CONTEMPORARY DEVELOPMENTS IN
ARTIFICIAL
INTELLIGENCE

INTERDISCIPLINARY INTERACTIONS AND IMPLICATIONS
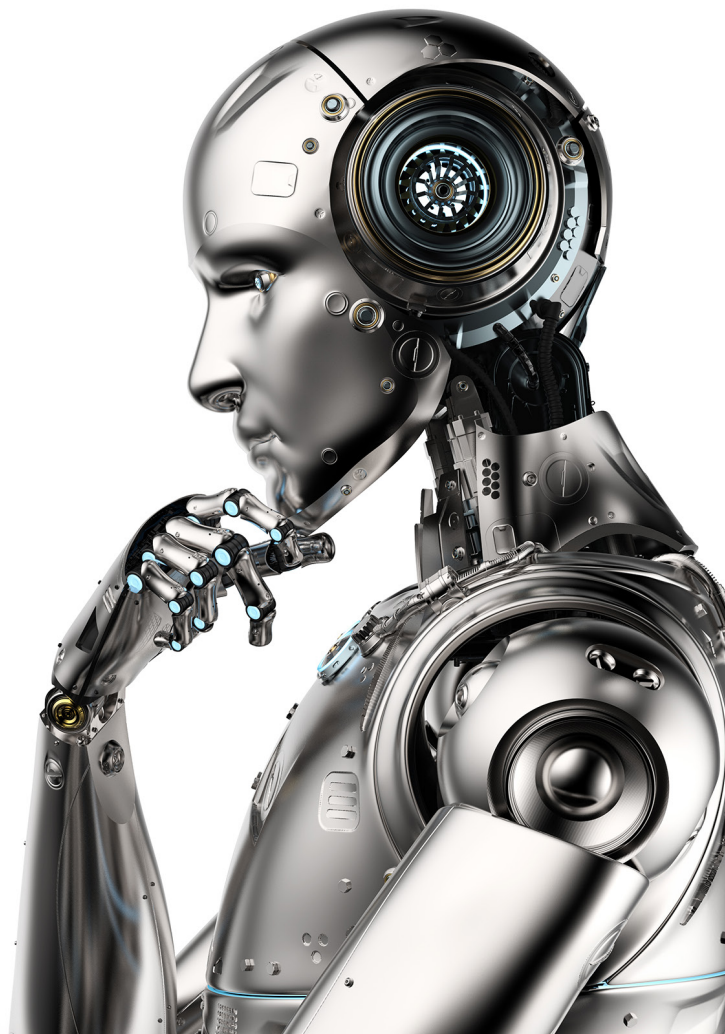
NATIONAL SYMPOSIUM

NOVEMBER 25-26, 2022
(FRIDAY 9 AM - SATURDAY 4 PM)

Institute of Interdisciplinary Studies
LES, Loyola College of Social Sciences
Sreekariyam, Thiruvananthapuram

Indian Institute of Science & Religion
New Delhi

NATIONAL SYMPOSIUM

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ARTIFICIAL INTELLIGENCE

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25 Friday & 26 Saturday November 2022

Institute of Interdisciplinary Studies (IIS)
LES, Loyola College,
Sreekariyam, Thiruvananthapuram

Organised Jointly with

Indian Institute of Science and Religion (IISR)
Delhi

Institute of Interdisciplinary Studies (IIS)

Loyola Extension Services, Loyola College of Social Sciences, Sreekariyam

More than ever, we realize today that society needs "not genius in isolation, but scholars in collaboration." Most of today's scientific discoveries are carried out by a team of researchers and scholars from various fields, often in unhealthy isolation from one another in the name of disciplinary focus.

We are at the cusp of the fourth industrial revolution. An analysis of the cultural and social outcome of the past academic and industrial revolutions has come to recognize that the fundamental problem underneath our cultural crisis is found to be a profound confusion about how to be in the world; an uncertainty as to how we can think and act scientifically and humanely, critically and spiritually, technologically and ethically. We realize that in the process of our historical and cultural evolution, we have failed to integrate the academic and the popular, the scientific and the human, the critical and the spiritual, and the technical and ethical, and the developmental and the ecological.

The convergence of NBIC (Nano-Bio-Information and Cognitive) Technologies is already defining the present trajectories of the scientific development. The fourth industrial revolution will be built on the convergence of all kinds of technologies-- Artificial Intelligence, Nanotechnology, Biotechnology, Ethics, Robotics, and related new and future entries. It will be exciting times for humanity but we need to be vary about one trend -- we need to differentiate a technologically-assisted humane future and ensure that it is not taken over by a cold, inhuman, dystopian technocratic vision of the present and the future.

The proliferation of disciplines, subjects, fields and other innumerable categories into which knowledge has come to be divided and categorized has led to a severe lack of communication amongst these different constituencies. This will ultimately stultify academic research and development. Though specialization has its many advantages as in the area of technology, it also has the danger of losing a holistic view of the matter at hand which may lead to sub-optimal approaches to problem-solving which will defeat the very purpose of knowledge creation. Moreover, history has shown that interaction between civilizations, cultures, societies, and peoples has always led to the progress of humankind.

