graz, Austria, from 1994 to 2004. He spent the summer 2000 as a visiting scholar at the Department of Electrical Engineering and Computer Sciences, Computer Science Division, Berkeley Initiative in Soft Computing (BISC), University of California, Berkeley, U.S.A., May 2005 as guest researcher at the Department of Computer Science, Meiji University, Kawasaki, Japan, and September 2008 as visiting scientist at the Clinical Decision Making Group, Computer Science and Artificial Intelligence Laboratory (CSAIL), Massachusetts Institute of Technology (MIT), Cambridge/U.S.A.

From 2002 to 2016, Prof. Adlassnig was the Editor-in-Chief of the International Journal “Artificial Intelligence in Medicine”, Elsevier Science Publishers B.V., and was the director of

the Ludwig Boltzmann Institute for Expert Systems and Quality Management in Medicine from 2002 until 2005. He is co-founder, CEO, and Scientific Head of Medexter Healthcare GmbH (www.medexter.com), a company established to broadly disseminate intelligent medical systems with clinically proven usefulness. Since its inception in 2002, Medexter succeeded in establishing technical platforms and clinical decision support systems for a number of academic, commercial, and clinical institutions.

Prof. Adlassnig's research interests focus on computer applications in medicine, especially medical expert and knowledge-based as well as clinical decision support systems and their integration into medical information and web-based health care systems. Prof. Adlassnig is highly interested in formal theories of uncertainty, particularly in fuzzy set theory, fuzzy logic, fuzzy control, and related areas. He is equally interested in the theory and practice of computer systems in medicine. Prof. Klaus-Peter Adlassnig's sphere of interest includes various aspects of the philosophy of science, particularly the state and future impact of artificial intelligence.

Keynote Talk 4

Title: Advanced Approaches of Artificial Neural Network --From A Hybrid Double Layered Neural Network to Deep Learning

Junzo Watada

IPS Research Center, Waseda University, Japan

Abstract: We have worked on artificial neural network (ANN) for 30 years from 1990. Recently ANN influences us by the deep learning structure. We intend to talk about our research of ANN to solve problems. We built double-layered ANNs in 1990s to solve mean-variance problems, that is, quadratic programming problems such as portfolio problems in financial engineering. The double-layered ANNs consist of Hopfield machine and Boltzmann machine. The two kinds of ANN collaborate to solve the quadratic mean-variance problems in the way that the upper level ANN selects optimal neurons and the lower level ANN decided each optimal weights. But bi-level programming problem is more complicated. Even bi-level linear programming problem is NP-hard to solve it. We found that several wrong optimum results were presented in journal papers. We built a hybrid recurrent ANN to solve bi-level quadratic programming in 2014. Also we apply the system to solve real applications. We explain such research directions. Finally we will report recent resulted of deep learning understanding of video pictures based on Masking Vision Based Autonomous Navigation.



Biography: Dr. Junzo Watada received his B.Sc. and M.Sc. degrees in electrical engineering from Osaka City University, Japan, in 1970 and 1972 respectively, and his Ph.D. degree from Osaka Prefecture University, Japan. Currently, he is an invited researcher, IPS Research Center, Waseda University at Kitakyushu, Japan and a professor emeritus, Waseda University, Japan.. He received the Henri Coanda Medal Award from Inventico in Romania in 2002. He is a Life Fellow and a Honorary Member of the Japan Society for Fuzzy Theory and intelligent informatics (SOFT). Prof. Watada is an IEEE life senior member, Executive Chair of ISME as well as of WCICME, the president (2019-2021), Forum of Interdisciplinary Mathematics after being a vice-president for six years. He commits himself in editing various international journals as a principal editor of several journals and an editorial board member of more than 30 journals. His professional interests include artificial neural network, human tracking, human centric data mining, soft computing, knowledge engineering, financial engineering and management engineering. He published more than 900 papers including 274 journal papers (63 Q1), (48 Q2), 3 monographs, 15 edited books and 112 book chapters, more than 500 int. conference papers.

