

Responsible Research and Innovation in Artificial Intelligence: A Perspective

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Abstract

Increasing computational power and automation have embedded Artificial Intelligence based technologies as well systems in many sectors of society in many or other ways in response to the incremental innovation and developments in this particular area. This article will provide a perspective through the lens of Science, Technology and Innovation framework as tangled with each other within science, technology and innovation policy studies. As the power of such emerging technologies generate risks as well benefits along with it; the concerning debates on responsibility have broadly expanded in recent times. The article is proposed with the intentions first to conceptualize this technology with the theme of research and innovation through responsibility. Since any technological innovation always perform in a specific institutional context, closely connected to stakeholder participatory dynamics. Hence, a suitable approach responsible innovation requires interdisciplinary research which incorporates: (i) the ethics of technology; can best be conceptualized as an embedded involvement of social scientists and ethicist in laboratories during the innovation process within the institutions. (ii) the need for institutional reflexivity approach, discussing reflexivity during the institutional practice which emphasize scientists to become more open towards their role and moral responsibilities in public. (iii) to focus on stakeholder engagement for policy formation and science, technology and innovation (STI) studies literature, and take the opinion of public through the debate such engagement activities in order to promote public engagement and participation activities in emerging technology for measuring the anticipated impact on society. Several important questions will be addressed: how responsibility comes with robotics and AI with aiming to responsible innovation? How public engagement and their participation is the supportive way in this regard.

Keywords: Artificial Intelligence, Ethics, Responsible Research & Innovation; Science Technology and innovation policy studies.

I. INTRODUCTION

Increasing attention to “responsible innovations have been given within research policy as Science and innovation both are formalized and entangled within it. [6] Therefore, the concept of responsible innovation can be interpreted as an attempt to provide a broader and more holistic framework to better address ethical, social and legal issues. The concern debate over responsibility have highlighted as the power of particular technology simultaneously can bring societal benefits as well as hazards. Increased computational power could also have such possibility.

Beyond associated professional roles, scientists have shown their negotiation and recognition towards the responsibility of their research. In 2015, group of scientists including pioneering inventors of artificial intelligence (AI) been awarded by Information Technology and Innovation Foundation(ITIF) for raising concerns for AI in response to the social concerns for humanity. Additionally, it is being given the assurance for such AI research along with regulatory and ethical framework through which AI must benefit humanity and ensuring the positive humanitarian impact of the AI systems on the society. But the discourse of negotiation between technologists, scientists, innovators, policy makers and outside world regarding responsibility is contested domain of debate till the date and important to be discussed.

II. CONCEPTUALIZING RESPONSIBILITY: TECHNICAL INNOVATION AND RESPONSIBLE RESEARCH

Any new technological innovation should be informed to all citizens in terms of uses both from the responsibility as well safety perspective. Any emerging technology like Artificial Intelligence and its applications can be discussed in risks and benefits from both side and should ensure making advantage for all and having significant impact on society.

While focusing on science, technology and innovation, the concept of Responsible Research and Innovation (RRI) signifies with such a process and mechanism which bind technical innovation on one side and outcome of particular technology on other side in combined manner during the complete process of research and innovation. Second, notion of the responsible research evolving all societal stakeholders (policy makers, researchers, public, and institutions) through inclusive participatory approaches in order to meet either with the societal challenges or needs and benefits for the society. The grand societal

challenges will directed to the possible solutions with the engagement of all the societal actors in the construction of innovative services, products and solutions.

Although concept and discussion in the responsible research and innovation have been a topic of recent discussion in academics. Various studies and literature have been highlighted many of the key features as well features to explore framework of responsible innovation [5],[6],[9] contributed in this area.

i) Technology And Innovation: Retrace for The Positive Impact of Research

Since its inception, research in Artificial intelligence (AI) have examined a genre of problems, explored a wide range of sub-areas and approaches for the research. For the last 20 years, AI research has been particularly reflected upon the problems adjacent with the design and formation of intelligent systems, applications and building agents. In this particular context, economic notions of rationality and statistical learning methods have been followed as the criteria of intelligence. the adoption of probabilistic representations which has led to integration of the different areas of AI and mixed areas like machine learning, neuroscience, deep learning and other fields been emerged. Combining with the availability of data and processing power has although performed different seminal roles of speech recognition, machine translation, image processing as well designing of intelligent system, question-answering systems, particular area specific application combined with more than one AI technology. Example: robot functioning with sensors.

The competence between AI and its related areas been initiated and came out from the laboratory research practices to commercial significant and available technologies. There is now a broad consensus that impact of research in AI on society is being increased along with its advancement and continuous furtherance progress. Human mind and intelligence is being distinguished mark as the resulted identification into exceptional huge benefits. Maintaining this substantial potentiality of AI, it is important to investigate while avoiding potential hazards, how benefits should get maximized.