We urgently need a "culture of interdisciplinarity." We need to be ready not only to face the world with expertise from different university-based fields (disciplines) but also with different communities that produce knowledge about the world differently. Spirituality, ethics, religion and philosophy have to dialogue with social, natural and biological sciences. The scientists need to dialogue with artists and mystics. Such a liberating dialogical approach will not only contribute to the sustainability of our civilization but also its re-generation for the generations that will come to replace us in the unfolding of the human drama. It is against this fragmentary backdrop of our knowledge-pursuit that the alternative paradigm of the interdisciplinary pursuit of knowledge is defined as the mission of IIS.

Indian Institute of Science and Religion (IISR), Delhi https://iisrdelhi.in/

Modern science and religion are arguably two most powerful influences in our society today, leading and guiding the life and destiny of people. This is particularly true of our India where traditionally both science and religion have flourished and enjoyed great respect and wide support. However, it is often found that these two go diverse ways, particularly in contemporary times, leaving most people in a state of confusion and conflict. Indian Institute of Science and Religion (IISR) is an attempt to bring together the latest findings of modern science and deepest insights of religions to build up a better humanity and a better India, particularly in her multi-religious, multicultural and multiracial context. IISR is an undertaking by the Jesuit Province of Delhi in the age-old Jesuit tradition. History tells us that the Jesuit Society has been deeply and creatively involved in the origin and development of modern science right from its inception in the 16th century, as part of its service for the greater glory of God and the betterment of humanity. IISR has been functioning for over 20 years extending its service in the field of science-religion dialogue to various institutions and organizations, particularly universities, colleges, major seminaries and similar institutions of higher education and research, Christian and non-Christian.

Loyola College of Social Sciences (LCSS), Trivandrum

Loyola College of Social Sciences, founded in 1963, is an organic entity of Global Network of Jesuit Higher Education. The Jesuit education aims at forming men and women for others, leaders of competence, conscience, compassion and commitment. The institute instills excellence in life through service. It is committed to human excellence, global citizenship, the care of all creation, justice, interculturality, and life-long learning. The College offers courses in M A (Sociology), MSW (Masters in Social Work), MAHRM (Masters in Human Resource Management) and MSc Counselling Psychology. The College is affiliated to the University of Kerala and is a recognized Research Centre of the University, and guides students for Ph.D. in Sociology, Social Work and Management Studies. The faculty members take up research projects at various levels. A full-fledged Extension Services, Loyola Extension Services (LES) is an integral part of the College. The LES acts as the Social Lab of the College. True to the Jesuit tradition of MAGIS (Excellence) and the commitment to Faith and Justice, Loyola strives to reach the benefits of higher education to the people, especially the marginalized. In reaching this goal, we are guided by the Ignatian vision of life and its application in Jesuit Education.

Loyola Extension Services

Loyola Extension Services (LES) is the Social Lab/Incubator Centre of Loyola College of Social Sciences (LCSS). LES was officially registered as the social lab of Loyola College only in 1986. It has built a robust tradition in the arena of community engagement. In its development trajectory over the years, LES has metamorphosed to appropriately shoulder new challenges in family counseling, legal counseling, formation and training as well as publicly useful research. A remarkable shift happened in January 2022 when we re-imagined LES as a Multiversity Platform, to integrate many of the present initiatives and activities as well as proposed future ones. We have launched a global certificate programme on "Conscience and Compassion", under the aegis of Gandhi-Mandela-Freire (GMF) Fellowship. The GMF Fellowship is the maiden global programme of LES Multiversity Platform. The multiversity platform of LES would explore many more relevant engagements to re-establish the culture of transformative learning by deepening its inter- and trans-disciplinary foci and strengthening its commitment to critical civic engagement based on the foundation of compassion. Another major initiativofLES is the launch of the Institute of Interdisciplinary Studies (IIS), which aims to nurture a culture of interdisciplinary quest by pooling together resources, individual scholars and academic groups for specific research that are contextually relevant, and to disseminate the insights from these research among the larger academic and popular audience through various means such as publications, seminars, and consultancy.

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Concept Note

Today, almost every field of human behaviour and society, including organisations, companies, social structures, economic behaviours, religious and cultural dimensions, are affected and shaped by AI. War and aviation, business and agriculture, communication and miscommunication, health and sickness, art and poetry, science and religion, learning and relearning, etc., depend quite heavily on AI. It will revolutionise the way we live, think and work. There is no opting out of AI systems for most of us in the contemporary times!

In general, Artificial intelligence (AI)-powered devices are systems or machines that resemble human intelligence to carry out tasks and can iteratively improve themselves based on the information they acquire. The main goal of AI is to mimic - and eventually surpass - human perception, intelligence and behaviour. The phrase and its subfields, such as machine learning and deep learning, are frequently used interchangeably. Many businesses are investing heavily in data science to maximize the benefits of AI. Data science is an interdisciplinary profession that combines knowledge of business with expertise from fields like statistics and computer science to analyse data gathered from various sources.

