Artificial Intelligence:
Calling on Policy Makers to Take a Leading Role in Setting a Long-Term AI Strategy

**An IEEE European Public Policy Initiative
Position Statement**

Adopted 15 October 2017

Artificial Intelligence (AI) is quickly finding its way into the lives of people all across the world, thanks to the innovative work of scientists and technologists, many of whom are IEEE members. As AI becomes a greater part of our everyday lives, so does the discussion about managing risks and rewards. As more applications of AI are developed, IEEE members are leading the debate on how to build trust, prevent drastic failures, and integrate ethical considerations into the design of AI technologies.

Summary

The IEEE European Public Policy Initiative (EPPI) supports the vision that the major goal of AI applications is to create value that benefits people. This statement aims to facilitate the design of European AI policies. The following recommendations target the European Union (EU) institutions, the member states' governments, and the involved agencies:

- Increase AI expertise within the EU institutions and member states public bodies, support AI education and retraining of the workforce
- Align strategy, actions, and policy between EU institutions and member states; define a policy regarding intellectual property, certification, and standards, in particular for the system industry (manufacturing, transport, energy industry, medical systems, space, etc.)
- Increase R&D budgets in Europe, and align a strategy between the EU and the member states, encourage exchanges between strong European competence in AI and cyber physical systems, in particular for applications in the system industries
- Promote public trust, understanding, and discourse about AI and the consequences of applications and policies regarding AI.

IEEE EPPI Recommendations:

1. **AI R&D and expertise.** R&D funding for the AI sector should be increased, and more AI expertise be constructed, to provide sound and applicable AI technology that can be trusted. Common research with the domain of cyber physical systems should be encouraged. Educative programs need to be

defined towards acquiring technical expertise in AI, particularly focused on younger generations and not just at the university level.

2. **AI societal impact.** It is recommended to increase funding of interdisciplinary research on societal implications of AI. Research topics range from basic research into intelligence to principles on ethics, safety, privacy, fairness, liability, and trustworthiness of AI technology. Societal aspects should be addressed at not only an academic level, but also involve business, public authorities, and policy makers. Safety of systems involving AI and interacting with the "real world" should be studied. Protection of the citizens should be considered as a first-order priority.

3. **AI & jobs.** Due to automation in industry, jobs are already being replaced. AI applications will continue to substitute humans in repetitive, less skillful work or critical tasks (such as in medicine). It is recommended to design strategies for creating new jobs that machines cannot do as well, including complex reasoning requiring more creative skills, and supplement them by educational programs. AI could also upset existing system industries, with potential consequences in terms of jobs or economic strength in these industries.

4. **AI is a product and AI is in many products.** AI algorithms and applications have to be considered as products and owned by companies, and therefore the companies should be responsible for the AI products not being a threat for humanity. Moreover, many industries, in particular system industries (automotive, air and space, defense, energy, medical systems, manufacturing) are going to be deeply changed by the surge of AI. This evolution could have a deep impact on existing strengths, trade balance, and jobs.

5. **AI standards and regulations.** The regulations should address transparency and accountability of AI algorithms, risk management, data protection, and for system industry and safety. Certification of systems involving AI is a key technical, societal, and business issue. It should provide measures when someone (company, person) does something inappropriate and how to enforce the law. Good regulation should not stop innovation, and should be based on standards, where possible, to be innovation-friendly.

Background

The field of Artificial Intelligence (AI) research was formally established at a conference at Dartmouth College in 1956. However, still in 1940, Alan Turing's theory of computation suggested that digital computers could simulate formal reasoning (Turing test). The goal was to investigate ways in which machines could mimic cognitive human functions, such as learning and problem solving. Since then, the field of AI went through ups and downs (such as in the 1960's as well as the mid 1970's) due to over expectations, limitations in knowledge acquisition, and computational resources. Nevertheless, there have been also significant advances and from academic areas of study, nowadays, AI is embedded in mainstream technologies such as robot motion planning and navigation, computer vision (i.e. object recognition), natural language processing and speech recognition, data processing, and knowledge representation and reasoning.

A substantial increase is expected in future applications of AI, including autonomous vehicles (such as drones and self-driving cars), medical diagnosis, treatment, and physical assistance for the elderly, to mention a few.

