EUROPE REGULATES ROBOTICS
ABSTRACTS OF THE SPEAKERS' PRESENTATIONS

A European Approach to Robotics and AI

Massimo Ippolito – Industrial Operations next frontier: advancements in robotics and AI fuel efficiency operations growth

Automation and robots, as well as connected systems, cloud technology and 5G, will permeate daily industrial operations at all levels. But, Artificial Intelligence applications combined with other technologies like Digital Twin, A/R, that will get smarter the more they are used, will fuel efficiency operations growth.

Bjoern Juretzki – A European Approach to Robotics and AI

The European Commission has presented a comprehensive strategy on AI in April 2018. It provides an integrated European vision on AI resting on three pillars: 1. Boosting Europe's technological and industrial capacity, 2. Preparing for socio-economic changes, 3. Ensuring an appropriate ethical and legal framework. All this is underpinned by the EU AI Alliance, an inclusive stakeholder forum, and an AI high-level expert group. In close collaboration with the EU AI Alliance, this expert group is tasked to produce AI ethics guidelines by the end of 2019. In another work stream, the European Commission is elaborating a coordinated plan with EU Member States to maximise investments and avoid a fragmentation of the Single Market, also by the end of 2019.

Cecilia Laschi – A European Approach to Robotics and AI research

Futuristic scenarios propose robots in daily life, creating expectations that have not yet been matched. What are the abilities that robots still miss for extensive application?

There are concerns on the impact of robots on jobs and social life. Instead, robotics can contribute to relieve human beings from life-risking or heavy jobs, providing support to workers in physically hard work, keeping human capabilities for their intellectual, handcrafting, empathic values.

Europe is the right place to drive the progress of robotics and AI, thanks to its cultural tradition grounded in humanities. A European initiative like a FET-Flagship in Robotics can accompany the technological progress, based on a European forefront position, with the study of economic and social models and related public policies that take advantage of robots at work.

A European approach can also help design machines that integrate in the planet's environment and preserve its resources, rather than consuming them, and that contrast the current rise of so-called e-waste.

A European Approach to Liability

Andrea Bertolini – A Risk Management Approach to Liability in Robotics and AI: A Way for Europe?

The socio-legal issues arisen by new technologies – in particular robotics and AI applications – are not exceptional, but rather special, and may be framed within existing legal paradigms. Indeed, neither autonomy nor the ability to learn, justify *per se* a change in perspective.

Therefore, such applications might be deemed products and thus be regulated by product liability rules. However, when functionally assessed, these norms prove inadequate in providing the incentives needed for the development of various applications. By taking into account both law and economics literature and recent statements of the European Commission, the major criticisms will be identified.

Finally, automation requires multiple agents – producer, user, service provider – to cooperate within the same task: thus, different sets of liability rules often overlap, although not originally intended for the assessment of the same event. The distribution of the burden of proof – in particular under the PLD – technological complexity and litigation costs might prevent the "exact" apportionment of liability among such parties, based on criteria of personal reprehensibility.

Liability rules could then depart from such concepts, to burden the party best positioned to minimize and manage costs – in particular, but not solely, through insurance mechanisms – and ensure compliance, according to a "Risk-Management Approach".

Ian Kerr – Liability Once the Facts Begin to Buck

"Why, would it be unthinkable that I should stay in the saddle however much the facts bucked?" (Wittgenstein, On Certainty"
The current Canadian approach to robot liability—*to the extent that there is such a thing*—is not fundamentally different from other existing forms of civil liability: robots can cause harm by way of (human) negligence (eg, a doctor utilizing an untested algorithm or machine), product defect (eg, failed lidar in a SAE Level 3 autonomous vehicle) or even a breach of contract (eg, a software bot not delivering promised goods or services). Today's robots are primarily understood as merely the instruments of human action.

