Abstract Book

Continuum Forums

ROBOTFORUM2023

International Forum on Artifcial Intelligence and Robotics

March 13-15, 2023 | Las Vegas, USA

robotforum2023@continuumforums.com
https://www.continuumforums.com/2023/robotforum

Dr Christian Laugier

Research Director at Inria Grenoble Rhône-Alpes, France

Bayesian & AI driven Perception and Decision-making for Autonomous Vehicles.

This talk addresses the exciting new concept of Autonomous Driving, as well as the technical questions and solutions associated with it. Emphasis will be placed on the scientific and technological challenges associated with embedded perception, complex dynamic scenes understanding and real-time driving decision-making. It will be shown how these problems can be tackled using Bayesian Perception, Artificial Intelligence and Machine Learning approaches.The talk will be illustrated using results obtained by Inria Grenoble Rhône-Alpes (France) in the scope of several R&D projects conducted in collaboration with IRT Nanoelec (French Technological Research Institute) and with several industrial companies such as Toyota or Renault.

Biography:

Dr. HDR Christian LAUGIER is Research Director at Inria and Scientific Advisor for Probayes SA. His current research interests mainly lie in the areas of Autonomous Vehicles, Embedded Perception and AI &Bayesian Reasoning. He is a member of several IEEE International Scientific Committees and he has co-organized numerous workshops and major IEEE conferences in the field of Robotics such as IROS, IV, FSR, or ARSO. He also co-edited several books and special issues in high impact Robotics or ITS journals such as IJRR, JFR, RAM, T-ITS or ITSM. He recently brought recognized scientific contributions and patented innovations to the field of Bayesian Perception & Decision-making for Autonomous Robots and Intelligent Vehicles. He is IROS Fellow and he is the recipient of several IEEE and conferences awards in the fields of Robotics and Intelligent Vehicles, including the IEEE/RSJ Harashima award 2012. In addition, he has co-founded four start-up companies.

Dan Zhang
York University, Canada

Innovation Design and Applications of Robotic Manipulators in Intelligent Manufacturing System

Due to the potential high rigidity, high accuracy, and high loading capacities of parallel manipulators, research and development of various parallel mechanism applications in engineering are now being performed more and more actively in every industrial field, and it is considered a key technology of robot applications in industry in the future. However, the parallel manipulators haven't widely been adopted by industry due to the limitations of their existing performance capabilities, including (1) the small orientation workspaces; (2) the singular configurations in kinematic chains; (3) the change of the overall stiffness.

In this presentation, the rational of using parallel robots for parallel robotic machines will be discussed and explained. A comparative study will be carried out on some successful parallel robotic machines and conventional machine tools. The research activities on parallel manipulator and its innovative design in the Laboratory of Advanced Robotics and Mechatronics at York University will be introduced, they are: Innovation Design for Parallel Robots; Performance Improvement of Parallel Robots by Structure Construction; Reconfigurable Robotic Systems; and the applications of parallel manipulators.

The new design methodologies and technologies for next-generation high performance Generalized Parallel Manipulators (GPMs) will be introduced. These new GPMs will effectively overcome the limitations of conventional parallel manipulators and be used for manufacturing applications including high precision assembly, fast product handling, milling and surface finishing as well as applications in other industries. This will enable technology transfer of these techniques to industry applications by focusing on the critical technology gaps and rigorous experiments.

Biography:
Dr. Dan Zhang is a Kaneff Professor and Tier 1 York Research Chair in Advanced Robotics and Mechatronics in the Department of Mechanical Engineering at York University. Dr. Zhang was a Canada Research Chair in Advanced Robotics and Automation, was a founding Chair of the Department of Automotive, Mechanical and Manufacturing Engineering with the Faculty of Engineering & Applied Science at Ontario Tech University. He received his Ph.D. in Mechanical Engineering from Laval University, Canada, in June 2000.

Dr. Zhang's research interests include: synthesis and optimization of parallel and hybrid mechanisms; generalized parallel mechanisms research; reconfigurable robots; micro/nano manipulation and mems devices (e.g., sensors); rescue robots; smart biomedical instruments (e.g., exoskeleton robots and rehabilitation robotics); AI/robotics/autonomous systems; Aerial and Underwater Robotics and Artificial Intelligence for Robotics.

Dr. Zhang has published 237 journal papers and 187 conference papers, 12 books, 9 book chapters and numerous other technical publications. Dr. Zhang has served as a General Chair for 67 International Conferences and delivered 117 keynote speeches. Dr. Zhang is listed as the World's Top Two Percent Researchers by Stanford's Standardized Citation Indicators in 2020 and 2021.

Dr. Zhang is a Fellow of the Canadian Academy of Engineering (CAE), a Fellow of the Engineering Institute of Canada (EIC), a Fellow of American Society of Mechanical Engineers (ASME), and a Fellow of Canadian Society for Mechanical Engineering (CSME), a Senior Member of Institute of Electrical and Electronics Engineers (IEEE), and a Senior Member of SME.

Demetri Terzopoulos
Computer Science Department, University of California, Los Angeles

Biomimetic Human Simulation and the Deep Learning of Neuromuscular and Sensorimotor Control

Realistic computer simulation of the human body — not just the bones, joints, and muscles, but also the sensory organs and, of course, the brain — is a grand challenge in robotic science and the quest for artificial intelligence/life. In this context, I will present our recent advances in biomimetic human simulation and sensorimotor control. Our framework features an unprecedentedly detailed biomechanical human musculoskeletal model actuated by numerous muscles, with functional eyes whose retinas have many nonuniformly distributed photoreceptors. This bio-inspired perceptual apparatus feeds the sensorimotor center of our virtual human's brain, which currently incorporates two dozen (deep) neural networks, organized as a visual sensory subsystem that drives a neuromuscular motor subsystem. Synthesizing its own visual and motor training data, our autonomous virtual human learns efficient, online, active visuomotor control of its eyes, head, torso, and limbs to perform a variety of nontrivial sensorimotor tasks never previously achieved in realistic biomechanical human simulations or anthropomimetic robotics.

Biography:
Demetri Terzopoulos is a Chancellor's Professor of Computer Science at the University of California, Los Angeles, where he holds the rank of Distinguished Professor and directs the UCLA Computer Graphics & Vision Laboratory. He is also Co-Founder and Chief Scientist of VoxelCloud, Inc., a multinational healthcare AI company. He grad-uated from McGill University, received his PhD degree ('84) in Artificial Intelligence from the Massachusetts Institute of Technology (MIT), and remained a Research Scientist at the MIT Artificial Intelligence Laboratory through 1985. He is or was a Guggenheim Fellow, a Fellow of the ACM, a Life Fellow of the IEEE, a Distinguished Fellow of the IETI, a Fellow of the Royal Society of London and the Royal Society of Canada, a Member of the European Academy of Sciences and the New York Academy of Sciences, and a Life Member of Sigma Xi. His many awards include an Academy Award for Technical Achievement from the Academy of Motion Picture Arts and Sciences for his pioneering work on physics-based computer animation, as well as IEEE's Computer Pioneer Award, Helmholtz Prize, and inaugural Computer Vision Distinguished Researcher Award for his pioneering and sustained research on de-formable models and their applications. Deformable models, a term he coined, is listed in the IEEE Taxonomy. With his more than 400 published research papers and several volumes, primarily in computer graphics, computer vision, medical imaging, comput-er-aided design, and artificial intelligence/life, the ISI and other indexes have listed him among the most highly-cited authors in engineering and computer science. He has given more than 500 invited talks worldwide about his research, including well over 100 distinguished lectures and keynote/plenary addresses. He joined UCLA in 2005 from New York University, where he held the Henry and Lucy Moses Endowed Pro-fessorship in Science and was Professor of Computer Science and Mathematics at NYU's Courant Institute of Mathematical Sciences. Previously, he was Professor of Computer Science and Professor of Electrical & Computer Engineering at the Univer-sity of Toronto. Prior to becoming an academic in 1989, he was a Program Leader at Schlumberger corporate research centers in California and Texas.