At the same time, AI technologies created new challenges for the economy and the society. A common concern about the development of AI is the potential threat it could pose to humankind. The opinion of experts within the AI field is mixed; however, development of militarized artificial intelligence is a commonly shared concern. The United Nations (UN) initiative on banning autonomous weapons[1] was followed by the open letter of leading AI and Robotics researchers[2] .

With this position statement, IEEE EPPI wants to share its vision that, like other technologies, AI has the potential to be used for good or harmful purposes and encourage urgent discussion about the best direction of AI development to create useful AI applications with profound positive impact on society.

Promote Public Understanding of AI

Several organizations and communities are engaged to promote trust and understanding of AI. IEEE launched *The IEEE Global Initiative for Ethical Considerations in Artificial Intelligence and Autonomous Systems[3] (The IEEE Global Initiative)* in April of 2017, and it is comprised of over two hundred and fifty global thought leaders and experts in AI, ethics, and related issues. The goal of The IEEE Global Initiative is to find broad consensus on how these intelligent and autonomous technologies can be aligned to moral values and ethical principles that prioritize human well-being. Public comments and input about the first version of their *Ethically Aligned Design* document received over one hundred and fifty pages of feedback from countries around the world, including China, Japan, India, Mexico, and Russia. The IEEE Global Initiative also identified many areas where standards are needed and, as a result, IEEE has initiated the IEEE P7000™ series of ethically oriented standards.

Google, Facebook, Amazon, IBM and Microsoft have created the Partnership on Artificial Intelligence to Benefit People and Society[4], dedicated to advancing public understanding of the sector of AI, as well as coming up with principles for future researchers to abide by. The Partnership aims to develop principles on ethics, fairness, privacy, trustworthiness, liability and safety. How ethics and values could be embedded into the AI algorithms; how to ensure transparency, fairness and accountability of the algorithms; whether there should be a general legal framework for algorithms or whether there should be sector specific regulations reason.

The 2016 IEEE AI & Ethics Summit[5] (15 November 2016, Brussels) brought together technology leaders and policy makers to discuss their vision for what AI means to the future of humankind. The panels converged around the belief that prior to writing legal regulations, ethical issues need to be considered. How to program human ethics? Are the machines capable of making what humans consider as ethical or moral decisions? Should they make decisions or do humans need to be in the loop?

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[1] https://www.un.org/disarmament/geneva/ccw/background-on-lethal-autonomous-weapons-systems/
[2] https://futureoflife.org/open-letter-autonomous-weapons/
[3] https://standards.ieee.org/develop/indconn/ec/autonomous_systems.html
[4] https://www.partnershiponai.org/
[5] https://euagenda.eu/events/2016/11/15/ieee-ai-ethics-summit-2016-

The public hearing on Artificial intelligence & Society[6] (1 February 2017, Brussels) joined speakers from academic, corporate, and trade union backgrounds to discuss the broad impact of AI seen from all corners of society (labor, safety, privacy, ethics, skills, etc.). The input and information gathered at this hearing is intended to feed into EU policy on AI.

Civil Law Rules on Robotics: Prioritizing Human Well-being in the Age of Artificial Intelligence, an event organized by Knowledge4Innovation and IEEE-SA and hosted by IEEE in the European Parliament in April 2017, featured experts from The IEEE Global Initiative, along with officials working on these topics, for a multifaceted dialogue. The event was hosted by MEP Mady Delvaux, who served as Rapporteur on the Civil Law Rules on Robotics Report. By addressing issues of autonomy and liability (including aspects of robotic personhood), the effects of job transformations, and privacy and data protection, panelists explored how it is only by prioritizing human well-being when introducing AI into society that we will avoid unintended consequences and redefine progress in the age of AI.

The success of AI technology depends on the ease with which people use and adapt to AI applications. *Eurobarometer survey on autonomous systems[7]* (June 2015, European Commission, Directorate-General for Networks, Content and Technology -DG CONNECT) looks at Europeans' attitudes to robots, driverless vehicles, and autonomous drones. The survey shows that those who have more experience with robots (at home, at work or elsewhere) are more positive towards their use. Moreover, the way AI systems interact with end users and help them to build cognitive models of their power and limits, are key technological objectives that help their adoption and sense of control.