This two-day symposium on AI provides both technical and non-technical introduction to AI for a selected audience and looks at the marvellous opportunities and major threats offered by AI from Interdisciplinary perspectives. Scientists, philosophers, scholars, researchers, and students are invited to come together and reflect on the tremendous possibilities this technology offers us and also to critically deliberate over its societal, philosophical and ethical implications

Programme Schedule

Friday 25 November 2022

9.30 - 10.30	**Inauguration**

Welcome	**Dr. Saji P. Jacob** (Principal, Loyola College, Sreekariyam)
Inaugural Address	**Dr. Asharaf S.** (Dean & Professor, Kerala University of Digital Sciences, Innovation & Technology)
Presidential Address	**Dr. E.P. Mathew SJ** (Provincial, Kerala Jesuits)
Felicitations	**Dr. Koppala Stanislaus** (Provincial Superior, Andhra Jesuit Province, Secunderabad)
	Fr.Sunny Kunnapilly SJ (Manager, Loyola College)
	Dr. K. K. Jose (Director, Mathematical Sciences, Statistics & Data Science, M.G. University, Kottayam)
Dynamics	**Dr. Binoy Jacob** (Director, IIS)
Vote of Thanks	**Ranjit George SJ** (Director, LES & Asst. Professor, Loyola College)

10.30 -11.00	**Tea Break**

11.00 – 12.00
Keynote
Address

"How Human are the Humanoids?"

Dr. Job Kozhamthadam
(Executive Director, IISR, Delhi)

12.00-13.00

"Artificial Intelligence in Space 4.0: ISRO's AI Enabled Space Robots"

Durairaj R.
(Head, AI & Space Robotics, IISU, ISRO, Trivandrum)

13.00 -13.45	**Lunch Break**

13.45-14.45

"Machine Learning"

Dr. Achuthsankar S. Nair
(Head, Dept. of Computational Biology and Bioinformatics, University of Kerala)

| 14.45-15.15 | **"The 'Non-Mathematizables' in Intelligence"** |
| | **Dr.Binoy Jacob**
 (Director, IIS)
 & **Dr.K.K. Jose**
 (Director, Mathematical Sciences, Statistics & Data Science, M.G. University, Kottayam) |

| 15.15-16.00 | **"Humanoids and Emotions: Issues for a Cross-disciplinary Dialogue"** |
| | **Dr. Inés M. Gómez-Chacón**
 (Complutense University of Madrid, Spain) (Zoom) |

| 16.00 | **Tea Break** |

| 16.45-17.30 | **"Agriculture Revolution 4.0: Smart Farming"** |
| | **Seena Jojit** (Research Assistant, ICAR - Central Tuber Crops Research Institute, Trivandrum)
 &
 Anandhu Raj
 (Junior Research Fellow, ICAR - Central Tuber Crops Research Institute, Trivandrum) |

Saturday 22 November 2022

| 9.15-10.00 | **"AI & Practical Applications"** |
| | **Ummar Shaik**
 (Indian Institute of Information Tech. & Management, Kerala) |

| 10.00-10.30 | **"3D Vision - Expanding the Horizons of AI"** |
| | **Dr. Dhanya S. Pankaj**
 (Asst. Professor, Dept. of Computer Science and Engineering, College of Engineering, Trivandrum) |

| 10.30 | **Tea Break** |

| 10.45-11.30 | **"AI & Robotics: Philosophical Perspectives"** |
| | **Dr. Augustine Pamplany**
 (Research Dean, IIS, LES, Loyola College) |

11.30-12.15	**"Hubris and Nemesis: Fostering All-inclusive and Sustainable Ethics for AI"**
	Dr. Kuruvilla Pandikkattu
	(XLRI-JRD Tata Foundation in Business Ethics, XLRI, Jamshedpur)

12.15-12.45	**"AI & Compassion"**
	Dr. Nadarajah Manickam
	(Multiversity Platform, Loyola Extension Services)

| 13.00 | **Lunch Break** |

13.30-14.15	**"AI in Medicine"**
	Dr. Princy Palatty
	(Associate Professor, Amrita Institute of Medical Sciences, Kochi)

| 14.15- 15.15 | **Project Presentations** |

| 15.15 | **Valedictory** |

| 15.45 | **Ta & Departure** |

How Human are the Humanoids?

Job Kozhamthadam

After giving some preliminaries on AI, robots and humanoids, the paper takes up the question of the humanness of humanoids. The paper believes that to be considered human a being must have at least the basic characteristics of a human person. More specifically, the humanoid should have the complexity of the human brain, it should be a person - autonomy, intellect, freedom, emotions and consciousness. The paper finds that a humanoid to date has only some of the requirements, and more will have to be achieved. The paper then points out the even if all these requirements are met in course of time, we need to consider the promises and perils the humanoid age brings. It concludes by pointing out that even if all the required features are satisfied, one thing will still be missing - a humanoid will lack what we intuiitively know to be humanness which still defines all attempts at duplication.