Keynote Talk 5

Title: Rough sets and Big Data Analysis

Hung Son Nguyen

Institute of Mathematics, Warsaw University, Poland

Abstract: The talk presents the recent issues, including interactivity, explainability and scalability of AI and ML algorithms, especially in the domain of big data analysis. Particular attention will be paid to the use of selected aspects of rough set theory in the development of techniques supporting AI / ML applications. In addition to the already known threads related to information granulation, leading to more effective approximate and simplified calculations, a new approach to the approximation of ML problems and models using user-friendly and easy-to-interpret sets of information systems will be discussed.



Biography: Hung Son Nguyen received the Ph. D. in 1997, D. Sci. (habilitation) in 2008 and he is working as a professor in University of Warsaw. His main research interests are fundamentals and applications of Rough set theory, data mining, text mining, bioinformatics, intelligent multiagent systems, soft computing, pattern recognition. On these topics he has published more than 140 research papers in edited books, international journals and conferences. Hung Son Nguyen is the fellow of International Rough Set society, and a member of the Editorial Board of international journals, i.e. Transaction on Rough Sets, Data mining and Knowledge Discovery (from 2005-2008) and ERCIM News, Computational Intelligence and the Manager Editor of Fundamenta Informatica. He has served as a program co-chair of RSCTC'06 and 'RSKT2012, IJCRS2018, as a PC member of various other conferences including PKDD, PAKDD, AAMAS, RSCTC, RSFDGrC, RSKT, etc., and as a reviewer of many other journals. He was involved in numerous research and commercial projects including dialog-based search engine (Nutech), fraud detection for Bank of America (Nutech), logistic project for General Motors (Nutech), Semantic Search Engine, Intelligent Decision Support System for Firefighting in Poland, RID – Development of Innovative Transport System and Recommendation system for fashion and cosmetic branches.

Keynote Talk 6

**Title: Computer-Aided Skin Cancer Detection:
from practical problems to theoretical questions**

**Nguyen Tien Zung
University of Toulouse, France**

Biography: Nguyen Tien Zung obtained my PhD in 1994 in Strasbourg, was CNRS Researcher during the period 1995-2002, and then became Professor of Mathematics at the University of Toulouse in 2002. In 2015 he was promoted to Distinguished Professor (classe exceptionnelle). He is also the Founder of the artificial intelligence startup Torus Actions SAS, that currently has about 15 PhDs in Maths and AI as permanent employees and collaborators. One of the main projects of Torus Actions, the Skin Cancer AI, has achieved an unprecedented level of accuracy and informativeness, and recently won a big research grant from the European Research Council, as well as a "Deep Tech Prize" from BPI (French Public Bank of Investments).

Keynote Talk 7

Title: Fuzzy Expert Systems in Western and Eastern Medicine

**Nguyen Hoang Phuong
Thang Long University, Vietnam**

Abstract: In most countries in Asia, there are two medicines: Western medicine and Eastern medicine which called traditional oriental medicine. Eastern medicine is based on the concept of wholism which considers the various parts of the human body as an organic whole focusing the harmony and coordination of the internal organs with other parts or structure and unity of the human body with the external environment. The diagnosis and treatment of Eastern medicine based on overall analysis of symptoms and signs, the cause, nature and location of the illness and the physical condition of the patient. On the other side, Western medicine is closely related with modern knowledge of science and technology, providing better skills and equipment for examination, diagnosis and treatment of certain illnesses. In fact, the integrated medicine seeks to apply the best of both systems and to offset the weaknesses of each. Integrating Eastern and Western medicine means applying the best of the two systems and this will give better results than that obtained with either system alone. In diagnosis, the differentiation of disease syndromes of Eastern medicine and disease diagnosis of Western medicine are often complementary. In treatment, the integrated approach can clearly state which diseases should be treated by Eastern medicine, which diseases should be treated by Western medicine and which diseases should be cured employing both methods.

Fuzzy set theory and fuzzy logic are a highly suitable and applicable basis for developing fuzzy systems in medicine for tasks such as the interpretation of sets of medical findings, syndrome differentiation in eastern medicine, diagnosis of diseases in Western medicine, mixed diagnosis of integrated western and eastern medicine, the optimal selection of medical treatments integrating western and eastern medicine, and for real-time monitoring of patient data. This was verified by trials with the following systems which were developed by our group “Artificial Intelligence in Medicine” in Vietnam: a fuzzy expert system for syndromes differentiation in oriental traditional medicine, an expert system for lung diseases using fuzzy logic, case based reasoning for medical diagnosis using fuzzy set theory, a diagnostic system combining disease diagnosis of western medicine with syndrome differentiation of oriental traditional medicine, a fuzzy system for classification of western and eastern medications and finally, a fuzzy system for diagnosis and treatment of integrated western and eastern medicine.