AI Impact on the Labor Force

The impact of AI on the workforce has to be a major concern of EU policymakers. The educational agenda needs to be refocused in order to equip the workforce with the necessary digital skills to compete on the free market. AI coding and understanding of how intelligent systems work needs to be trained as new literacy skills for any human. New jobs are required interfacing the AI systems and their end users.

With the emergence of new AI-based industries and, in general, the digital knowledge-based economy, the proportion of the labor force requiring some form of education or training beyond high school will increase significantly. EU governments, business, and educational institutions need to share the responsibility for investment in education and training in order to increase a skilled workforce. Pragmatic educative programs need to be designed targeting different generations and different levels of education (not only in the University environment), covering technical and societal (ethical) aspects of AI. Major challenges for policy makers to consider include how training should be organized (e.g. based on projects and learning through examples), by whom (which governmental agency), with what money, who will pay people while they are educated / reskilled.

Valuable recommendations to the EU policy makers regarding the consequences of Artificial Intelligence on the (digital) single market, production, consumption, employment and society are provided in the recently published report-opinion of the European Economic and Social Committee (rapporteur Catelijne Muller)[8].

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[6] http://www.eesc.europa.eu/?i=portal.en.events-and-activities-artificial-intelligence
[7] http://ec.europa.eu/public_opinion/archives/ebs/ebs_427_en.pdf
[8] http://www.eesc.europa.eu/m?i=portal.en.int-opinions.40538

In the midst of budget deficits and rising unemployment, it may be difficult for some to accept the fact that there is a very different and problematic future looming on the horizon. If we do not adopt proactive policies now, we will face a future with large numbers of unskilled workers looking for jobs that require skills they do not possess (people without jobs), and a large number of jobs that will go unfilled (jobs without people).

Providing a highly qualified workforce to maintain the EU competitiveness in AI and providing employment alternatives for those who lose their jobs due to AI are equally urgent labor issues that need to be addressed by the EU governments. It may be useful to further explore the potential efficacy of the universal basic income experiments recently started in Italy and Finland.

AI Research and Development

Science and technology policy is one of the missions of the EU for which a multi-annual budget exists. The current instrument for this is the European Commission (EC) funding program, Horizon 2020 (2014-2020). However, the EC and member states need to further increase the funding for AI R&D in order to enable industry and the research sector to explore the risks and opportunities raised by their dissemination of AI-based technologies and solutions. The EU investment plan in AI R&D needs the coordinated efforts of the EC, member states, industry, and the European Fund for Strategic Investment, focused into sectors of European leadership, such as the system industry, personalized medicine for early diagnosis, prediction and prevention of diseases, and ecological and environmental disaster prediction.

Effective Regulation and Standardization

In order to avoid fragmentation of standards in the single EU market, it is important to create a mechanism for harmonizing the regulatory actions of different agencies that govern economy sectors related to AI at the EU level and at the member state level. The regulation needs to take into account that AI is not only a product but a component in many products.

On 31 May 2016, the EU Committee on Legal Affairs (JURI) published a draft report on Civil Law Rules on Robotics[9], which was officially voted by the EU Parliament on 16 February 2017. The report makes recommendations to the European Commission for specific rules regarding autonomous vehicles, drones, and medical-care robots. It also reflects the EU understanding of AI as an underlying component of many technologies (particularly in autonomous robots) and not only as a standalone technology. AI is considered as something that enables autonomy in other technological systems, such as in system industry (manufacturing, transport, energy, medical systems, space, etc.). The report calls for the creation of a European Agency for Robotics and AI, consisting of regulators and technical and ethical experts to monitor AI and robotics-based trends, identify standards for best practices, recommend regulatory measures, define new principles, and address potential consumer protection issues.