Like the rebirth of contract law during the Millennial move to automated e-commerce, the coming era of robotics and artificial intelligence (AI) is poised to generate a renaissance in tort law. Combining "the promiscuity of data with the capacity to do physical harm", our next generation of robotic systems will accomplish tasks in ways neither easily anticipated nor subsequently understood—increasingly blurring the line between person and instrument.

In this presentation, Ian Kerr, *Canada Research Chair in Ethics, Law and Technology*, contemplates the implications of next generation robots and AIs on civil liability. After a brief articulation of the lessons learned in developing Canada's attribution rules for automated electronic commerce, Dr. Kerr examines the European approach to liability and asks whether emergent behavior in machines, the increasing inexplicability of highly successful algorithmic decision-making, and the continuous blurring of actors and instruments should or should not buck Europe (and Canada) out of the saddle, radically shifting our thinking about core civil liability concepts such as negligence, product liability and the concept of personhood.

Ugo Pagallo "3 works in progress and 3 recommendations on the "electronic personhood" of robots

By the end of 2018 and mid-2019 the EU Commission will present its ethical guidelines on AI development, as well as guidance on both the interpretation of the Product Liability Directive and liability for new technologies formation. In light of this threefold work in progress, the aim is here to prevent some misunderstandings of today's debate on the legal statuses of robots and AI systems. By distinguishing between notions of legal person and accountable agents in the legal domain, we should (i) skip any hypothesis of granting AI robots full legal personhood; (ii) take seriously into account new forms of accountability and liability for the activities of AI robots in contracts and tort law; and, (iii) test such new forms of accountability and liability of AI robots through methods of legal experimentation.

Angela Sanguinetti – Liability and New Technologies: a European Commission perspective

The Staff Working Document on Liability for Emerging Digital Technologies (SWD) is a milestone in the work on liability and new technologies. The presentation describes the genesis of the SWD in light of the political context and explains the need to focus on specific applications and to look at the national regimes. Subsequently, the main challenges raised by new technologies in the SWD are presented, including whether there should be a horizontal or sectorial approach. The SWD also launched the work of the Expert Group on Liability and New Technologies (EG) in its two formations, the PLD formation and the New Technologies formation. The third and final part of the presentation provides information on the ongoing work of the EG, including on the main disruptive features/challenges identified.

A European Approach to Ethical Design

Massimo Bergamasco – The Road Ahead in Robotics and AI between Digital Utopian and Techno-Skeptical Visions

Recent developments of advanced robotics and AI present different issues that are fascinating from a pure research point of view but that are also fundamental under an ethical perspective related to the consequences of their integration in the future life oh human beings. Starting from few state-of-the-art results in the research of robotics and AI, the presentation addresses specific approaches in the use of digital technologies that today are modifying the way in which human beings and machines cooperate in real contexts. Future projections and technical challenges in specific application domains are defined.

Raja Chatila – Trustable Autonomous and Intelligent Systems

Computerized socio-technical systems, based on algorithmic computations and decisions that impact human individuals and society in a way or another, must be trustworthy. This implies several properties that have been classically studied under the general designation of "dependability" or "resilience". The realization of these properties includes verification and validation techniques and has become essential in sectors in which critical functions are assumed by computer systems.

However, this tradition in system engineering has been rather ignored or minimized recently in the development of autonomous and intelligent systems. The reasons usually given are complexity and lack of explainability. A trend reverse toward ethical design has become necessary, following principles of:
- Transparency: of values on which systems are built and decisions taken, explicability, auditability, traceability.
- Accountability: responsibility and liability of humans.
- Neutrality: of system and data.