Job Kozhamthadam is the founder-director of IISR (Indian Institute of Science and Religion) Delhi. He is professor emeritus of Jnana Deepa, Pontifical Institute of Philosophy and Religion, Pune, India. He has organized more than 14 International symposia on cutting-edge themes in the field of science-religion interfacing. He has published 11 books and more than 180 papers in international and national journals. His book, *The Discovery of Kepler's Laws: The Interaction of Science, Philosophy and Religion*, published in 1994 by Notre Dame University Press, USA, was choses as one of the Outstanding Academic Books of the Year 1994 by *Choice Magazine*, the international journal of libraries and research institutes, based in USA.

Artificial Intelligence in Space 4.0 ISRO's AI Enabled Space Robots

Durairaj R.

AI is everywhere and evolving. There are seemingly endless ways in which artificial intelligence is touching our lives. With contributions from AI and Machine Learning, space activities are also expected to undergo a radical transformation. This talk gives a brief introduction on the significance and impact of AI in space industry - from launch to constellation control, satellite performance analysis and space robotics both in the global scenario and in the Indian context. AI and ML oriented initiatives taken by ISRO are also discussed, covering technologies, applications, and the new ecosystem of collaboration with private industry and academia to significantly enhance the growth of space economy.

AI enabled Space robotics is one of the most promising areas in the emerging Space 4.0 era. Since the environment of space is extremely challenging, sending robots rather than astronauts for performing tasks like on-orbit servicing and planetary exploration is a lucrative choice. One of the important aspects is to build Intelligence & Dexterity to such space robots, so that the robots can perform autonomously beyond the capabilities of a human being in space. The focus of the presentation is primarily in this exciting area. This presentation also covers some developmental details of the half-humanoid AI Space robot "Vyommitra", being developed by IISU in collaboration with other centres, academia and industry for ISRO's prestigious Gaganyaan human space mission. Also covered are other AI enabled space robotics projects being spearheaded by IISU, ISRO.

Durairaj R. is a Senior Scientist in ISRO with 20 years of experience. He has completed his Masters in Electro-Optical Engineering from College of Engineering, Guindy, Anna University, Chennai and joined ISRO in 2002 at Space Applications Center, Ahmedabad. He has made significant contributions in the field of development of remote sensing, meteorology spacecraft systems and payloads for planetary missions such as Chandrayaan-1.

Since 2007, he is working at ISRO Inertial Systems Unit, VSSC, Trivandrum. Currently, he is Head of Artificial Intelligence & Space Robotics Division, and responsible for the development of space robotic systems for ISRO's prestigious Gaganyaan Human Space Mission. He is also responsible for the development of AI enabled space robots for on-orbit servicing missions. He has received many awards, including the ISRO Young Scientist Award-2010 for the meritorious contribution in spacecraft technology to the Indian Space Programme and the ISRO Team Excellence Award for the year 2017 and Prominent Young Scientist award as distinguished alumni from College of Engineering, Guindy, Chennai in 2022. He is also a member of various national bodies including the Indian Society of Systems for Science & Engineering (ISSE) and National Institution for Quality and Reliability(NIQR).

Machine Learning

Dr. Achuthsankar S. Nair

Artificial Intelligence, a technology that has been around for more than 50 years has suddenly acquired a mesmerising face[1]change. Techniques called machine Learning and Deep Learning has given computers a 'divya drishti.' Computers can recognize faces, emotions, play chess, drive cars and translate. This talk is a bird's eye view of the exciting field.

Dr. Achuthsankar S. Nair is Professor and Head of the Department of Computational Biology & Bio-informatics. He had his education in the University of Kerala, IIT Bombay and University of Cambridge. He holds two Ph.Ds; one in Engineering and the other in Music. He was formerly the Director of C-DIT, Govt. of Kerala, for 3 years. He is the author of 15 books and has published numerous scholarly articles and a modest number of research publications both in national and international journals. He is a recipient of several awards for academic contributions as well as for social service.

The 'Non-Mathematizables' in Intelligence

Binoy Jacob, SJ

Can humanoids possess the cognitive functions of human beings? This has been a fierce debate since 1930s, especially when the British scientist Alan Turing proposed that human thoughts can be reproduced by machines. The issue is addressed and implemented, to a great extent, with tremendous advances in AI such as Big Data and Humanoids. Humanoids are non-human machines with human forms or characteristics. Are there humanoids with awareness and emotions? Are they same as that of a person? Machines do not have the

capacity for self-reflection, a basic function of consciousness. Decisions are executed in machines based on certain predefined algorithms. Algorithms do not describe reality as it is. However, innumerable researches are going on in AI for the perfect imitations of human thought and human decisions. Perfection and accuracy depend on the mathematization of systems.

We find that classical mechanics and quantum mechanics are extraordinarily mathematizable. However, 'complete' formalization is not possible even within the mathematical systems (Gödel's Incompleteness Theorems). It is all the more complex in other areas such as economics and psychology which are highly influenced by socio-cultural and historical conditions. Hence, humanoids, as of now, exhibit a model, an imitation, a representation of humans, but lack substantial aspects of being human. Are there means for humanoids to mathematize the human conditions and draw meaning out of the human experiences? Fuzzy mathematics/fuzzy logic is a tool to address the issue to some extent.