Dr. Emdad Khan

Chairman, Internet Speech, San Jose, CA 95138, USA

Professor, Dept. of Computer Science, Maharishi International University, USA

AI Driven Digital Transformation: Conversational, Intelligent and Actionable AI for Enterprises

AI driven Digital Transformation is a key driver forrapidly growing transformation of enterprises of all sizes. Digital Transformation enables to model an enterprise as a digital system (i.e. using Digital Twins) and with the help of AI driven capabilities, such a model can answer "what", "why", "when", "how" type of questions for all activities and processes; thus enables to optimize all key business aspects including marketing, sales, operations, engineering, resources, HR, reporting, finance, IT, products, services and the like. All these result in sustainable revenue growth, lowering cost with higher ROI (Return on Investment) and higher customer delights.

Key technologies used in AI driven transformation includes AI, Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), Cognitive Systems, Big Data, real time Analytics, Bots/Softbots/ Robots, RPA, and IPA (Intelligent RPA). This implies thatmost botswould need to be intelligent to handle many complex tasks. One key aspect of man-machine and machine-machine interface is "Conversation". Hence, Conversational AI is an important part of AI driven Digital Transformation.

This talk will focus mainly on the modeling aspect of a digitally transformed secure, intelligent and connected enterprise using Digital Twins - how toconstantly monitor, analyze, provide key insights and help adapt in an optimal way.
It will discuss Conversational AI, intelligence needed in making key data & logic driven decisions and taking associated actions. Key algorithms and technologies will be briefly discussed as appropriate, especially, natural language processing with special focus on "Natural Semantics", Semantic Engine, NLG (Natural Language Generation), ML, DL, GANs (Generative Adversarial Networks), Lifelong Machine Learning (LML)&real-time Intelligent Analytics along with system architecture.

Biography:
Dr. Emdad Khan is Chairman of internet speech, Inc which he founded with the vision to develop innovative technology for accessing the information on the Internet anytime, anywhere, using just an ordinary telephone and the human voice. Khan is also a Professor at Maharishi International University, Iowa, USA. Khan holds 23 patents and published over 75 journal & conference papers on Intelligent Internet, Natural Language Processing/Understanding, Speech Recognition, Machine Learning, Big Data, Bioinformatics, Software Engineering, Neural Nets, Fuzzy Logic, Intelligent Systems, and more. Khan has developed the prototype of Voice Internet, Semantic Engine using a Brain-Like Approach - SEBLA, Machine Learning Algorithms for Natural Language Processing - MLANLP and a Lifelong Machine Learning System Driven by Natural Language, Semantics, And Logic (LMLS_NL_SEM_LOGIC). Khan has over 25 years of experience - working in both Industry and Academia. He is the author of the book "Internet for Everyone: Reshaping the Global Economy by Bridging the Digital Divide". Dr. Khan's current major interest is to use brain-like and brain-inspired algorithms to solve some open problems, especially, NLU (Natural Language Understanding), AI (Artificial Intelligence), and Intelligent Systems.

Guofan Shao
Purdue University, USA

Validating Image Classification for ML Reproducibility

Machine learning (ML) reproducibility is one of the most important considerations for the operational use of ML models. However, routine validation and testing metrics of image classification are highly sensitive to class imbalance. These metrics also indirectly contribute to the difficulties of ML model training with imbalanced datasets. Ultimately, they jeopardize the reproducibility of ML models. It is vital to use class imbalance-resistant evaluation metrics to strengthen the reproducibility of ML models. For example, area under precision-recall curve, balanced accuracy, and image classification efficacy are technically sound for validating and testing ML models. Here we demonstrate varied effectiveness of different evaluation metrics with hypothetical and real-world image classifications. We also explain when and how different metrics are used to evaluate ML models for their reproducibility.

Biography:
Prof. Guofan Shao is affiliated with Purdue University, USA. His teaching and research area is remote sensing. His research interest includes image data classification and its assessment. He has published 160peer-reviewed articles and six books and contributed two chapters (Satellite Data and Remote Sensing) in the Encyclopedia of Environmetrics (Second Edition) in 2012 & 2016, one chapter (Optical Remote Sensing) in the International Encyclopedia of Geography in 2017 & 2019.

Leonid Fridman

National Autonomous University, Mexico

Sliding Mode Controllers: Stages of Evolution

The history and evolution of sliding control will be discussed. The reason for the crisis of the first order sliding modes will be explained. The second order sliding mode control algorithms and their specific features will be presented. The control chattering of the continuous second order super- twisting control algorithm will be discussed. The precision of the arbitrary order sliding mode controllers will be shown. The continuous arbitrary order sliding mode controllers will be presented and discussed. The simple PI and PID like tuning rules for continuous sliding mode control design minimizing the amplitude or the energy needed to mountain the system in real sliding modes are proposed. Videos with the experimental illustration of the properties of the main sliding mode algorithms will be presented.

Biography:

Leonid M. Fridman received an M.S. degree in mathematics from Kuibyshev (Samara) State University, Samara, Russia, in 1976, a Ph.D. degree in applied mathematics from the Institute of Control Science, Moscow, Russia, in 1988, and a Dr. Sc. degree in control science from Moscow State University of Mathematics and Electronics, Moscow, Russia, in 1998. From 1976 to 1999, he was with the Department of Mathematics, Samara State Architecture & Civil Engineering University. From 2000 to 2002, he was with the Department of Postgraduate Study and Investigations at the Chihuahua Institute of Technology, Chihuahua, Mexico. In 2002, he joined the Department of Control Engineering and Robotics, Division of Electrical Engineering of Engineering Faculty at the National Autonomous University of Mexico (UNAM), Mexico. His research interest is mainly variable structure systems. He is a co-author and co-editor of 11 books and 18 special issues devoted to sliding mode control. From 2014- 2018 he served as a Chair of TC on Variable Structure and Sliding Mode Control of IEEE Control Systems Society. He is the recipient of the Harold Chestnut Control Engineering Textbook Prize of IFAC for his co-authored book “Sliding Mode Control and Observation”, winner of the National University Prize at UNAM in 2019, and Scopus prize for the best cited Mexican Scientists in Mathematics and Engineering 2010. Professor Fridman served and serves as an associated editor in different leading journals of control theory and applied mathematics. He was working as an invited Professor in more than 20 universities and research laboratories in Argentina, Australia, Austria, China, France, Germany, Italy, Israel, and Spain.