Anne Gerdes – Trustful design - AI and advanced Robotics

This presentation emphasizes the importance of an inclusive European ethical design perspective, which covers: (1) ethical technology design, (2) facilitation of moral self-cultivation in professional computer scientists and engineering communities, (2a) application of value-based design methods, enriched with a global outlook and based on European participatory design traditions, and (3) citizen empowerment through digital literacy and explainable AI as means to ensure active democratic citizenship in an AI-wired world. Initially, key ethical challenges are identified, particularly pointing to the problem of value alignment and suggesting that machine ethics and self-learning approaches may be viewed as complementary methods, which may provide for human controlled and trustful AIs. Furthermore, it is argued that it is imperative to support skill-building for computer professionals, which makes ethics second nature, and to promote a dialogue oriented participatory design perspective in AI and robotics projects. Finally, at a societal level, empowering citizen is pivotal for a flourishing future with trustful AI and robotics.

Viola Schiaffonati – An Integrated Epistemological and Ethical Framework for Robotics

In this talk, by adopting the perspective that conceptualizes new technologies (including robotics) as social experiments, I argue that the kind of experiments performed when evaluating robots are *explorative experiments*, i.e., investigations carried out in the absence of a proper theory that partly diverge from the traditional notion of controlled experiments. Considering this epistemological shift, I apply the ethical framework proposed by Ibo van de Poel for experimental technologies to robotics, and in particular to the issues related to the design of robots. To make the analysis more concrete, I discuss examples from search and rescue robotics, which offer a challenging opportunity to test socio-ethical approaches to the development of robots and their interactions.

A European Approach to Standardization and Testing

Fabio Bonsignorio – Reproducible Research, Benchmarking, Standardization
The second wave of Robotics, integrating Machine Learning, Probabilistic Robotics, and some AI is already having significant impact on our economy and our society. The third wave, inspired by the organizational principles of living beings and natural intelligence and merging more and more tightly with humans, will potentially have a disruptive impact on society and our self-perception and very nature. Meanwhile research methodology is lacking, societal and economic impact is not well understood, and citizen involvement in the issues still too limited. Do we need first of all to go back to the basics of the scientific method? Is there a humanistic 'European way' towards the societal utilization of robotic and AI systems?
The talk will cover the intertwined issues about Reproducible Robotics Research, researchers claim assessment, qualitative result evaluation, benchmarking of the performance of robotic and intelligent systems, risk modelling and why and how those issues affect current and future standardization efforts and the potential economic and societal impact of robotics technology.

Bardo Schettini Gherardini – An European standardization strategy on AI and robotics: a forthcoming success case or much ado about nothing?
Considering the digital technological trends, standardization increasingly plays a crucial role in terms of products/systems interoperability and connectivity, as well as on safety, security, ethics and liabilities aspects. The use of technical standards is therefore becoming pervasive.
Within this context, the European standardization system is a model unique in the world, with great benefits, but also constraints. The peculiar relation between voluntary European "harmonized" standards and the related European legislation, under the so called "new Approach", is the key aspect to be aware of when considering any European standardization strategy. Furthermore, a well structured dialogue between the European Institutions, the European Standardization organizations and industry is essential to ensure the success of European initiatives in this domain. On this background, the European Institutions are calling European standardizers to support a stronger Europe in the AI (and robotics) areas. How European Standardization organizations are replying to this challenge? What about industry? Does a coordinated European approach really exist? And what about the role that the European standardisation can play at international level?

Kees Stuurman – The EU regulatory framework for standardisation and certification: the impact on AI
AI encompasses many different technologies (software, data analysis, image recognition, speech recognition etc.) and many different relevant societal and regulatory issues (ethics, data protection, cyber security etc.). So actually we are referring to a broad and deep set of different elements and relevant aspects. This also implies that there is no such thing as 'the' standardisation of AI or 'the' regulation of AI. We can foresee a broad range of actions and measures in trying to get more grip on the roll-out of AI in our society. Likely both standardisation and certification will play an important role in regulating the introduction of AI. Technical standards will be key in relation to issues such as safety and security but could also be very relevant in laying down guidelines for ethical and societal aspects of developing and implementing AI. For several reasons, certification will most likely play an important role as well. Firstly, relevant certification frameworks especially in the field of data protection and cyber security that are currently being developed will be of direct relevance for implementing AI. Secondly one could imagine that the legislator might turn to certification schemes as part for regulating aspects such as duties to inform that AI is being used in providing services, the duty to announce calling by a robot instead of a human being etc. What are the current key legal issues in relation to European standardisation and how would they impact AI? What will be the significance of the (diverging) approaches chosen in the field of data protection certification and cyber security certification, and how will that impact the introduction of AI in Europe?