As the artificial intelligence is interdisciplinary by nature, with the continuation of these efforts, the process of responsible innovation can be understood from the perspective of both AI and society with the participatory involvement of all the actors associated with both side. Throughout the complete process of innovation, society should get embedded with scientific and technological advancement (from laboratory research to designing of

commercial product) and should ensure sustainability as well ethical and social acceptability. All the relevant actors should be mutually responsive to each other to make innovation process more interactive, robust along with the transparency. To achieve this purpose, it is worthwhile briefly to open the ideas and notion behind RRI in order to better understand should be taken the way initiated how these ideas could be more considered with the emerging artificial Intelligence based systems and technology.

ii) Responsibility as a theme of Research and Innovation : Need for innovation and responsible research in Artificial Intelligence

The incremental and sustainable progress in AI research enlist it timely to focus, asses and evaluate its research with the ability to constitute and contemplate along with intend to make it in larger interest of society for benefits of AI.

As the development of AI systems incarnate significant value of intelligence and automation which leads to constitutive ethical and legal questions in association with AI technology having a prominent influence on both producers and consumers. These questions extended within the broader spectrum of areas of law, public policy, philosophical and professional ethics, and for solution, expertise will be required from different areas such as computer AI scientists, technical and legal experts, political scientists, social scientists, policy makers and ethicists.

III. RATIONLE

Emerging technologies or technological innovations always take place in institutional context due to the lack of any related policy or forum for the evolution of that particular technology. So, there are the only procedure for the assessment of quality assurance of products or technology, proper follow up safety mechanisms, evolution of robustness and efficiency. While doing the early assessment of combination of both the ethical issues as well societal inclination and acceptance, there is a need for interactive approach among the actors involved in whole innovation process such as group of scientists, technologists, innovators and other stakeholders. The rationale here is that since prime objective of innovations should primarily responsible towards the society, in order to meet with societal exigency. The participation of different stake-holders is must to deal with the different societal complexities and associated ethical problems with particular technology or innovation. At the earliest possible stage of innovation process, It is expected there to

involve multiple stakeholders consists group of scientists and engineers, social scientists and philosophers.

We shall infer, remaining to the above line of context, Concept of responsible innovation can best be addressed and considered as an interposed involvement of social scientists and ethicist in laboratories during the process of innovation within the institutions. The urge for institutional reflexivity approach will be indorsed, discussing reflexivity during the institutional practice which emphasizes scientists to become more open towards their role and moral responsibilities in public.

IV. RESPONSIBILITY AS A SOCIAL ATTRIBUTION

Responsibility can be determined as a socially constructed manner which considered being responsibility ascriptions, and as the core entity initiating and constructing relationships between a set of different entities such as relates the relationship responsibility to ICTs. Among the various major issues, legislation and regulation considered to be the most prominent. The protection of intellectual property and data privacy taken as major issues in this regards. The highly contested areas regarding the role and responsibilities of involved multiple significant actors being discussed:

- 1) **Law and Liability for autonomous systems:** How the safety concerns of autonomous systems should come under the legislation? Such as self driving cars and drone aircraft what are the liability concerns? Which legal can address such issues? Does legal questions about AI and autonomous systems be handled by existing regulation under cyber law", or resolved differently?
- 2) **Machine ethics:** How should an autonomous vehicle come under the ethical framework against the probable large material cost with compare to the small human injury?
- 3) **Engagement of Different stakeholders:** How does public engagement be initiated by lawyers, technologists and policymakers on these issues of safety and security concerns? Or should come under the agenda of national security objective?
- 4) **Ethics for Autonomous weapons:** How can practically the ethical use of autonomous weapons are implemented? Should come under with the humanitarian law or should be banned as suggested by various international organizations? How practically be enforced? How responsibility and liability be distributed with these

weapons should be accepted? How can public debates should be organized on these issues and transparency be achieved?

- 5) **Privacy:** how data obtained from surveillance cameras, phone lines, emails, etc ensure and should deal and interact with the right to privacy?
- 6) **Professional ethics:** evolution of past and current projects to explore these questions in order to assess AI impact and ethical issues [4]. How the role computer scientists should be ensures to play under the law and professional ethics of AI development and uses?