Biography: Nguyen Hoang Phuong received the Ph. D. in 1996 in Computer Sciences from Technical University of Vienna, Austria with a dissertation on “Some contributions to Fuzzy Expert Systems with emphasis on Medicine” under supervision of Professor Klaus-Peter Adlassnig of the Medical University of Vienna, Austria. Dr. Phuong received the title of Associate Professor in Informatics in 2002 from the State Council of Promotion of Professorship, Vietnam. Since 1979, he worked at the Institute of Information Technology, Vietnam Institute of Sciences (now Institute of Information Technology, VAST, Vietnam), since 2004, he worked Director of Center of Informatics, Ministry of Health (MOH) of Vietnam, since 2009 – Deputy Director of Department of Science and Training, MOH, since 2012 - Deputy Director General and Head of Authority of Information Technology, MOH. Vietnam. Since 2015, he worked as Associate Professor at the Mathematics-Informatics Faculty, Thang Long University, Vietnam.

His main research interests are medical informatics, Artificial Intelligence, fuzzy expert systems, soft computing and Deep Learning with applications in medicine.

On these topics he has published more than 140 research papers in international/national journals and conferences, edited/co-edited 12 books, 9 proceedings of the International Conferences and 7 Proceedings of National Conferences on Medical Informatics and Applications of MOH of Vietnam. He was a co-guest editor of 5 special issues on “Fuzzy Systems and Applications of International Journal of Uncertainty, Fuzziness and Knowledge Based Systems (IJUFKS); Biomedical Soft Computing and Human Sciences; Journal of Advanced Computational Intelligence and intelligent informatics.

He was invited to give special talks at many institutes and Universities as Department of Med. and Bio. Informatics, German Cancer Research Center, Univ. of Heidelberg, Germany (1995), the Intelligent Systems Research Lab, School of Systems Engineering, University of Wales Cardiff, UK (1996), the Medical Computing Lab, Department of Information Systems and Computer Science, National University of Singapore (1996), Department of Computer Science and Department of Mathematics, University of Texas at El Paso, USA (1997), NASA PACES Center, UTEP at El Paso, USA (1997) , the Dept of Engineering, Osaka Prefecture University, Japan (1998), the Faculty of Engineering and Center of High Technology, Hokkaido Gakuen University, Japan (1998), Department of Medical Informatics, College of Medicine, National

Taiwan University, ROC (1999), Osaka Institute of Technology, Japan (1998,1999), Kyushu Institute of Technology, Japan (1999), Department of Computer Science, Meiji University, Japan (2000), Department of Engineering, University of Himeiji, Japan (2000), Department of Computing, Hong Kong Polytechnic University (2000) plenary talks at the international conferences BMFSA'99 (Japan), MIST'99 (Taiwan), MIF'99 (Vietnam) and others.

His current research focuses on applying Deep learning in medical image analysis, especially, for breast cancer screening and AI for Integrated Western and Eastern medicine and for diagnosis of mental disorders, for telemedicine.

ABSTRACTS

Bilattice CADIAG-II: Theory and Experimental Results

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Abstract: CADIAG-II is a functioning experimental fuzzy expert system for computer-assisted differential diagnosis in internal medicine. To overcome the current limitations of the system, we propose an extension based on bilattices. The proposed changes were implemented and reviewed in a retrospective evaluation of 3,131 patients with extended information about patient's medical history, physical examination, laboratory test results, clinical investigations and – last but not least – clinically confirmed discharge diagnoses.