Gurvinder S Virk – International robot standardisation

Convenor: IEC SC62A & ISO TC299 JWG5 (Medical robot safety) and ISO TC299/WG6 (Modularity of service robots)

The talk will present the main robot standardisation activities within ISO and IEC which have been initiated since 2005. Summary information on the working groups, namely, safety of industrial, personal care and medical robots will be described as well as the work to develop a common robot vocabulary so the key definitions are harmonised, performance of service robots and modularity of service robots. Key details on active work projects and how the robot standardisation landscape is evolving will be described. The recent growth in robot standardisation activities in ISO, IEC and other organisations is creating concerns regarding overlaps and some attempts at how various boundary and gap issues should be addressed has been initiated to prevent confusion for robot manufacturers. Also regulation of soft issues in robotics (e.g. robot ethics) have been discussed but no consensus on what should be done at ISO level has been reached.

A European Approach to Data Protection

Valentina Calderai – Between Creative Disruption and Ordered Change. A plea for European Large, Liberal Data Commons

The European data management regime is under construction, its keystone lying at the intersection of Data protection Law and Competition Law, as the former can bring to the light the anticompetitive dimension of the de facto appropriation of massive swaths of information concerning human behaviour, and the latter may improve our understanding of systemic risks for privacy, safety and democratic process, hardly opposed by procedural measures, tailored on individuals (informed consent and anonymization). Their convergence, however, should rest on a steady legal common ground in order the digital market project to succeed. Having considered the relative merits and demerits of different allocation regimes (a new system of data ownership; de facto control protected by contract law and liability rules; sector-specific access regimes based on public interest or competition law) this paper advances an argument in support of a general open access regimes, based on a functional analysis of the economic characteristics of the data and illustrated by an example drawn from health data management.

Gianclaudio Malgieri – A European Approach to AI Explanation: from the GDPR to 8 Member States Laws

Scholars and law-makers have widely addressed the issue of Explanation of algorithmic decisions in the world of Robotics and in general Artificial Intelligence.

The GDPR has tried to provide a solution to risks of automated decision-making through different tools: a right to receive/access meaningful information about logics, significance and envisaged effects of automated decision making processes; the right not to be subject to automated decision making with several safeguards and restrains for the limited cases in which automated decision making is permitted.

In a previous article it was suggested that the dualism between right to ex post explanation vs. right to ex ante general information should be overcome: transparency and comprehensibility should merge in the concept of "legibility". One remaining problem is the exact meaning of "suitable measures to safeguard the data subject's rights and freedoms and legitimate interests" that should be taken (e.g. when the automated decision making is authorised by Union or Member State law).

Member States laws implementing the GDPR are, thus, an important reference when discussing automated decision-making and suitable safeguards to protect individuals against such decisions: Article 22(2) lett. b explicitly refers to Member States laws, that should also adopt 'suitable safeguards' for protecting individuals. Even though many Member States have not implemented Article 22(2), lett. b, at least eight Member States (France, UK, Ireland, The Netherlands, Hungary, Belgium, Austria, Germany) have specific provisions about

automated decision-making in their GDPR implementation laws. The approaches are very diverse: scope of the provision can be narrow (just automated decisions producing legal or similarly significant effects) or wide (any decision with detrimental impact) and even specific safeguards provided are very diverse.

In particular, just few states guarantee a right to legibility/explanation about the algorithm, even considering accountability of algorithms (France and Hungary); while most states provide just the three safeguards mentioned at Article 22(3): subject's right to express his/her point of view; right to obtain human intervention; right to contest the decision.