Ouri Wolfson

University of Illinois, Chicago

Data Mining for the Relationship Among Consciousness, AI, and Coordination

In this talk I first review the basics of consciousness, and argue that it is a fundamental building block of General Artificial Intelligence. Then I argue that consciousness is achieved through some coordination mechanism. Finally, I describe our work in connectomics that uncovers a yet-to-be-explained coordination mechanism in the human brain. The work uses an approach to data-mine the brain from a novel perspective, namely traffic analysis. The results are unexpected in the sense that the movement of signals in the brain seems to be coordinated to follow some global optimization patterns as opposed to the anarchical system that would be favored by evolution.

Biography:

Ouri Wolfson's main research interests are in big data, distributed systems, mobile/pervasive computing, smart city, and connectomics. He received his B.A. degree in mathematics, and his Ph.D. degree in computer science from Courant Institute of Mathematical Sciences, New York University. He is currently the Richard and Loan Hill Professor of Computer Science at the University of Illinois at Chicago, and an Affiliate Professor in the Department of Computer Science at the University of Illinois at Urbana Champaign. He is the founder of Mobitrac, a high-tech startup that was acquired by Fluensee Co.; and the founder and president of Pirouette Software Inc. which specializes in mobile data management. He served as a consultant to Argonne National Laboratory, US Army Research Laboratories, DARPA, and NASA. Before joining the University of Illinois he has been on the computer science faculty at the Technion and Columbia University, and a Member of Technical Staff at Bell Laboratories.

Li Xinde

Southeast University, China

Gait identity and emotion jointly recognition under complex conditions Author Name: Li Xinde

Gait is a type of behavioral biometric, which provides a non-intrusive way of remote authentication. Recently, gait has been used for personality assessment, emotion recognition, and mental analysis, as well as traditional applications in authentication and video surveillance. These researches pervade many fields, including human-machine interaction, depression diagnosis, computer animation, social robotics, and virtual reality. There has been a drastic growth of novel works in recent years based on gait analysis with the development of artificial neural networks, but not without limitations, such as insufficient gait training data, simple and controlled environment, missing and noisy data, difficulty in data labeling, variations in the view angle, etc. These problems lead to the existing disadvantages such as low recognition rate, weak generalization ability, and difficulty in integrating into other intelligent tasks. To address the shortcomings of existing gait recognition research under the above conditions, we conduct an in-depth study with gait identity and emotion recognition tasks as the main research object.

Biography:

Xinde Li earned his Ph.D. in Control Theory and Control Engineering, from the Department of Control Science and Engineering, Huazhong University of Science and Technology (HUST), Wuhan, China, in 2007. Afterwards, he joined School of Automation, Southeast University, Nanjing, China, where he is currently a professor. He was an Academician of Russian Academy of Natural Sciences elected in 2020 and a cover person of Scientific Chinese in the same year. He was a vice director of Intelligent Robot Committee of Chinese Association for Artificial Intelligence from 2017, a vice director of Intelligent Products and Industry Working Committee of Chinese Association for Artificial Intelligence from 2019. His research interests include Artificial Intelligence, Intelligent Robot, Machine Perception and Understanding, and human-robot interaction, etc. He has undertaken many national key projects, i.e. National 863 key project, JKW key project, etc. and has published more than 80 high-quality papers and 2 books, and owns 17 national invention patents. He also won many prizes, i.e. international contribution prize, Scientific and Technological Progress Award in CAA, etc.

Dariusz Jacek Jakobczak
Koszalin University of Technology, Poland

Reconstruction of Multidimensional Data on Intelligent Technology and Artificial Intelligence

Artificial Intelligence is applied for prediction and calculations of unknown values of data or coordinates. Decision makers, academicians, researchers, advanced-level students, technology developers, and government officials will find this text useful in furthering their research exposure to pertinent topics in AI, computer science, numerical analysis or operations research and assisting in furthering their own research efforts in these fields. Proposed method, called Two-Points Smooth Interpolation (TPSI), is the method of 2D curve interpolation and extrapolation using the set of key points (knots or nodes). Nodes can be treated as characteristic points of data for modeling and analyzing. The model of data can be built by choice of probability distribution function and nodes combination. TPSI modeling via nodes combination and parameter γ as probability distribution function enables value anticipation in AI, risk analysis and decision making. Two-dimensional curve is extrapolated and interpolated via nodes combination and different functions as continuous probability distribution functions: polynomial, sine, cosine, tangent, cotangent, logarithm, exponent, arc sin, arc cos, arc tan, arc cot or power function.

Biography:
Dariusz Jacek Jakobczak was born in Koszalin, Poland, on December 30, 1965. He graduated in mathematics (numerical methods and programming) from the University of Gdansk, Poland in 1990. He received a Ph.D. degree in 2007 in computer science from the Polish -Japanese Institute of Information Technology, Warsaw, Poland. From 1991 to 1994 he was a civilian programmer at the High Military School in Koszalin. He was a teacher of mathematics and computer science at the Private Economic School in Koszalin from 1995 to 1999. Since March 1998 he has worked in the Department of Electronics and Computer Science, Koszalin University of Technology, Poland and since October 2007 he has been an Assistant Professor in the Chair of Computer Science and Management in this department. His research interests connect mathematics with computer science and include computer vision, artificial intelligence, shape representation, curve interpolation, contour reconstruction and geometric modeling, numerical methods, probabilistic methods, game theory, operational research, and discrete mathematics.

Gaurav Agarwal
KIET Group Of Institutions India

Deer Hunting Optimization-based Speech Emotion Recognition

I will discuss the AWT-MGSO filtering technique that can eliminate the noise present in a signal. Will emphasize on feature extraction the spectral and prosodic features to differentiate the emotions in a speech. The optimized hybrid DNN-DHO technique can classify the emotions in a better way. Followed by the carried out experiments on three different datasets for the recognition of speech that include TESS, RAVDESS, and IITKGP datasets. Proposed DNN-DHO method provides better accuracy with TESS, RAVDESS, and IITKGP datasets, as 97.85%, 97.14%, and 93.75%, respectively, because of the modified denoising and efficient feature selection. Comparing the proposed algorithm with the existing classifiers, the Random Forest has lower accuracy of 86.38% on the RAVDESS dataset. The existing Bagged Ensemble SVM has lower accuracy values on the RAVDESS as 75.69% and on the IITKGP-SEHSC as 84.11%. The baseline 2D CNN-LSTM has accuracy as 89.16% on the IEMOCAP and on the EmoDB as 95.33%. The proposed method provides better performance than the existing techniques.

Biography:
Gaurav Agarwal was born in Moradabad, India, in 1980. He is Ph.D. in Computer Science from the Indian Institute of Technology (ISM), Dhanbad; M.Tech. in Computer Science & Engineering from Shobhit University, Meerut; B.E. in Computer Engineering from the North Maharastra University, Jalgaon, Maharastra, India, in 2003. Since November 2022, he has been with the Department of Computer Science and Engineering as an Assistant Professor, at KIET Group of Institutions, Ghaziabad, India. He has more than 18 years of academic experience. He is a life member of the International Association of Computer Science and Information Technology (IACSIT), the Indian Society for Technical Education (ISTE), and Vijnana Bharati (VIBHA). He was the recipient of the Young Investigator Award by Interscience Research Network (IRNet), Orissa, Vocational Award, Rotary International U.S.A., and The Rotary Foundation award for outstanding service for world understanding and peace. He has contributed more than thirty-five research papers in several International and National journals and conference proceedings of high repute. His main areas of research interest are Speech Signal Processing (Vocal emotion recognition), Genetic algorithms, and Web Search Engines.