For example, when Big Data makes use of statistical analysis (Bayes' theorem) to draw conclusions, that need not be accurate due to the randomness of analysis. Randomness involves uncertainty in the occurrence of the event. It does not address 'fuzziness' which involves uncertainty in the meaning of the event. Most of the human decisions rely on the meaning of the event. If AI makes use of 'fuzzy random variables'and the algorithms that combines both randomness and fuzziness, the system may be 'semantically complete' (not axiomatically).

Thus, some of our cherished notions like values, meaning, subjecthood (agency) are not fully quantifiable. So are the basic human experiences. In spite of these, AI will make tremendous progress. It may not really understand or even explain what intelligence really is. Still it will challenge the way human beings interact with the world and among ourselves. This paper looks into some of AI's incredible opportunities and limitations it offers to us from a mathematical perspective.

Binoy Jacob, SJ is a Jesuit of Kerala Province. He holds doctorates in Mathematical Statistics and in Systematic Theology. He is a member of Clavius Group of Mathematicians, U.S.A. He is the Director of Loyola Institute of Peace and International Relations (LIPI), Kochi, the Coordinator of Higher Education Commission of Kerala Jesuits, and the Coordinator of the Peace and Reconciliation Network of the Jesuit Conference of South Asia. He also serves as the Managing Editor of Pax Lumina (www.paxlumina.com) and EZHUTHU Magazine (www.ezhuthu.org).

Humanoids and Emotions
Issues for a Cross-disciplinary Dialogue

Inés M. Gómez-Chacón, Universidad Complutense de Madrid (UCM), Spain

Technological rationality and cultural mathematization are shaping new ways of looking at the human being and their interaction with the world. The construction of humanoids highlights some of the drifts that can occur when we reduce truth to algorithms and reify the human singularity. This process leaves aside substantial aspects of the human.

This talk wants to raise a reflection about the uniqueness of the emotional experience of our human condition, versus the experience that humanoid robots can reach. We consider computational models that include emotion and consciousness. A series of reflections regarding the view of the person in these models is offered.

Delving into the meaning of some mathematical-technological phenomena related to artificial intelligence about emotions, and capturing the social messages that occur through those phenomena by delving into their deeper sense, can offer us keys to the understanding (and self-understanding) of the person in their being in the current society.

Inés M. Gómez-Chacón is Full Professor at the Complutense University of Madrid in the Faculty of Mathematical Sciences in Spain. She is director of the *Chair UCM Miguel de Guzmán* of the Faculty of Mathematical Sciences. She is research member and belongs to the executive committee of the *Institute of Interdisciplinary Mathematics (IMI)*.

Prof. Gómez-Chacón has extensive research experience in Mathematics Education in Spain and abroad, developing international projects with numerous publications in the field. Among the lines of research should be highlighted: Mathematics and technology, Cognition and Affect in Mathematics, Development of Advanced Mathematical Thinking, Philosophy of Mathematics and Interdisciplinarity.

Agriculture Revolution 4.0: Smart Farming

Seena Jojit & **Anandhu Raj**

Agriculture is as old as the history of mankind. Development of human beings is closely knit with agriculture and it played a very significant role in the development of other sectors of economy also. Current agricultural practices are framed on the sound knowledge we acquired over these years across different agro climatic conditions in different parts of the world. According to the United Nations' Food and Agriculture Organization (FAO, 2016), food production must increase by 60% in order to feed the increasing population. The challenge is further aggravated by the shrinking land area suitable for cropping, shortage of water and above all the big menace of climate change. Under these conditions, the strategy to increase food production should give focus on producing more from lower resource base, ensuring the quality of the produce and faster movement of the produce to the market.

Smart farming is a development that emphasizes the use of information and communication technology in the cyber-physical farm management cycle. New technologies such as the Internet of Things and Cloud Computing are the main driving force behind this concept. Artificial Intelligence (AI), the technology which is booming very high in the present world, is sufficiently capable of taking up these challenges smartly. Smart farming (SF), the technology where AI's potentials are integrated with mechanization, sensors and many other areas of information and communication technologies (ICT), is set to revolutionize the food sector by another green revolution.

e-Crop is an IOT device which could be placed in field to sense the real time weather condition of the field. The device is equipped with sensors for gathering information about weather parameters like maximum temperature, minimum temperature, rainfall, solar radiation, relative humidity, soil moisture content, wind velocity, and wind direction. All these weather parameters have a significant role in determining the yield of a crop.

The smart farming using e-crop was done by feeding the weather data and soil nutrient status to the crop simulation model to generate real time agro advisory. The crop simulation models will simulate the growth of the crop virtually and calculate its inputs (nutrients and water) required by the crop at that particular stage, and the calculations also depend on the available nutrient and soil moisture data. All these complex calculations will be

carried out by the server side of ICAR-CTCRI only the nutrient requirements are provided as advisory to the farmer's mobile phone. ICAR-CTCRI has also developed one mobile application called Krishi Krithya for making smart farming easy. The app has an interactive and easily understandable bilingual interface for farmers.