A Combination Model of Robust Principal Component Analysis and Multiple Kernel Learning for Cancer Patient Stratification

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Abstract: In recent years, bioinformatics has been significantly contributing to patient stratification that is one of the most important phases in early detection of cancer diseases. However, bioinformatics methods have to face two major challenges in analyzing large molecular biology datasets when stratifying cancer patients. Firstly, the datasets are very big with a high number of features. Secondly, because the data are more and more available and heterogeneous, there is a need of combining multiple data sources, providing more comprehensive and informative datasets. A variety of methods has been proposed to tackle these challenges, but they have often solved one or the other separately. Moreover, the integration model for noisy data encountered another difficulty. In this paper, we have proposed a model, combining of the robust principal component analysis-based dimensionality reduction and feature extraction with classification based on multiple kernel learning. The proposed method resolved efficiently both of challenges in stratifying cancer patients. The model obtained high accuracy with 92.92% and reliability in the tested statistical hypothesis. These results are beneficial to cancer research, diagnosis, and treatment.

Attention U-Net with Active Contour based Hybrid Loss for Brain Tumor Segmentation

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Abstract: Brain tumor (BT) segmentation from brain magnetic resonance imaging (MRI) plays an important role in diagnosis and treatment planning for patients. In this study, we proposed a new approach for brain tumor segmentation based on deep neural networks. The paper proposes to use Attention U-Net architecture which can handle the shape variety with the attention gate for brain tumor segmentation from MRI images. Especially, instead of using cross-entropy loss function, dice coefficient loss function or both, we propose to utilize a new loss function based on activate contour loss that is known to overcome the limitation of pixel-wise fitting of the segmentation map on the loss functions used before, to train the network. We evaluated and compared our approach and other approaches on a dataset of nearly 4000 brain MRI scans. Experiments demonstrate that the proposed method outperforms the state-of-the-art methods in terms of Dice coefficient and Jaccard indexes.

Refining Skip Connections by Fusing Multi-scaled Context in Neural Network for Cardiac MR Image Segmentation

Nhu-Toan Nguyen, Minh-Nhat Trinh, Thi-Thao Tran, and Van-Truong Pham

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Abstract: Applying convolutional neural network (CNN) for medical image segmentation has been well known for several years. The classical method normally used is based on encoder-decoder architecture. The main drawback of encoder-decoder architecture is the long-range feature dependencies are not preserved when model goes deeper the deeper. One way to overcome this problem is using complementary layers, called skip layers, from contracting path. However, the use of only skip layers that have the similar shape in contracting path is seem to be insufficient and inefficient. Therefore, some skip methods been released to boost the performance such as Unet++, Mask R-CNN++, ... In this study, we concentrate on improving skip layer method by applying attention mechanism and multi-scaled context fusion. This approach is able to associate the local features with global dependencies, weighting information between layers, so reducing unnecessary and noisy information, and simultaneously illuminate important features for segmentation. We evaluate our proposed method on 2017 ACDAC dataset. The results show that our model achieved the remarkable performance in term of Dice coefficient and Jaccard index. This demonstrates the efficiency of our approach to precisely segment the target regions in medical images.

End-to-end Hand Rehabilitation System with Single-shot Gesture Classification for Stroke Patients

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Abstract: Rehabilitation of the hands is crucial for stroke survivors to regain their ability to perform activities of daily living. Various technologies were explored and found unmatured, expensive and uncomfortable. Existing devices to assist rehabilitation are typically costly, bulky and difficult to set up. Our proposed solution aims to provide an end-to-end hand rehabilitation system that can be produced at low cost with greater ease of use. It incorporates gamification to motivate stroke survivors to perform physical rehabilitation through an infra-red depth camera and computer system. MediaPipe was employed for hand detection and hand landmark extraction. A single-shot neural network model was proposed for hand gesture detection with an accuracy rate of 98%. Lastly, a visually interactive game was developed to promote engagement of the user during the performance of rehabilitation.

Fine-Grained Network Traffic Classification using Machine Learning: Evaluation and Comparison

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Abstract: The network traffic classification problem is classified into coarsegrained traffic classification and fine-grained traffic classification. Previous researchers have successfully applied machine learning techniques to solve the coarse-grained traffic classification problem with very high accuracy. However, there are few studies associated with the fine-grained traffic classification problem because of an appropriate lack of labeled data of the application flows. This paper proposes a data collection method and investigates various unsupervised and supervised learning techniques in our collected data to solve the fine-grained traffic classification problem. Experimental results showed that the decision tree and random forest got the highest accuracy at 97%. Besides, the decision tree also had the lowest prediction time, which is well-suited to be implemented in real-time fine-grained traffic classification applications