Dr. Hoshang Kolivand

Liverpool John Moores University, UK

Current and Future of Smart Wearable Devices

There is no doubt that smart devices have changed our world recently and have the potential to become a fascinating widespread requirement in daily life. In about two decades, Mixed Reality (MR) has turned into one of the most attractive topics involved in variety of topics attempting to obtain satisfactory results. Smart devices and wearable devices play an important role in robotics. In this speech, I am going to present what I have done so far with new technologies including Augmented and Virtual Reality, Brain Computer Interface, Human Computer Interface and distance robotics. How to engage our current research with new technology to enhance our current research will be the next part of my speech. At the end, some points will be highlighted to go further with the future of VR and AR along with new technology.

Biography:

Hoshang Kolivand is an Associate Professor in Human Computer Interaction at Liverpool John Moores University, UK and a Visiting professor at Barath University, India. He received his MSc degree in Applied Mathematics and Computer Science from Amirkabir University of Technology, Tehran, Iran, and his PhD from Universiti Teknologi Malaysia (UTM) in 2013. His background is in 3D maths & Computer Graphics in particular Augmented and Virtual Reality. Over 150 international publications in the area of 3D visualisation, immersive technology & human Computer Interaction. A global leader in this field invited to address the current & future advances of immersive technology in several high-ranked international events.

Kenneth Carling
Dalarna University, Sweden

Does A Smart Agent Overcome the Tragedy of the Commons in Residential Prosumer Communities?

To realise the clean energy transition, peer-to-peer (P2P) renewable energy sharing markets have been proposed as one possible solution for achieving such a goal and moreover, are recognised as a potential path to achieving some of the other Sustainable Development Goals laid down by the UN, for example, affordable and reliable energy. In Europe, in the last year, energy prices have been increasing and the increase has been exacerbated by the Russian invasion of Ukraine and the ensuing EU trade restrictions. While a political and hierarchical approach has been ignited to lessen the economic stress of such price hikes on businesses and citizens alike, existing studies have shown that coordination at the micro level can be achieved by employing such P2P market structures. A pressing question in such a setting is how to set the trade price such that the community coordinates in a way that maximises social welfare. A solution to the question based on multi-agent reinforcement learning (MARL) has been provided as a proof-of-concept in a single environment. However, various factors such as climate and community scale have been shown to affect the collective performance in such energy sharing communities. In this work, to test the wider applicability of the proposed solution a full factorial experiment based on the factors of climate, community scale, and price mechanism, is conducted in order to ascertain the response of the community w.r.t. to the following outputs: community self-sufficiency, total net cost, and income equality. These outcomes shed light on the general validity of the advanced method and at what scales such a method is suitable.

Biography:

Kenneth Carling earned his Ph.D. in statistics in 1995 at Uppsala University, Sweden. Currently working as a professor and head of Microdata Analysis at Dalarna University in the Department of Data and Information Sciences, he has published some 50 peer-reviewed international articles on economics, transports including environmental impact assessments, operational analysis, and computing in addition to statistical methodology and applications. He has served as program manager for a master's program in Business Intelligence as well as Data Science. Currently, he leads a LivingLab on data-sharing on the last-mile distribution market in an EU consortium and a project on a decision support system for retailers' site locations. He is also engaged in several studies on applied technologies applied for online price settings extended to also include market failures due to systemic risk and collusion prompted by the same technology. Moreover, he is involved in setting the Swedish R&D plan for the cyber security of national transport infrastructure.

ROBOTFORUM2023
International Forum on Artifcial Intelligence and Robotics
March 13-15, 2023 | Las Vegas, USA

Kenneth Carling
Dalarna University, Sweden

Symposium on Data Science and Statistics (SDSS 2023) What is Data-Driven Leadership and how do you teach it?

The role of a Data-Driven Leader is to drive accountability and focus on building a data culture characterized by the leader and the members of the organization implementing decisions in a fact and data-based process. This is achieved by steering teams away from opinions, cognitive bias, group-thinking and self-censorship. But how is this leadership developed individually and organizationally? This paper attends to this question specifically for students in Analytics and Data Science.

Strategy, Statistical Numeracy, Team-based Learning

1 Introduction

Chatterjee et al (2021) states that a data-driven culture brings business transformation to organizations for improved business performance. This transformation influences both products and process innovation with the leader as a facilitator of these business benefits. Unsurprisingly, scholars in business and management, such as Carillo et al (2018), as well as practitioners ask the question: How to turn managers into data-driven managers?; where it is assumed that managers have a business education with limited coverage of Analytics and Data Science. However, at the core of a data- driven organization there are data scientists already possessing the technical skills of Analytics and Data Science. Hence, one may equally well ask the question: How to turn data scientists into data-driven leaders?

Some would say that Data-Driven Leadership is an integrated approach to leadership, change management and Data Analytics for a continuous organizational improvement with the outcome of improved prioritization, resource allocation, fast-paced decision making, focused actions and reliable process execution.

The Institute for Advanced Analytics reports, in the US only, over 250 Master's programs in the field with about 10,000 students to be contrasted to virtually none a decade ago. While comprehensive reviews of what the market requires of a Data Scientist for employability consistently point at technical skills, soft skills such as, e.g, the ability to communicate effectively and being a team-player are additional prerequisites from the employers' side (Smaldone et al, 2022). In fact, these articulated prerequisites could arguably be interpreted as an

organizational expectation on data scientists to take on an active role in the organization's transformation to a data-driven culture; Windt et al (2019) identifies the leadership as a key factor in the transition.

However, soft skills are at the best indirectly developed by the students in most programs in the field. For instance, a dedicated course curriculum in Data-Driven Leadership is a rare encounter, and the few existing ones are highly heterogeneous in content and learning goals. This paper offers a proposal for the standardization of a curriculum in a Data- Driven Leadership course for Analytics and Data Science students at a master's level. This proposal reflects the soft skill requirements identified by Stanton and Stanton (2020) for the three most common positions being data science, data analytics, and business analytics. Examples of such soft skills are communication, innovation, leadership, and team-working abilities. However, the proposed curriculum ex-

ploits the technical (hard) skills of the students, which typically would not be the case in a management course in a business school.

2. Methods for Developing and Evaluating the Curriculum

There are several methodological aspects to consider. To decide on the content a literature search was conducted in Google Scholar. Variations of "data", "driven", and "leader" with synonyms was used as search terms. Such search gave an ample number of articles on business transformation and its impact, but none directly relevant to leadership education of data scientists. As an alternative search strategy, a Google search was conducted with "syllabus" and variations coupled with the above search terms. This resulted in less than a handful curriculums predominately with a behavioral economics content. Instead, the content and learning outcomes were derived from the CHAMPS KNOW program (Chang et al, 2016), targeting the soft skills identified by Stanton and Stanton (2020), and topics recommended by Carling (2019).