The shortage of farm labour has become a major issue in agriculture. The smart farming technology developed by ICAR-CTCRI can also contribute to farm automation. Integrating the technology with a smart fertigation device enables fertilizers and water to be applied to crops on a daily basis. The fertigation device has a control system that can receive and process messages from the server about the nutrient and water requirements of the crop. The relay system inside the device has a series of motors connected to nutrient (NPK) containers. The pumping action depends on the message received. Nutrients taken from the tanks are mixed inside the mixing tank and applied to the field via a drip system. The daily application of fertilizer and water based on the advisory can further improve crop yield and minimize the loss of resources.

The practical application of smart farming under farmers field revealed that smart farming plots recorded higher yields with lower nutrient application. Further advanced trials are being conducted in Malappuram district for upscaling of e-Crop and make it self-learning.

ICAR-CTCRI has developed smart farming technology and demonstrated its outstanding benefits to farmers. The technology is highly successful in sweet potato and other tuber crops. Thus, the need of the hour is to use this technology to other crops, which can improve existing farming practices and maximize resource utilization efficiency. Further enhancement of the technology and its possibilities can be carried out by collaborating with other organizations, universities, etc., with similar interests.

Seena Jojith is a Junior Research Fellow at ICAR – Central Tuber Crops Research Institute, Sreekariyam, Trivandrum. She holds M Tech in Computer Science (Image Processing) from Cochin University of Science and Technology. At ICAR – CTCRI, she has developed a mobile aap namely "Krishi Krithya" which can be used by farmers in order to help crop grow with optimum resource application. She has undertaken various projects related to smart farming and artificial intelligence. Her skills include computer programming such as C++ , MATLAB, Python, etc.

Anandhu Raj is a post-graduate in agricultural Sciences with research and field experience in multiple domains of agriculture. Currently he is a Junior Research Fellow at ICAR- CTCRI, Trivandrum. His skills and areas of interests include: developing smart agriculture solutions through artificial intelligence, machine learning and IOT. He is skillful in using python Data analysis and statistical software, designing field experiments, data collection, laboratory analysis, soil sample analysis, managing fields in research station and multiple locations. He is a recipient of several scholarships and fellowships.

3D Vision - Expanding the Horizons of AI

Dhanya S. Pankaj

The computer vision researchers have effectively used 2D images for a ton of applications. However, the lack of depth information has limited their utility in specific problems where geometric information is important. The availability of low cost 3D sensors and the development of advanced techniques to generate 3D data from 2D images have resulted in a sudden surge in AI applications that employ 3D data. The 3D data is used across a

wide variety of domains like industrial quality inspections, autonomous vehicles, remote sensing, retail industry, 3D printing, reverse engineering, robotic vision, construction and real estate, medical imaging, archiving of historical articles, remote repair and so on. In this talk, we explore the basics of 3D images, their acquisition methods and their use cases across various domains. We also explore the point cloud representation of 3D data and how they are used for different vision applications

Dhanya S. Pankaj is Assistant Professor, Department of Computer Science and Engineering, College of Engineering Trivandrum. Her areas of interest include Digital Image Processing, Point Cloud Processing, Computer Vision, Machine Learning, and Natural Language Processing. She secured her Ph.D. in Computer Science and Engineering from Indian Institute of Space Science and Technology, Thiruvananthapuram on "Improved Algorithms for Automatic Registration of 3D Point Clouds." She has published articles both nationally and internationally reputed journals.

AI & Robotics: Philosophical Perspectives

Augustine Pamplany

Developments in AI and Robotics have opened up fresh areas of debate on some of the traditional concepts of philosophical anthropology such as imago Dei, personhood, human freedom, and human corporeality, etc. Broadly conceived, this is a debate between bio-conservatism and transhumanism, which reflects extreme polarities between the total rejection of any technological intervention with human nature and the radical technological enhancement of the human beings. The debate, to some extent, is hijacked by traditional philosophical positions on the one hand and the utopian technocratic hype on the other. The paper will show how certain of the philosophical assumptions driving the transhumanist projects through AI and humanoid robotics can be an opportunity for theological anthropology to widen its rationally deterministic understanding of imago Dei and personhood to cosmic and mystical horizons as well. Based on the speculative metaphysical ideas of the proximity between matter and spirit, and the natural and the supernatural that are present in the transhumanist debate on AI and robotics, the paper will highlight certain directions for philosophical anthropology to reconceive certain of the anthropological themata in a manner compatible with a dynamic worldview.