Vagelis Papakonstantinou – Is the GDPR EU's constitution for the digital?

Having warranted a pan-European approach to personal data processing, the GDPR is perhaps morphing into something much more than that: Europe's reply to the digital. If constitutions broadly divulge the way of thinking for their respective societies, the GDPR appears to have a reply for all, from household personal data processing to self-driving cars and robots, from the right to be forgotten and IT systems' security to AI and bioengineering. The GDPR's omnipresence may perhaps be explained if the right to data protection is perceived as a "right of rights"; After all, the EU lacks a comprehensive approach towards the digital, and the GDPR may be stepping in to fill a real or imagined gap. However, the GDPR is no panacea; Ethical and regulatory hints may be traced in it (for example, mistrust to machine decision-making or an emphasis to accountability) but these are of a limited scope. And it still has to prove its worth and resilience in the streets of Europe. Consequently, when we are looking for answers to entirely new problems, such as in the field of robotics, we better try to look for solutions elsewhere - or develop new ones of our own, as was the case with the GDPR itself some fifty years ago.

Dianora Poletti – A European Approach to AI, Robotics and Health Data

In the processing of Health Data, AI and the widespread use of Robots and E-Health devices shed a new light on the issues of a field marked by a difficult balance between public and private dimension. Besides, these new technologies and the need for information sharing increase existing risks, such as discriminatory profiling and improper disclosure of data.

The Health Sector can therefore become a meaningful point of view to check the efficiency and the limits of the European solutions stated by the GDPR on several matters: the identification of controller and processor, the rights of the data subject (patient) and the data breach risk assessment. The ethical approach to Robotics and the Algorithmic Fairness thus get a crucial relevance, which is strictly connected to the necessity to protect the patient dignity.

A European Approach to IP Law

Enrico Bonadio – Intellectual Property Aspects of Robotics

The talk focuses on various intellectual property (IP) issues for the robotic industry. Innovation-based commercial and legal strategies within this industry will be highlighted. How and to what extent robotics companies in Europe protect and promote their investments and products by relying on patents, trade secrets, copyright, trademarks and designs? The presentation tries to provide answers, by also expanding on IP-focused court disputes involving robotics firms.

Robots embedded with artificial intelligence (AI) are also capable of coming up with creative outputs that often satisfy copyrightability and patentability requirements: which raises the issues of who should be considered as the owner of the relevant copyright or patent.

The talk explores solutions to these thorny issues.

Luke McDonagh – Intellectual Property Challenges for University Knowledge Transfer in the field of Robotics - Patents and Spin Out Companies

Intellectual property forms a crucial aspect of the innovation system in the field of robotics. The protection of copyright, trademarks, trade secrets, and especially patents, underpins commercial innovation in the sector. With respect to encouraging innovation in robotic technologies, major economies such as the EU, UK, Japan and Mexico are keen to draw benefits from university innovation in robotic science, by spinning out new inventions into private sector companies and social enterprises. Indeed, some of the EU Horizon2020 INBOTS project partners are leaders – SSSA (Pisa) and ETH (Zurich) - at developing university inventions in the area of robotics and spinning out commercially viable companies, such as IUVO. Our aim is to investigate the 'best practice' experiences of university IP policies and knowledge transfer strategies within the EU – including those of our partners – SSSA, ETH, UCM, CSIC. This analysis has already begun this with an evaluation of the London City Incubator at City, University of London. In this presentation I discuss our preliminary findings on optimal IP strategies for robotics research, and look ahead to upcoming empirical research with our INBOTS partners and other EU based organisations, as well as links with Mexico (UNAM) and Japan (Waseda University).