Considering that team-working ability was identified as a critical soft skill, team-based learning was a natural choice of pedagogical approach. The curriculum was assessed and confirmed to align with best-practice as presented by Vance (2021).

Details on learning outcomes, content, and pedagogical approach is found on the course page:

www.du.se/en/study-at- du/kurser/course/?code=AMI27V

The curriculum imposes a weekly structure where the teams have weakly assignments to be completed in a way decided by the team. The assignments are practical in nature and can concern a simulation- based investigation, a presentation on a topic or a data analysis project, all with a decision pronlem in focus. Each week one team member is appointed the leadership role, a role that rotates within the team.

Each week and member provides data to a self- reflective protocol where 10 items concern the member's self-assessment, 10 items concern the member's assessment of the week's team leader, and additional 6 items concern the assessment of the team as a whole. These data is subject to analysis and useful for estimating if the member improves as a collaborator in a team, if the leadership abilities improve, and if the collaborative strategies are increasingly sophisticated.

Moreover, each student completes a Briggs-Myers personality test before and after the course. A before-after analysis may therefore be conducted to estimate whether the students were altered regarding the four personality traits of the test, that in turn relates to data-driven leadership.

Course exit evaluations are also conducted to estimate the students' attitudes towards the curriculum. Those were conducted by an independent instructor.

3. The Implementation of the Curriculum and the Results

The curriculum was implemented in two master programs in Business Intelligence and Data Science, respectively. There were 55 students altogether, evenly distributed between the two programs. Slightly more than a half of the students studies the curriculum in the second semester and the remaining in their first semester. Teams were formed as heterogenous as possible with regard to program, seniority, and gender. The course ran between Nov. 7, 2022 and Jan 13, 2023 involving altogether eight teams. With the consent of the students, the data consists of 50×10 self-reflective protocols and 50×2 personality test outcomes.

The results are very preliminary and are to be updated in January 2023. However, a chi-square test of difference in the before-and-after distribution of personality test outcomes is expected to reject the hypothesis of no-change in distribution. The change is expected to be in the direction of more extraversion and logic-based decision-making, whereas the other two dimensions may be subject to little change.

The mid-term course (to be replaced with exit) evaluation indicates that the students considered the curriculum reasonable in workload with, although challenging initially, suitable team-based learning.

4. Concluding comments

The proposed curriculum attempts to address an, from the market perspective, expectation on data science professionals. The findings indicate that it is feasible to heighten analytics and data science students employ-ability by developing their soft-skill in a comparatively short time-frame. This approach seems superior to the alternative route, namely to enhance the technical skills of managers.

However, the approach to effective education of data- driven leadership is in its infancy and for that reasons several workshops are conducted in the 2023 for further peer-reviewing.

References

Carillo, K. D. A., Galy, N., Guthrie, C., & Vanhems,
A. (2018). How to turn managers into data-driven decision makers: Measuring attitudes towards business analytics. Business Process Management Journal, 25(3):553–578.

Carling, K. (2019). On Leading and Making Data- Driven Decisions, or Not. In Developing Informed Intuition for Decision-Making (pp. 161-173). Taylor & Francis.

Chang, W., Chen, E., Mellers, B., & Tetlock, P. (2016). Developing expert political judgment: The impact of training and practice on judgmental accuracy in geopolitical forecasting tournaments. Judgment and Decision Making, 11(5), 509–526.

Chatterjee, S., Chaudhuri, R., & Vrontis, D. (2021). Does data-driven culture impact innovation and performance of a firm? An empirical examination. Annals of Operations Research, 1-26.

Smaldone, F., Ippolito, A., Lagger, J., & Pellicano, M. (2022). Employability skills: Profiling data scientists in the digital labour market. European Management Journal, 40(5):671-684.

Stanton, W. W., & Stanton, A. D. A. (2020). Helping business students acquire the skills needed for a career in analytics: A comprehensive industry assessment of entry-level requirements. Decision Sciences Journal of Innovative Education, 18(1), 138-165.

Vance, E. A. (2021). Using Team-Based Learning to Teach Data Science. Journal of Statistics and Data Science Education, 29(3), 277-296.

Windt, B., Borgman, H., & Amrit, C. (2019). Understanding leadership challenges and responses in data-driven transformations. Proceedings of the 52nd Hawaii International Conference on System Sciences.

Yashar Javadi
University of Strathclyde, UK

Towards Nde 4.0; Robotic Stress Measurement in Bolt, Weld and Additive Manufacturing

At the Sensor Enabled Automation, Robotics & Control Hub (SEARCH), we have developed a new Non-destructive Evaluation (NDE) system to measure mechanical stresses. This is a robotic Phased Array Ultrasonic Testing (PAUT)system. We are conducting several research projects to study thehardware and software requirements as well as the feasibility of its application for the robotic stress measurement of the bolt, with the application of offshore renewable energy, and also residual stress measurement in welding and Wire Arc Additive Manufacturing (WAAM).In this Keynote Talk, I will present some of the case studies we have been conducting in SEARCH on the robotic PAUT of bolt, weld and WAAM components.As automation in welding and Additive Manufacturing (AM) becomes increasingly prevalent in the Industry 4.0 manufacturing paradigm, the importance of quantifying mechanical stresses will grow and I will then explain how this will link with the AI and requirements of NDE 4.0.

Biography:
Dr. Yashar Javadi is a Strathclyde Chancellor's Fellow (Lecturer as part of the Strathclyde Global Talent Programme) at the University of Strathclyde. His multidisciplinary work has been reflected in his appointment which is a joint appointment between two departments (EEE and DMEM). He is currently the Guest Editor of "Welding and Additive Manufacturing for Industry 4.0", a special issue of "The Journal of Manufacturing and Material Processing", and also on the Topic Board of that journal. He is also the editor of the Special Issue "Robotic Non-Destructive Testing" in Sensors. In a career spanning over 16 years in the field of engineering (particular focus on welding, non-destructive evaluation, additive manufacturing, and robotics), he has worked as a lecturer and postdoctoral research associate (at the University of Manchester and the University of Strathclyde) in the academia and also a manager of the welding/NDT department and welding engineer in the industry. He has published fourty journal papers with 1000 citations in total including two papers with 100 citations. Currently, he is a member of the Centre for Ultrasonic Engineering (CUE) where his research focus is on the in-process inspection and residual stress measurement (non-destructive methods) in the welding and Wire + Arc Additive Manufacturing (WAAM). Some part of his current research output is reflected in two WAAM/NDT papers published in Insight (2018) and Additive manufacturing (2019) journals plus two Welding/NDT papers recently published (2020) in Materials & Design (in-process calibration) and the Journal of Manufacturing Processes (residual stress).

Corrado Aaron Visaggio

University of Sannio, Italy

Malware Generated by Artificial Intelligence Engines

Machine learning is widely used for detecting and classifying malware.Unfortunately, machine learning is vulnerable to adversarial attacks.In this talk, I will provide an overview of the generative adversarial approaches and how they can be used for generating malware. Further, I will present the results of a study investigating how GAN could affect the performance of a detection system based on machine learning. In our evaluation, several neural networks for malware detection have been trained and then 10 parallel GANs based on convolutional layersarchitecture (CNNs) for the generation of adversarial examples with a gradient-basedmethod were built. The findings suggest that machine and deep learning based malware detectors could be fooled by adversarial malicious samples with an evasion rate of around 99% providing furtherattack opportunities.