Augustine Pamplany is the Founder-director of the Institute of Advanced Interdisciplinary Studies, Cochin, India. He holds Ph.D in Bioethics from Dublin City University, Ireland, and in Philosophy of Science from International University, Colombo. He holds Masters in Philosophy from Jnana Deepa Vidyapeeth, Pune, and MS in Psychology from Madras University. He has authored 8 books and over 60 articles in peer-reviewed journals. He is the Managing Editor and Publisher of Omega – Indian Journal of Science and Religion. He is a recipient of the Erasmus Mundus Fellowship in Bioethics from the European Commission, and Science-Philosophy Course Award from the Centre for Theology and Natural Sciences, Berkeley; Global Perspectives on Science and Spirituality Award from the Interdisciplinary University, Paris; Erasmus Mundus Fellowship from Leuven, Belgium; Radboud University, The Netherlands; and the University of Padua, Italy. He is a member of UNESCO forum teachers in Bioethics. He lectures in a number of Institutes in India and abroad. He is currently a faculty scholar at Dublin City University, and a Visiting Faculty at Global Ministries University, California. He is a priest in the Little Flower Congregation.

Hubris and Nemesis: Fostering All-inclusive and Sustainable Ethics for AI

Dr Kuruvilla Pandikattu SJ

Being human today needs to live in communities where people interact with each other. This demands morality for living with others. Further, at the individual level, there is the human urge to be good (and to do good) and here comes the role of conscience and personal ethics. So, this chapter looks at the need for morality in the era of AI.

It assumes that ethics is an integral part of being human today. The technological invocations challenge us to evolve outlines of a new ethics that can help us live with AI's overarching influence on us.

With the ubiquitous nature of AI, ethical concerns mount exponentially, especially in terms of jobs lost, privacy, systematic biases and prejudices, etc.The growthof AI has implications for practically every field of human existence, including business ethics, nanoethics and bio-medical ethics. After briefly focusing on these, we move on to talk about the exploitative and dominative nature of intelligence in general and AI in particular. Then we look at hubris and nemesis which are part of the power and domination that human beings possess or claim due to the progress of AI.

It may be mentioned that the earlier mentioned "Rome Call for AI Ethics" mentions six general ethical guidelines for AI.

1. Transparency: AI systems must be explainable in principle.

2. Inclusion: all human beings' needs must be considered so that everyone benefits and all individuals have the best possible opportunities to express themselves and develop;

3. Responsibility: Those who design and deploy AI must do so in a responsible and transparent manner.

4. Fairness and human dignity are safeguarded by impartiality: do not create or act based on bias.

5. Reliability: AI systems must be able to work in a consistent manner. [and]

6. Security and privacy: AI systems must operate in a secure manner while also respecting the privacy of their users

In the context of justice, fairness and balance that Nemesis, born out of human Hubris, brings into the moral discourse, we need to take into account the larger or broader issues related to the goal (*telos*) of the whole society, the common good of the whole human (and posthuman) family and fostering individual and collective virtues.

In this paper we focus on social ethics, in so far as it is caused by the emergence of AI, which we saw are gigantic. Being human today demands a larger and broader moral scenario, where we deal with the significant issues of the survival and flourishing of human beings and their destiny. We have dealt with them only briefly. We have been more interested in the fundamental questions of domination and power that AI provides us to human beings. Our ethical concern is regarding the unbridled power that leads to human hubris and the resulting nemesis.The ever-present danger of human destruction due to our own collective **pride and resulting annihilation cannot be totally ruled out. We need to be aware that**"technology can hide, and technology can blind us"

Dr Kuruvilla Pandikattu SJ (born 1957-) is Chair Professor of JRD Tata Foundation on Business Ethics at XLRI, Jamshedpur and was professor of Physics, Philosophy

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AI & Compassion

Dr. M. Nadarajah

M. Nadarajah is an Indian Malaysian by birth and citizenship. He is a Ph.D. from JNU, Delhi and the thesis is published (1999) as a book titled Culture, Gender and Ecology: Beyond Workerism. He has worked over the last 42 years in many capacities and positions in many national and international organizations and institutions and in many multi-faceted and inter-connected projects and initiatives. He has been involved in a wide range of areas covering: consumerism, environmentalism, media-ted realities and critical media education, philanthropy, education (including pre-school), people-oriented educational product design development, institution building, software and portal development, process (ISO) development and management, project management observatory (PMO), organisational strategic planning, urbanism, agroecology, alternative healing traditions, inter-trans-faith initiatives, sustainability and spirituality. At present, he actively serves as an educational consultant with the multiversity platform initiative, Loyola Extension Services (LES), Loyola College of Social Sciences (LCSS), Thiruvananthapuram. He is involved in developing various initiatives at the multiversity platform including the Gandhi-Mandela-Freire Fellowship programme.

AI: Some Prospects and Problems

K. Babu Joseph

Intelligence may be described as the capacity to learn (through experimentation, observation and synthesis) and apply. Artificial intelligence (AI) is intelligence simulated and put to use. Awareness is knowledge, not necessarily complete, about something. Consciousness is full awareness about awareness itself. Standard definitions of these terms may be different, but the present characterizations capture the essentials. AI is a subject that can be introduced even at the school level, because it is used to improve the natural intelligence of children and help them to learn faster than otherwise. In society, there exist several misconceptions about the current status of AI as the technology of creating and using devices such as The Terminator and I-Robot portrayed as possessing superhuman powers. The truth is that these are purely fictional characters that live only in movies and AI, as of now, cannot deal with their feats.