Soil Moisture Monitoring System Based on LoRa Network to Support Agricultural Cultivation in Drought Season

**Tien Cao-Hoang, Kim Anh Su, Trong Tinh Pham Van, Viet Truyen Pham
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Abstract: This paper presents an Internet of Thing system based on the LoRa wireless sensor network to monitor soil moisture to support agricultural cultivation in drought season. Our proposed system was developed using Ai Thinker Ra-02 LoRa module integrated with Arduino pro mini board, which is responsible for gathering soil moisture and transmitting data to a gateway for forwarding to a data server on the internet. So that, farmers and researchers can monitor the soil condition remotely. Two experiments were conducted, which are the sensor calibration test to calculate the volumetric water content from the sensor's analog signal and the network coverage test to find the LoRa module capability. The system had been deployed to test in the real situation. It is expected to support the farmer to monitor the soil condition of plants due to the effects of drought and salinity phenomena.

Towards Parallel NSGA-II: An island-Based Approach

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Abstract: Genetic algorithm refers to adaptive heuristic search algorithms which are commonly used to generate high-quality solutions for optimization and search problems. For the cases of multiobjective problems, nondominated sorting genetic algorithm II (NSGA-II) is introduced as a powerful variant of GA because it alleviates computational complexity and illustrates an elite approach which removes sharing parameter in comparing to other multiobjective evolutionary algorithms. Although NSGA-II has its own merits, this algorithm undesirably takes a lot of time to run with a large amount of data. This happens since NSGA-II runs only one computational thread, which makes room to improve via parallel strategy. Inspired by this idea, we propose an approach that improves NSGA-II in terms of speed but still maintains optimized results. This is carried out by devising a strategy to properly divide the population into islands with good fitness individuals, each of which runs in individual thread. Using this strategy leads to a parallel NSGA-II that can run on multithreads (or multiprocesses). We have examined the parallel NSGA-II with some dataset. The results indicates significant speed improvement enjoyed by our parallel version.

A Radial Basis Neural Network Approximation with Extended Precision for Solving Partial Differential Equations

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Abstract: In this paper, a radial basis function networks (RBFNs) method is reported for numerical solutions of partial differential problems. RBFNs can be considered as a universal approximation scheme, and have emerged as a powerful approximation tool and become one of the main fields of research in the numerical analysis [Haykin (1999)] Derivative approximations of variable fields are computed through the radial basis functions. They have the properties of universal approximation and mesh-free discretisation. The proposed technique is verified through several linear and non-linear partial differential problems, including Navier-Stokes equations.

Construct an Intelligent Navigation System for AGV Robot Based on Deep Learning

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Abstract: Motion planning plays an essential role in motion control for autonomous mobile robots (ARMs). When the information about the operating environment and robot's position obtained from a simultaneous localization and mapping (SLAM) system, a navigation system guarantees that the robot can autonomously and safely move to the desired position in the virtual environments and simultaneously avoid any collisions. This paper presents an intelligent navigation system in unknown 2D environments based on deep reinforcement learning (DRL). Our work was constructed base on the Robot Operating System (ROS). The proposed method's efficiency and accuracy are shown in Gazebo's simulation results and the physical robot's actual results.

Feature Selection based on Shapley Additive Explanations on Metagenomic Data for Colorectal Cancer Diagnosis

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Abstract: Personalized medicine is one of the hottest current approaches to take care of and improve human health. Scientists who participate in projects related to personalized medicine approaches usually consider metagenomic data as a valuable data source for developing and proposing methods for disease treatments. We usually face challenges for processing metagenomic data because of its high dimensional and complexities. Numerous studies have attempted to find biomarkers which can be medical signs related significantly to the diseases. This study, we propose an approach based on Shapley Additive Explanations, a model explainability, to select valuable features from metagenomic data to improve the disease prediction tasks. The proposed feature selection method is evaluated on more than 500 samples of colorectal cancer coming from various geographic regions such as France, China, United States, Austria, and Germany. The set of 10 selected features based on Shapley Additive Explanations can achieve significant results compared to the feature selection method based on Pearson coefficient and it also obtains comparative performances compared to the original set of features including approximately 2000 features.