Biography:

Corrado Aaron Visaggio is an associate professor at the Department of Engineering of the University of Sannio. He obtained the MSc in Electronic Engineering (2001) from Politecnico di Bari, and the PhD in Information Engineering (2005) from University of Sannio. His main research interests are: malware analysis, data protection, data protection, threat intelligence. He is the director of the Unisannio Chapter of the CINI Cybersecurity National Lab. He leads the Cybersecurity Lab at the Department of Engineering of University of Sannio and founded two tech companies. He has authored almost one hundred scientific papers and he serves in several Editorial Boards of International journals and Program Committes of international conferences.

Fadhil Mukhlif
Universiti Teknologi Malaysia, Malaysia

Intelligence Health Framework Based on AI and Smart Sensors

The World Health Organization (WHO) refers to the 2019 new coronavirus epidemic as COVID-19, and it has caused an unprecedented global crisis for several nations. Nearly every country around the globe is now very concerned about the effects of the COVID-19 outbreaks, which were previously only experienced by Chinese residents. Most of these nations are now under a partial or complete state of lockdown due to the lack of resources needed to combat the COVID-19 epidemic and the concern about overstretched healthcare systems. Every time the pandemic surprises them by providing new values for various parameters, all the connected research groups strive to understand the behavior of the pandemic to determine when it will stop. The prediction models in this research were created using deep neural networks and Decision Trees (DT). DT employs the support vector machine method, which predicts the transition from an initial dataset to actual figures using a function trained on a model. Extended short-term memory networks (LSTMs), are a special sort of Recurrent Neural Network (RNN) that can pick up on long-term dependencies. As an added bonus, it's helpful when the neural network can both recall current events and recall past events, resulting in an accurate prediction for COVID-19. We provided a solid foundation for intelligent healthcare by devising an intelligence COVID-19 monitoring framework. We developed a data analysis methodology, including data preparation and dataset splitting. We examine two popular algorithms, LSTM and Decision tree on the official datasets. Moreover, we have analysed the effectiveness of deep learning and machine learning methods to predict the scale of the pandemic. Key issues and challenges are discussed for future improvement. It is expected that the results these methods provide for the Health Scenario would be reliable and credible.

Biography:
Fadhil Mukhlif Completed B.Sc. in Electrical Engineering from University of Tikrit, Iraq in 2010, M.Eng. in Telecommunication Systems from University Technical Malaysia Melaka (UTeM), Malaysia in 2013 and PhD in Computer Networks &Wireless from Faculty of Engineering, University of Malaya (UM), Malaysia in 2020. He is currently a Postdoctoral Research Fellow in the Faculty of Computing, UniversitiTeknologi Malaysia (UTM), Johor, Malaysia. His research interest mainly includes Computer Networks, AI, Machine & Deep Learning, Cyber Security, Telecommunication Networks, UAV, IoT, WSN, Game Theory, Cloud Networks.

Faisal Syafar
Computing and Information Systems Research Centre, Universitas Negeri Makassar, Indonesia

Data and Information Quality for Better Quality Decision Making in Higher Education Institutions

Currently, quality is considered a critical concern for better education worldwide, particularly in higher education (HE) levels. As HE systems grow and expand, the potential decrease in quality has become a new issue. Various indications of an emerging 'quality emergency' in HE institutions include high dropout rates at the early stages, an increasing amount of university graduate unemployment, and a general perception of lowering academicstandards.

It's undoubtedly that HE organizations make a great effort to gather and utilize data and information. Data, information, and knowledge offer a foundation for a proper and best decisions making.

The need for accurate data/information is increasing. However, it turns out that academic information systems are still unable to produce reliable, complete, and timely data and information. Various problems may be encountered as early as the implementation of an educational information system, including the lack of the same purpose among providers of higher education. The application of academic information systems has not been carried out efficiently, resulting in redundant data and unnecessary duplication of activities. The qualityof data collected is still poor, irrelevant data are collected, and timely reporting of data is low. in addition, the feedback system is not optimal, and the utilization of data and information for advocacy, program planning, monitoring, and management at the levels of faculty,department, and study programs are still low, resulting in inefficient use ofresources.

With an improvement of DIQ framework in HE industry, it is possible to improve learning settings in real-time and offer accurate data and information to improve a student's success, both during in university and after graduation, both during and after the COVID-19 pandemic. Qualifying to all of DIQ dimensions, it becomes much more quality guarantee and create a good governance of HE management at dispersing levels (schools/faculties, departments, and study programs).

Biography:

Faisal Syafar receivedhis BSc in Electronics Engineering from IKIP Ujung PandangofIndonesiain1990, the first Master in Remote Sensing from Gadjah Mada University, Indonesia in 1996, the second Master in Information Technology from University of South Australia in 2009 and thePhDinInformation Technology from University of South Australia in 2015. Heiscurrentlyan Associate Professor of IT in Universitas Negeri Makassar, Indonesia where he is directing Computing and Information Systems Research Centre. His research area spans over mobile collaboration technologies, Internet of Things, leveraging data and information to generate quality of healthcare, engineering assets as well as teaching and learning domains. He has served as editor and reviewer of reputed International Journals and as TPC in many International Conferences on Computer, IS and IT field. He is a Member of Institute of Electrical and Electronics Engineers (IEEE), Computer Supported Cooperative Work in Design (CSCWD), Association for Information Science and Technology (ASIS&T), professional member of Association for Computing Machinery (ACM), American association for Science and Technology (AASCT) and Association for Information System (AIS). He has published in many academic journals, book chapters and conferences proceedings in various topics covers relevant to his research background.

Farah Jemili
University of Sousse, Tunisia

Artificial Intelligence for Cyber Security Applications

The recent White House report on artificial intelligence (AI) highlights the importance of AI and the need for a clear roadmap and strategic investment in this area. As AI emerges from science fiction to become the frontier of world-changing technologies, there is an urgent need to systematically develop and implement AI to see its real impact in diverse fields of study.
This paper offers a contribution to the deployment of AI for cyber security applications. Intrusion detection has been the subject of numerous studies in industry and academia, but cyber security analysts still want a greater accuracy and comprehensive threat analysis to secure their systems in cyberspace. Improvements to intrusion detection could be achieved by adopting a more comprehensive approach in monitoring security events from many heterogeneous sources. Merging security events from heterogeneous sources and learning from data can offer a more holistic view and a better knowledge of the cyber threat situation. A problem with this approach is that at present even a single event source (for example, network traffic) can encounter big data challenges when it is considered alone. Attempts to use more heterogeneous data sources poses far greater challenges. Artificial Intelligence and Big Data Technologies can help solve these heterogeneous data Problems.
The proposed approach includes the pre-processing of data and learning. The experimental results show effectiveness of the approach in terms of accuracy and detection rate and prove that Artificial Intelligence I can help achieve better results in Cyber Security context.