AI is however a very useful tool in a large variety of fields such as agriculture, art, business, communication, data science, education, games, governance, healthcare, industry, planning, research, psephology and so on. Such applications come under the category of weak AI which constitutes 99.9 percent of its applications today. Creation of robots or humanoids with consciousness, let alone awareness, is perhaps a distant dream. There

are no humanoids possessing emotions like friendliness, love, empathy, compassion and a sense of values. Ethics seems to be beyond its purview. Consciousness and allied phenomena remain the uncharted domain of strong or general AI. Among currently popular uses of weak AI are pattern recognition, face recognition, music synthesis, drawing, painting, graphics, animation, speech delivery, translation, driverless cars, forensics, hospital services, telemedicine, computer vision, astrophysics and several others.

Artificial neural networks are the principal tool employed in AI work. They involve a preliminary training stage before the problem is presented for solution. Prediction is a task usually taken up. Weather or stock market forecasting is an example. Machine learning is a restricted form of AI, in that it handles a single problem or a specific class of problems by means of a common strategy. It is worth noting that modern machine learning is heading towards Artificial General Intelligence (AGI) or strong AI, following advances made in what is known as neuromorphic computing. The major difference between the PC and the human brain is that while the PC uses binary logic, the human brain is driven by asynchronous spikes and their interpretations. INTEL and several other companies are now focusing on populating their chips with massively parallel spike processing neurons that operate asynchronously. The Intel chip is named LOIHI and is currently under active development. It uses a new language called Lava. The greatest advantage with the new technology is that it can function at very low powers. Let us hope that we are slowly but steadily approaching the great goal of strong AI.

Although AI is of great usefulness in various fields, it has some dangerous implications too. For example, a study of criminal tendencies in a population based on face recognition technology, might lead vast numbers of innocent people to internment by the state. Data crunching and prediction are the forte of AI. Empirical studies in disciplines like economics, sociology, psychology and climate change stand to immense benefit from AI technology.

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AI & Probability: A Statistical Synthesis

K. K. Jose Kanichukattu

Probability Theory, developed during the 17th and 18th centuries, is regarded as the most powerful tool to deal with randomness. Probability is a measure of randomness. Though the foundations for probability theory were developed by French mathematicians Pascal and Fermat in their correspondences for solving gambling problem put forward by the gambler De Mere by 1650's, it took a sound form with the works of Christian Huygens and Jacob Bernoulli. Though started in 1685, the first book on probability theory namely, *ArsConjectandi* by James Bernoulli was published in 1713, eight years after his death in 1705. Bernoulli's law of large numbers which appeared in this book,is fundamental to the statistical definition of probability based on relative frequencies.

The various approaches to define probability include the classical approach of Laplace, the frequency approach of Von Mises, the axiomatic approach of Kolmogrov and the subjective approach of Bayes. It is pivotal to the discipline of statistics and has sound

foundations with Kolmogrov's axiomatic definition using measure theory developed in 1933.With the advent of computational facilities using large scale computers, Bayesian approach and fuzzy probability approach is gaining more importance. The central limit theorem has occupied a central role in statistical theory and inference. With the introduction of fuzzy logic, mathematicians and probabilists are debating on the merits and demerits of each. However, vagueness is to be measured in mathematical terms and probabilities may also be assigned to such events.

A basic problem, at the present stage of the Information Society, is how to manage the cognitive process while taking into account its intrinsic features of uncertainty, including imprecision and vagueness. This has both theoretical and practical implications in Technology, Economics, Bio-Medicine, and so on. In fact, real-life situations are the prime source of motivation for this management to be considered. From a more theoretical point of view, information and uncertainty are two closely related notions. In fact, uncertainty stems from a deficiency of information. On the other side, information may be thought of in terms of reduction of uncertainty although this is only a possible, albeit important, way of looking at the concept of information. Therefore, any conceptual enrichment in the domain of information is matched by the corresponding need for the management of new types of uncertainty. In the last few decades, the theory of uncertainty has noticeably expanded its conceptual domain and its methodological tools. Some of the debating issues raised over the past 50 years after the emergence of fuzzy mathematics, might have resolved because it is the debate process, by its very nature, that has forced a positive evolution in bridging the gap between these two very powerful and very useful models of uncertainty and variability.

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More than ever, we realize today that society needs "not genius in isolation, but scholars in collaboration." Most of today's scientific discoveries are carried out by a team of researchers and scholars from various fields, often in unhealthy isolation from one another in the name of disciplinary focus. We urgently need a "culture of interdisciplinarity." We need to be ready not only to face the world with expertise from different university-based fields (disciplines) but also with different communities that produce knowledge about the world differently. Spirituality, ethics, religion and philosophy have to dialogue with social, natural and biological sciences. The scientists need to dialogue with artists and mystics. Such a liberating dialogical approach will not only contribute to the sustainability of our civilization but also its re-generation for the generations that will come to replace us in the unfolding of the human drama. It is against this fragmentary backdrop of our knowledge-pursuit that the alternative paradigm of the interdisciplinary pursuit of knowledge is defined as the mission of IIS.

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