Clinical Decision Support Systems for Pneumonia Diagnosis using Gradient-weighted Class Activation Mapping and Convolutional Neural Networks

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Abstract: Diagnosis based on images plays an essential role in clinical treatment aims to findings abnormal regions. In recent years, deep learning has an enormous breakthrough in the field of medical diagnostics. Medical imaging research is embracing the automatic detection techniques used in computer vision, especially, chest X-ray images. The artificial intelligence-based systems not only aid to store a large amount of data but also assist doctors to detect signs of diseases at early stages and provide effective treatment regimens with an accurate diagnosis. Although deep learning has greatly supported to develop efficient image-based diagnostic methods, the algorithms still work as a black box. We face difficulties to interpret the output from deep learning algorithms. The aim of this study, we propose to combine pneumonia diagnosis using Gradient-weighted Class Activation Mapping (Grad-CAM) and Convolutional Neural Networks (CNN) with a clinical decision support system based on chest X-ray (CXR) images. This research leverages a CNN architecture that is designed from scratch for classifying CXR images. Then the best-selected model and the worst model are chosen and run with Grad-CAM technique to provide visual explanations for the comparison. As shown from the experiments, the proposed method obtains a promising result and is expected to aid the radiologists and doctors in the diagnosis process.

Improving 3D Hand Pose Estimation with Synthetic RGB Image Enhancement using RetinexNet and Dehazing

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Abstract: Hand pose estimation has recently attracted increasing research interest, especially with the advance of deep learning. Albeit many successes, the current state of research does present some opportunities for improvement of estimation accuracy. This paper presents several image enhancement techniques to embed with existing deep learning architectures to improve the performance of hand pose estimation. In particular, we propose a preprocessing approach for image data using a low light illuminance model or a dehazing algorithm before passing the image data to a hand pose estimation model. Both the preprocessing methods are evaluated on a rendered hand-pose dataset using different evaluation metrics. The experimental results shows success in boosting the performance of hand pose estimation for both 2D and 3D image data.

FRI2-A4

Imbalance in Learning Chest X-ray Images for COVID-19 Detection

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Abstract: We present a method which enables to learn and recognize symptoms of COVID-19 from chest X-ray images in a class balancing algorithm. Images are trained and tested by deep learning methods allowing to extract initial image features. A probabilistic representation is used for all aspects of the learning objects: features, samples, class and relative data modeling. An imbalance-based sample detector is used to discover a minority class in the class distribution. In learning, the samples of the minority class are analyzed and the imbalance issue is fixed. This is done with and without the use of SMOTE and SPY for class balancing. In recognition, the SVM is applied to classify images. The imbalance nature of the model with a solution combining VGG-16, SPY and SVM is demonstrated by excellent results over other parametric learning options.

FRI2-A5

Deep Learning based COVID-19 Diagnosis by Joint Classification and Segmentation

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Abstract: COVID-19 is currently one the most life-threatening problems around the world. Fast and accurate detection of the COVID-19 infection play an important role to identify, take better decisions as well as ensure treatment for the patients. In this paper, we propose a fast and efficient method to identify COVID-19 patients based on deep learning approach. The proposed approach includes segmentation and classification stages. The segmentation stage is performed by employing U-Net neural network to accurately segment the lung position from chest CT images and the classification stage is achieved by DenseNet169 model. We applied the proposed model to dataset contains 349 CT scans that are positive for COVID19 and 397 negative CT scans that are normal or contain other types of diseases. Experiment show that our model outperforms other methods in term of accuracy, sensitivity, F1, and AUC evaluation metrics.

HDBSCAN: Evaluating the Performance of Hierarchical Clustering for Big Data

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Abstract: Today, with the significant growth development of technology accompanied by the rapid increase in data, there is a lot of potential data that has not been discovered, classified, and processed into usable data. Therefore, the need of categorizing data is born and become hot recently. However, the classification of a massive volume of data is not an easy task, and it involves a lot of human resources to label the data. Clustering is one of the most used in the first step of data cleaning intended to help humans can label a volume of data with the same tag, reduce redundancy in a shorter time. In this paper, we conducted intensive experiments to verify the effectiveness of Hierarchical Clustering on multiple datasets using Apache Spark. A comparison has been conducted for different sizes, and the volume of data is provided in the experiment section