Biography:
Farah JEMILI had the Engineer degree in Computer Science in 2002 and the Ph.D degree in 2010. She is currently Assistant Professor at Higher Institute of Computer Science and Telecom of Hammam Sousse (ISITCOM), University of Sousse, Tunisia. She is a senior Researcher at MARS Laboratory(ISITCOM –Tunisia). Her research interests include Artificial Intelligence, Cyber Security, Big Data Analysis, Cloud Computing and Distributed Systems. She served as reviewer for many international conferences and journals. She has many publications; 6book chapters, 6 journal publications and more than 20 conference papers.

Garima Jain

Swami Vivekanand Subharti University, India

Healthcare Service with IoT and Robotics

Robots are all over the place from science literature to the limited hospital, where they are shifting healthcare. Robotic technologies look as if they are in numerous zones that unswervingly touch patient care. They can be castoff to purify patient places and functioning complements, plummeting jeopardies for patients and health personnel. They work in research laboratory to take illustrations and to passage, investigate, and accumulate them. The robotic workshop associate can pinpoint that container and lure the blood with less discomfort and nervousness for the patient. Robots also formulate and distribute medications in pharmacological labs. IoT in health cares implifies routine though significant responsibilities to recover patient consequences and receipts some of the drain off health practitioners. Everyday jobs such as distant patient nursing, conduct evolution thoughts, and the case of vaccines are all proficiencies of medical policies with integrated IoT. Many researchers have focused in the area of robotics with IoT and healthcare but due to lack of proper evidences these researches are out of reach from the realty. This research paper focuses on the major impact of robotics and IoT on healthcare improvement. With the advancement of robotics technologies with the key features of IoT in the medical field can make the patient's life easier and happier.

Biography:

Garima Jain was born on November 3, 1992. She is pursuing her P.hD. from Dayalbagh University, Agra. She has received her M.Tech. degree from Galgotias College of Engineering, in 2017. Presently she is working in Swami Vivekanand Subharti University, Meerut. She has 3 year of academic's experience. She has also worked with industry. She has good understanding of emerging technologies like Machine Learning, R Language, Python, Block chain, SQLite. She is also a NAAC coordinator. She also attend more than 40 Faculty Development Programme from recognized organizations like IIT Bombay, IIT Roorkee, DTU Delhi on Machine Learning, python, IoT and many more. She has also attended more than 50 workshops, seminar, and webinars from reputed association like IEEE, Elsevier, and NIT's. She has published various papers in National & International Conference and Journals including Scopus and other reputed journals. She is also awarded with a Best paper Presentation Award in year 2017. She has also got a merit certificate for Ideal innovation idea presentation at National Level. She is always a good performer in area of Cultural activities and received many awards for his ability. She is a great speaker in many FDP's and events.She is presented as reviewer in many international conferences. She also participated equality in gender awareness program in University and activity participated along with student in outreach extension activity.

Guanglei Wu
Dalian University of Technology, China

Overview, Design and Application of Spherical Motion Manipulators

Spherical motion widely exists in robot system and its application, and has a very broad application prospect, which is one of the important research directions in the field of robot research at present. The research and development of the spherical manipulator is very important for the performance analysis and design of the new system to meet the new challenges brought by emerging markets. The research of spherical motion manipulator spans a large number of research fields, involving many topics. New parallel robots and actuators have been conceived to solve engineering problems, and future research problems, together with other problems that have not yet appeared, need to be solved to continuously improve the technical level of spherical motion generators. This report takes the spherical robot as the object, and makes an in-depth study on its type, structure, application background, design and prospect.

Biography:

Guanglei Wu, Associate Professor Dr. Guanglei Wu received his PhD in robotics from Aalborg University, Denmark, 2013, and worked as an industrial Postdoc fellow in Aalborg University from 2014 to 2016. He was a visiting scholar in the Research Institute in Communications and Cybernetics of Nantes (currently reorganized as Laboratory of Digital Sciences of Nantes-LS2N) in June-July 2012, in McGill University in Aug. 2015, and in Aarhus University in 2020. Currently, he is an associate professor in School of Mechanical Engineering, Dalian University of Technology (DUT). His research interests include robotic technology, conceptual design and performance evaluation of robots, robot dynamics and control, industrial robots and their applications. He has published one monography by Springer, 9 patents, and over 80 peer-reviewed articles in international journals and conferences. He was the awardee of DUT Xinhai 1000 Youth Talent program, IFToMM Asian MMS & CCMMS 2016, Dept. Sci. Tech. Liaoning province, Longcheng Talent program by Changzhou Municipality. He is the referee for over 50 international journals and conferences in the fields of mechanisms and robots.

Hiroyuki Kameda
Tokyo University of Technology, Japan

Language Acquisition and Communication Robots with Mind

Recently, many revolutionary technologies have emerged in the field of Artificial Intelligence and robotics. For example, GAN (generative Adversarial Network) in image processing, ChatGPT in natural language processing (NLP), and humanoid robot Atlas in robotics. But there are still big gaps between robots and humans in many points. In my talk, in order to realize a robot that works as a partner in our daily life, I will start to mention what languages are, and how languages are academically defined. Then I will explain my rule-based method of acquiring unknown words and the ILP-based (Inductive Logic programming-based) method of acquiring unknown syntactic rules, and also discuss how robots (AIs) can acquire languages themselves as if humans learn languages by developing the ability of learning. At the same time, I introduce my trial to build a communication robot PDDIN that has a kind of mind to understand others and a new research plan forin-home service robots.

Biography:
Hiroyuki Kameda, Prof. of the School of Computer Science of Tokyo University of Technology (TUT), got a Ph. D (Doctor of Engineering) from the University of Tokyo in 1987. Since then he has been working at TUT to study Thought & Language, e.g., psychological parser, unknown word acquisition, grammar acquisition, a talkative robot with a mind (PDDIN), tailor-made cognitive rehabilitation games (Jcores), and so on, while working as the Dean of the School of Computer Science (2013-2017), and the Dean of the graduate school of Bionics, Computer and Media Sciences (2017-2019). Recently, he has been engaged in research on service robots, metaverse for education, and simulation for building a circular economic society.

John C Murray
Faculty of Technology, University of Sunderland, UK

Applications in Artificial Intelligence: To Trust or not to Trust, that is the Question?

The idea of Artificial Intelligence has been around for many years, through portrayals in Science Fiction, to real world applications and developments through academic research and investigation. It is a topic that has proved intriguing to many, yet worrying and concerning to others. Very much in line with Moore's law which predicted the doubling of semi-conductor transistors every two years, the advancements of Artificial Intelligence (and its sub domains such as Machine Learning and Deep Learning) has also seen an exponential increase in capabilities.

This increase in capability and performance has seen the application of AI increase significantly, and being applied to many aspects of our lives. We look at and discuss the aspect of trust and ethics in AI. This is a multi-faceted discussion, looking not only at the application of AI from an ethics or trust stand point, but also from a human perspective, how do we engage with AI and more importantly, how do we build a level of trust in these systems.

In addressing these challenges we will look at this from several key perspectives, first from the perspective of understanding how AI is not only applied to applications but trying to look 'under the hood' through beginning to see the impact of explainable AI, and secondly from the perspective of Social Robotics. How the embodiment of AI within a robot, and specifically social robots can influence our adoption, acceptance and trust (or not) in these systems.