V. RESPONSIBLE RESEARCH AND INNOVATION AS SHARED AND COLLECTIVE RESPONSIBILITY

In order to meet the shared goals, responsibility and their relationships may be presented in many forms: as collective, individual and professional as the previous section has shown. Many of these responsibilities are mutually constitutive and interlinked. For example, as a professional responsibility, laboratory scientist or AI researcher may be having to develop a code for AI system or application designing for a customer within time with a specific quality; As a legal responsibility, possibly have to deal with existing regulation, like: data protection or copyright law; also may have moral responsibility for ensuring the fairness user behavior in the system and a responsibility toward her peer scientists and researchers to ensure transparency of her code. Along with above mentioned responsibilities. As team responsibility, have may be ensuring responsible behaviour by team members. Therefore, responsibility be defined as collective activity to achieved shared goals. Understanding more than of responsibilities, with different degrees of visibility and validity. The different responsibilities may be mutually supportive, but they may also be contradictory. Further, in the field of artificial intelligence, this idea as a mutually shared responsibility could be explored.

VI. CONCEPTUAL FRAMWORK

A. Responsible Innovation as an embedded involvement of social scientists and ethistht in laboratory practices: The discussed ethical issues reflect a huge gap between the laboratory practices and social world which require to ensure that not only distinct technical standards and perspectives comes under the responsible innovation but broader societal concerns should also be meditated. Recent attempts and studies in this

regard would have seen to be focused on the active participation of philosophers and social scientists at laboratory level and demonstrated success in it [6] approaches in this regard have been included ethnographic, laboratory practices, interviews with scientists, ethical technology assessment.

B. To build bridge between external value system and scientific practices: need for institutional reflexivity and interdisciplinary research responsibility demands on the parts of institutions and actors through the different forms of engagement with the social world. While following [6] need for institutional reflexivity in governance is demonstrated in order to allow innovation to be proactive and to be with social responsibility. Background, repository, and societal discourses once will present in the institutional framework, the conditions will be compatible for the incorporation of ethics and reflexivity into technical standards and application usage.

Technological development work within the particular stakeholder dynamics with their involvement and take place in specific institutional contexts. Such given institutional context incorporates two main categories: (i) formal institutions such as laws, standards, regulations and contracts; and (ii) informal institutions such as customs, traditions and routines [10].

In the case of artificial intelligence, development of AI systems which embody and inherent significant amount of both intelligence and autonomy, leads to important legal and ethical questions, user centered issues , privacy and data security concerns and intellectual property related issues rights of whose impact could be realized on both producers, consumers and society. The associated institutions in this area have a responsibility not only to reflect on their own value systems but also to help building the reflexive capacity within the practice of science and innovation.

In this particular context, interdisciplinary research approach is required for responsible innovation. Alongside science, technology and engineering it is suggested that responsible innovation can consist: (i) the ethics of technology, in order to investigate during the technological design of AI systems and applications ; (ii) the perspective of institutional theory, for understanding the role of institutions in the realization of values to intake within ; and (iii) to focus on stakeholder engagement for the policy, planning the in the area of artificial intelligence from the Science, Technology and Policy perspective [9].

VII. CONCLUDING REMARKS AND FUTURE RESEARCH

7) Governance of Science, technology and Innovation through Inclusive Public Participation: responsible innovation requires an ideal approach of timely and continuous inclusion of various stakeholders' during the process of technological design includes public values which can be extracted from the public debate. The taken insights of this interdisciplinary research should then inform to the decision-making process, to the relevant technological design and to the associated institutions.

We conceptualized RRI in Artificial Intelligence as an embedded involvement of social scientists and ethicist in laboratories during the innovation process within the institutions. There is the need for institutional reflexivity approach, reflexivity should be discussed at the level of institutional practice which asks scientists to open up their responsibilities towards the public, blur the boundary line between their role responsibilities as a laboratory scientist along with the more moral responsibilities in public sphere.

8) How should interdisciplinary research be done?

In order to attune research and innovation processes to the need and benefit of society. Interdisciplinary research has been recommended by policy makers, social scientists, technologists and philosophers. Empirical studies [9] show how interdisciplinary research can address ethical and societal aspects of technological development during the R&D stage, contributing to have an increasing reflexivity among institutions and scientists. On other side, sometimes, as argued by others that the ethical issues rose during R&D sometimes “cannot be tackled and solved within the laboratory and/or during the laboratory practices should be put on and beyond the agenda of groups outside the laboratory” [10]. The suggestive approach proposes to fill this gap by broadening the perspective of design which includes the analysis of relevant institutions and give emphasize on the processes of stakeholders' participation. To increase the effectiveness of such interdisciplinary research Indeed, we need to seek methods in this particular context. Thus, an ideal approach to responsible innovation should address the challenge of modifying the design of not only related particular AI systems and technology, but also of associated institutions and stakeholders' involvement [9].

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