Applying Deep Reinforcement Learning in Automated Stock Trading

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Abstract: The continuously changing nature of stock markets poses a non-trivial challenge to build automated trading agents that assist traders in their decision makings. Fixed sets of trading rules and offline pre-trained models are inefficient to adapt regarding the real-time fluctuations on the stock markets. Deep Reinforcement Learning (DRL) algorithms train autonomous agents that could potentially address such highly dynamic environments by integrating the generalization power of artificial neural networks with the online learning through experiences gained in the interactions with the environment. We investigate the capability of three DRL algorithms, namely Deep Deterministic Policy Gradient (DDPG), Twin Delayed DDPG (TD3), and Soft Actor-Critic (SAC), for tackling the automated stock trading problem. We employ two datasets, from the US and Vietnam markets, with different characteristics and market trends, on which the DRL-trained agents are compared against a random trading agent. Experimental results indicate the potentials of these DRL algorithms and also exhibit their pitfalls when being applied in datasets where the majority of the stocks are not up-trending. We propose a simple, but effective, technique to assist the agents to minimize their losses.

Telecommunications Services Revenue Forecast using Neural Networks

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Abstract: Forecasting is a very important task not only for any business but also in other fields. There are numerous categories to forecast in business, but determining the future revenue (revenue forecast) is one of most crucial task so that leader can propose appropriate policies, decisions to optimize production and business activities. Revenue forecasting is a complex problem and requires the use of many different methods and techniques to achieve the highest accuracy. This study mainly analyzes approaches to select neural network models, processes, highlights the necessary steps and leverages advancements in deep learning for revenue forecast on a set of revenue data generated in the monthly, quarterly period from 2013 to June 2019 of 9 regions in Tra Vinh province. The considered telecommunication services groups including Internet services, MyTV service, landline phone service and postpaid mobile service are taken into account for revenue forecast tasks with the deep learning techniques. The proposed method achieves promising results and is now deploying in the practical cases at VNPT Tra Vinh.

Product Recommendation System using Opinion Mining on Vietnamese Reviews

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Abstract: Opinion mining (also known as sentiment analysis) through customers' reviews or feedbacks which can identify the user opinion about different product features has received a lot of attention exhibited in numerous studies. The majority of recommender systems have recommended products based only on overall evaluation and primarily based on expert's evaluation. In this work, we propose a method to explore Vietnamese reviews extracted from e-commerce websites in Vietnam to provide suggestions in products selection based on products' features/functions. Such features/functions may be interested differently depending on various types of customers. The proposed approach introduces a topic-based model to identify products' features which are mentioned in customer comments/reviews. The proposed system is implemented with the integration combining the VietSentiWordnet to calculate the importance scores for the features of each product. We also construct a product recommendation database which can store customers preference and purchases history. The work is analysed on more than 2,000 Vietnamese comments/reviews about laptop products and is expected to be feasible to apply in practical cases.

Deep Neural Networks for Mammograms Classification for Breast Cancer Screening

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Abstract: Nowadays, breast cancer is one of the most popular cancers for women in many countries in the world, especially, in Vietnam. In order to early detect breast cancer in early stages, the mammograms classification of Vietnamese patients for breast cancer screening based on X-Ray is considered as an important method. In this research, we propose a method for classifying mammograms of Vietnamese patients into three categories of BIRADS: BIRADS 1: breast is normal, BIRADS 2: (according to BIRAD 2 to BIRAD 3): breast is abnormal with benign mass and BIRAD 4: cannot evaluate a hurt in breast cancer X - Ray, need more other testing or the breast has a hurt with high malignant rate. Our mammograms classification system for breast cancer screening is developed based on CNN networks with basic framework of ResNet50. The system is trained and tested on Vietnamese patients X – Ray dataset with 7848 mammograms provided by radiologists of Hanoi Medical University Hospital. The evaluation of the system accuracy on testing set which results that macAUC = 0.761. Clinical evaluation of the mammograms classification system with about 500 mammograms using some evaluation metrics at the Department of radiology, Hanoi Medical University Hospital shows that the system performance accuracy is much better than the diagnosis accuracy of one radiologist and it is the same as the diagnosis accuracy of “committee of radiologists”. With is result, our system can be considered as a “second radiologist” which can help radiologists in mammograms classification of Vietnamese patients for breast cancer screening.