Biography:

I have a background in Electronic Engineering and Software Engineering, with a Ph.D. in Computational Robotics and Neuroscience from the University of Sunderland. I am a Professor and Academic Dean of the Faculty of Technology. I have spent much of my academic career in the area of Human-Robot Interaction, and Ethics and Trust around Artificial Intelligence and Machine Learning systems. I've worked on many research projects from FP7 to H2020 and with businesses and organizations including DASA, QinetiQ, UK Home Office, Borderforce, Smith and Nephew, and many more including SMEs. I am interested in research into the acceptance of technology, robotics, and AI into society, the social challenges of this, and how we design AI and Robots to be socially acceptable. This includes looking at work around human factors, cognitive biases, and personality and ethics. I am interested in understanding the application of Artificial Intelligence and Machine Learning to societal problems. I also have interests in security, from computer security (such as ethics, and encryption) to border security (through my work with the UK Home Office and Border Force) to food security and policy.

Jorge Davila

National Autonomous University of Mexico, Mexico

Robust State Estimation and Its Applications

State-estimation in the presence of unknown inputs, also called robust state estimation, is a crucial research area in the control field. The development of observers capable of reconstructing the states, even in the presence of unknown inputs, has been possible by understanding the relations between system structural properties and advanced control techniques. Robust state-observers have been designed using different approaches; it stands out the sliding-modes based observation tools. Sliding-modes control is a control technique based on the injection of switching signals to enforce the system to behave in a specified form. The class of observers designed using sliding-modes techniques is characterized by its high capability to perform robust exact estimations in uncertain environments. In this talk, we will discuss the basis for the design of sliding-modes based observers, and we present some applications of these estimation techniques.

Biography:

Jorge Davila received the BSc and MSc degrees from the National Autonomous University of Mexico (UNAM) in 2000 and 2004. In 2008, he received a Ph.D. degree from the National Autonomous University of Mexico (UNAM) and was awarded the Alfonso Caso medal for the best thesis in the Ph.D. program. He currently holds a full Professor position at the Instituto Politecnico Nacional of Mexico. He is part of the Laboratory of Control and Autonomous Systems. He is also an Associate Editor of the IFAC Journal of Nonlinear Analysis: Hybrid Systems, a member of the Conference Editorial Board of IEEE, and a High-Level Foreign Expert of Ministry of Education of China. He is an IEEE Senior Member and an AIAA Senior Member. His research interests include observation of systems with unknown inputs, design of observers for switching systems, robust control design, control of nonholonomic systems, and control and estimation of multi-agent systems.

Oliver Bimber

Johannes Kepler University Linz, Austria

Seeing through Forest with Drones

With Airborne Optical Sectioning (AOS), we have introduced a synthetic aperture imaging technique that captures an unstructured light field with drones.
Multispectral images recorded within the shape of a wide (possibly hundreds to thousands of square meters) synthetic aperture area above forest are combined computationally
in real-time to remove occluders, such as trees and other vegetation. The outcome is a widely occlusion free view of the forest ground.
A wide range of applications, such wildlife observation, search and rescue, archaeology, or early wildfire detection have been investigated in the course of many field studies.
In this talk, I will report on the achievements and the challenges of the AOS project - in particular in the course of classification, anomaly detection, and optimal sampling with
various platforms, such as manually operated or autonomously flying drones and drone swarms.

Biography:
Oliver Bimber is a full professor of Computer Science at the Johannes Kepler University Linz, Austria. He received Ph.D. and Habilitation degrees from TU Darmstadt and TU Munich. Bimber co-authored the book “Displays: Fundamentals and Applications” with Rolf R. Hainich and the book “Spatial Augmented Reality” with Ramesh Raskar (MIT). He served on the editorial board of the IEEE Computer Magazine for over ten years. The VIOSO GmbH was founded in his group. His students received several awards for their research and inventions, and have won scientific competitions, such as the ACM Siggraph Student Research Competition, and the ACM Student Research Competition Grand Final which was presented together with the Turing award.

Syed Muhammad Adnan
Shenzhen Institutes of Advanced Technology, China

Artificial Intelligence and Robotics

Artificial Intelligence is largely advent in the recent time. Now, the next step is Smart & Intelligent City. In Smart & Intelligent City, Intelligent Robots could lay very vital role, including Smart Home Management, Smart Elderly and Child Care, Intelligent Shopping Crats, and Luggage Trolleys following the person, as well as, can alarm the person with certain abnormal activities. Further, for all these applications it is critical to design and develop perception algorithms that are efficient in terms of both embedded resources and power usage. These days not only the focus is to design robust algorithms to detect, recognize, identify and track objects and persons using Robots, but, a lot of work has been focusing on resource efficient, power efficient, while, running at higher processing seed on the embedded or compact platforms, therefore, it is an acute demand for these days to develop new convolution architectures, learn highly accurate models from data, while, using reinforcement learning make robots more self-intelligent. At this hour of time, it is very critical to solve all these issues to begin the initial steps for Intelligent and Smart Robots that human friendly in homes, roads, markets, and office spaces.

Recently, we have used self-supervised learning to train the robot to understand the human activities, follow the person to assist as intelligent shopping cart in unconstrained outdoor, where, it not faces many different people with similar clothings, as well as, it faces object hurdles during movement, and it has to simultaneously recognize the objects while moving in real-time. The model is tested in indoor environment, as well as, in outdoor world to tackle the problems of multi-scale image resolutions, illumination changes, complex varying backgrounds, as well as, it has to maintain a reasonable frame processing seed to continue follow the person. To tackle complex background changes, and occlusion with other objects and persons in the real outdoor world, we have proposed a simple attention mechanism to recognize the person, while, the attention has a very little computation burden, thus, it could run at the speed of 32 frames per second.

Biography:

Syed Muhammad is working as Senior Managerin artificial intelligence, computer vision, and machine learning in Konka. His research work is mainly focused on learning deep recognition, detection, classification, and segmentation models. He has mainly worked in person re-identification, pose estimation, compact deep CNN design, classification models, Intelligent IoT systems, Person-Following Robots, and segmentation of human body parts. In his recent, papers he has solved the problem of learning features to identify different people, while, has also focused on lightweight generic metrics to run on embedded platforms. He has already published 4 papers in indexed journals, and 5 conference papers with IEEExplore, ACM, and Scopus indexing. In addition, has written 14 patents. Recently, he is serving as Review Editor in the Chinese Journal of AI.

Taku Senoo
Hiroshima University, Japan

Dynamic Robot Manipulation using High-speed Cognitive Behavior System

In recent years, many intelligent robot systems have been developed. However, almost all of them are designed with a primary goal of the emulation of human capabilities, and with less attention to pushing the envelope in terms of speed as mechanical systems. With the goal of pursuing the limit of the machine system beyond the human being by improving both hardware and control method, we have developed high-speed robot systems. High-speed vision and newly-developed high-torque mini actuatorare the key technology to maximize system performance. By developinga high-speed multi-fingered hand with these incorporated, we have achieved various manipulations including dynamic sports skill and precise task. Moreover, we have developed a new bipedal running robot system. These results indicate that the high-speed robot can react quickly to target motion, disturbance and environmental change in unpredictable conditions.

UPCOMING CONFERENCE

International Forum on Artifcial Intelligence and Robotics

June 17-19, 2024 | Porto, Portugal

ROBOTFORUM2024