The results from the European Parliament public consultation on the future of robotics and artificial intelligence with an emphasis on civil law rules, showed widespread support for further regulation in the area[10]. The current EU legislation needs to be re-evaluated and new EU-wide legal tools adopted, particularly regarding liability rules. A relevant step in this direction is the call for rules to regulate the use

[9] http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-
//EP//NONSGML%2BCOMPARL%2BPE-582.443%2B01%2BDOC%2BPDF%2BV0//EN
[10] http://www.europarl.europa.eu/cmsdata/130040/summary-report.pdf

of robots, including creating a separate legal status for robots[11], proposed by the JURI and the Working Group on Robotics, chaired by Mady Delvaux. Major legal issues to be addressed by the new binding EU legislation include:

- Establish liability of industry for accidents involving autonomous machines (such as smart robots, driverless cars). This poses a challenge to existing liability rules where a legal entity (person or company) is ultimately responsible when something goes wrong
- New AI product safety regulations are needed
- Protection for citizens and businesses in case of malfunctioning software
- AI machines pose challenges in terms of data protection
- Mandatory insurance of AI products

Complementary to legislation, a guiding ethical framework for the design, production, and use of AI is required, based on the principles of human dignity and human rights, equality, justice, non-discrimination, and social responsibility. Ethical codes of conduct for AI researchers and designers, as well as licenses (rights and duties) for designers and users, need to be taken into account when proposing new legislation. Further to that, AI accountability and transparency have to be addressed as an explicit guiding ethical principle.

The leading role of EU governments and policy makers in setting a long-term AI strategy, instead of leaving it to industry and the research sector, is of paramount importance. This is particularly justified if the AI development is defined in terms of where we want to go, rather than how quickly we may get there[12].

The European institutions and member states need to collaborate with multi-stakeholder bodies, such as IEEE, the European standardization organizations and other relevant global standardization organizations, and the European Association of Artificial Intelligence[13], in order to harmonize technical standards for the European market as a means of consumer protection.

IEEE is already developing a series of standards focusing on ethical considerations in AI and AS (Autonomous Systems), including:

- IEEE P7000 (Model Process for Addressing Ethical Concerns During System Design)[14]
- IEEE P7001 (Transparency of Autonomous Systems)[15]
- IEEE P7002 (Data Privacy Process)[16]
- IEEE P7003 (Algorithmic Bias Considerations)[17]
- IEEE P7004 (Standard on Child and Student Data Governance)[18]
- IEEE P7005 (Standard on Employer Data Governance)[19]
- IEEE P7006 (Standard on Personal Data AI Agent Working Group)[20]

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[11]http://www.europarl.europa.eu/news/en/news-room/20170210IPR61808/robots-and-artificial-intelligence-meps-call-for-eu-wide-liability-rules

[12] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2906249

[13] https://www.eurai.org/

[14] https://standards.ieee.org/develop/project/7000.html

[15] https://standards.ieee.org/develop/project/7001.html

[16] https://standards.ieee.org/develop/project/7002.html

[17] https://standards.ieee.org/develop/project/7003.html

[18] https://standards.ieee.org/develop/project/7004.html

[19] https://standards.ieee.org/develop/project/7005.html

[20] https://standards.ieee.org/develop/project/7006.html

The EU General Data Protection Regulation (GDPR), expected to be enforced on 25 May 2018, is a promising document that holds the chance of keeping the leading role of the EU in protecting their citizen's rights not just to privacy but to consent.

Postface

If society approaches these technologies primarily with fear and suspicion, missteps that slow AI's development or drive it underground will result, impeding important work on ensuring the safety and reliability of AI technologies. On the other hand, if citizens are informed about the positive benefits of AI, while being educated in terms of skills and jobs, the technologies emerging from the field could profoundly transform society for the better in the coming decades[21].

Related Note

IEEE-USA has also recently published a [Position Statement on Artificial Intelligence Research, Development and Regulation](#),[22] targeting the U.S. Government and Federal Agencies. Both position papers (IEEE-USA and EPPI) are compatible and share the same principles, however their target audiences are different.

This statement was developed by the IEEE European Public Policy Initiative and represents the considered judgment of a broad group of European IEEE members with expertise in the subject field. IEEE has nearly 60,000 members in Europe. The positions taken in this statement do not necessarily reflect the views of IEEE or its other organizational units.

Contact Information:

Should you want to get in touch with IEEE European Public Policy Initiative or find out more about its activities please go to: http://www.ieee.org/about/ieee_europe/index.html

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[21] https://ai100.stanford.edu/
[22] http://globalpolicy.ieee.org/wp-content/uploads/2017/10/IEEE17003.pdf