Why Some Power Laws Are Possible And Some Are Not

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Abstract: Many dependencies between quantities are described by power laws, in which y is proportional to x raised to some power a . In some application areas, in different situations, we observe all possible pairs (A,a) of the coefficient of proportionality A and of the exponent a . In other application areas, however, not all combinations (A,a) are possible: once we fix the coefficient A , it uniquely determines the exponent a . In such case, the dependence of a on A is usually described by an empirical logarithmic formula. In this paper, we show that natural scale-invariance ideas lead to a theoretical explanation for this empirical formula.

How to Estimate the Stiffness of the Multi-Layer Road Based on Properties of Layers

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Abstract: When we design a road, we would like to check that the current design provides the road with sufficient stiffness. For this purpose, we need to estimate the stiffness of the road based on stiffness and thickness of different layers. There exists an empirical formula for this estimation. In this paper, we show that this formula can be explained by natural scale-invariance requirements.

SAT1-A3

Need for Diversity in Elected Decision-Making Bodies: Economics-Related Analysis

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Abstract: On a qualitative level, everyone understands the need to have diversity in elected decision-making bodies, so that the viewpoint of each group be properly taken into account. However, when only the usual economic criteria are used in this election – e.g., in the election of company’s board – the resulting bodies often underrepresent some groups (e.g., women). A frequent way to remedy this situation is to artificially enforce diversity instead of strictly following purely economic criteria. In this paper, we show the current seeming contradiction between economics and diversity is caused by the imperfection of the use economic models: in an accurate economics-related decision making model, optimization directly implies diversity”

SAT1-A4

Why It Is Sufficient to Have Real-Valued Amplitudes in Quantum Computing

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Abstract: In the last decades, a lot of attention has been placed on quantum algorithms – algorithms that will run on future quantum computers. In principle, quantum systems can use any complex-valued amplitudes. However, in practice, quantum algorithms only use real-valued amplitudes. In this paper, we provide a simple explanation for this empirical fact.

Optimization under Fuzzy Constraints: Need to Go Beyond Bellman-Zadeh Approach and How It Is Related to Skewed Distributions

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Abstract: In many practical situations, we need to optimize the objective function under fuzzy constraints. Formulas for such optimization are known since the 1970s paper by Richard Bellman and Lotfi Zadeh, but these formulas have a limitation: small changes in the corresponding degrees can lead to a drastic change in the resulting selection. In this paper, we propose a natural modification of this formula, a modification that no longer has this limitation. Interestingly, this formula turns out to be related for formulas for skewed (asymmetric) generalizations of the normal distribution.

On an Application of Lattice-valued Integral Transform to Multicriteria Decision Making

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Abstract: The paper is devoted to the application of the integral transform for lattice-valued functions, which is based on a Sugeno-like fuzzy integral, to multicriteria decision making. We present an integral transform defined within the space of functions whose function values belong to a complete residuated lattice. We use this integral transform as an extended qualitative aggregation operator in multicriteria decision making to get the evaluation of alternatives for a decision-maker. The proposed approach is illustrated and compared with a common approach on a car selection problem.

SUN1-B2

Symmetry-Based Explanation for Odemark's Equation directory Fuzzy Transform for Fuzzy Fredholm Integral Equation

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Abstract: This work pursues two goals: to solve a fuzzy Fredholm integral equation of the second kind and to propose a new numerical method inspired by the theory of fuzzy (F-) transforms. This approach allows us to transform the fuzzy Fredholm integral equation into a system of algebraic equations. The solution to this algebraic system determines an approximate solution to the original problem. The existence and uniqueness of the exact solution is proved.

SUN1-B3

One-Class Support Vector Machine and LDA Topic Model Integration - Evidence for AI Patents

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Abstract: The present contribution suggests a two-step classification rule for unsupervised document classification, using one-class Support Vector Machines and Latent Dirichlet Allocation Topic Modeling. The integration of both algorithms allows the usage of labelled, but independent training data, not stemming from the data set to be classified. The manual labelling when trying to classify a specific class from an unlabelled data set can thus be circumvented. By choosing appropriate document representations and parameters in the one-class Support Vector Machine, the differences between the independent training class and the data set to be classified become negligible. The method is applied to a large data set on patents for the European Union.