Daniel Schoenberger – Deep Copyright: Up- and downstream questions of AI and Machine Learning

Artificial intelligence (AI) systems are increasingly capable of taking over tasks that until recently required cognitive abilities, such as the creation of literary texts, melodies or images. Already commercial applications reach the market, whose outputs would arguably be considered as creative, if produced by a human author. Also, systems have become capable of translating all kinds of text including prose between dozens of languages. One enabler for this development is (deep) machine learning (ML), which may require input from copyrighted works to train the respective models in becoming "creative". The talk will discuss some of the legal and philosophical issues that arise from these developments, looking both at the status of the "downstream" generated works, and the possible constraints that copyright law might impose on the materials the systems need for learning and hence for their "upstream" modelling.

Alternative Approaches to Regulations

Dominik Bösl – Robotic Governance: self-regulation of robotics and A.I. technologies

Dominik Bösl introduces his concept of Robotic Governance, which strives to bring together all stakeholder-groups in the fields of robotics and artificial intelligence, in order to foster a world-wide and interdisciplinary dialogue, involving internationally renowned experts. The goal is to reach a consensus on how to take responsibility for new technologies in these fields. The findings are to be published in the Robot & A.I. Manifesto – a set of voluntary guidelines and the foundation to realize self-regulation in these fields of new technologies.

Erica Palmerini – EU approaches to the regulation of robotics and artificial intelligence

While discussing the recent initiatives and official documents of the European Parliament and the European Commission that aim to regulate robotics and artificial intelligence, two main points will be stressed. In terms of the methods of regulation, a composite approach is adopted, that resorts to various instruments, both innovative and traditional, in order to attain an effective framework of rules and to limit and control the drawbacks associated with each single mode of regulating technology. In terms of the contents of the proposed regulation(s), the very general approach initially showed by the European Parliament – apparently devising a wide-ranging body of rules dealing with all robotic applications and the legal problems they can pose – seems to have been abandoned in favour of multiple branches of intervention, that either consider in a comprehensive manner robots that belong to a distinct type and compound, and require a complex and

multifaceted approach (ex., autonomous road vehicles), or point to regulate homogenously those robotic applications that share a particular feature, endowed with legal relevance (ex. autonomous mode of operation or connectivity).

Irene Sardellitti – Overview of the Initiative on Artificial Intelligence for Europe
Artificial intelligence (AI) has emerged as a major force that is gradually changing how systems work, generating significant new gains in productivity and growth and serving as a powerful tool in the search for solutions to our major societal challenges. The European Commission has published the initiative on Artificial Intelligence for Europe (25 April 2018). It is organized around three pillars: 1) Strengthening Europe's technological and industrial capacity in AI and facilitating its uptake; 2) Addressing the socio-economic challenges brought about by Artificial Intelligence by encouraging the modernization of education and training systems, supporting talents and anticipating changes in the labour market; 3) Ensuring an appropriate ethical and legal framework on the basis on the values of the Union and in line with the EU Charter of Fundamental Rights. This talk will give an overview of the initiative.

Atsuo Takanishi – Historical/cultural aspects in social implementation/regulation of robots in Japan, and some absolute limitations in using of AI or digital computation for real world phenomena
As a roboticist especially in humanoid robotics my talk in the workshop consists of the following parts.
-       My historical and recent research themes in robotics such as the bipedal walking/running robots, musical instrument player robots, emotion expression robots, medical robots and medical patient simulation robots, etc.
-       Humanoid robotics and the "Robotic Human Science"
-       The "Robot Tokku," the special economic zone for robot test and experiment in Fukuoka started in 2003 and robot experiments on the streets in Fukuoka and its generalization to all over Japan opened in 2006.
-       Difference in brain activity of sound processing between Japanese and people in the other countries
-       History, culture and religions of Japan
-       The greatest disaster country "Japan" and the peculiarity of Japanese culture and language
-       The basic mechanism of robot/servo control
-       The absolute limitations in digital sensing, computation and control of the real world phenomena such as the Dynamics, the Nyquist frequency, the Chaos, etc.
-       Possible problems in judging real world phenomena with reference to social regulations
-       Conclusions