The Impact of the EU AI Act on the UN Sustainable Development Goals for 2030 – A Text Analysis

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Abstract. *This article conducts an analysis on the content of the Artificial Intelligence Act which has recently been passed by the European Parliament and which is expected to be implemented during a two-year stepped transition period. Artificial Intelligence has been praised for significantly increasing the efficiency with which businesses, institutions, and countries as an extension, have been able to develop their sustainable development goal scores towards the United Nations' 2030 ambitions, especially in implementing sustainable business development, urban development, renewable energy, healthcare, education and more. Contrary to these contributions, a large number of researchers and international organizations have signaled the necessity of ensuring the application of ethical and legal considerations during the development and usage of artificial intelligence and machine learning models through the use of data management, protection, and ethical modeling experts within organizations. The article thus seeks to highlight the areas of sustainable development most impacted by the introduction of the Artificial Intelligence Act, both negatively in slowing down innovation, and positively in ensuring the safe and ethical use of these technologies. The methodology of research used involves sentiment analysis using Python's Natural Language Toolkit followed by keyword mapping to enable a targeted view into the most positive/negative pages of the act, the most highly mentioned sustainable goals, and the mapping between this sentiment and the mention count.*

Keywords: artificial intelligence, regulations, sustainable development goals, AI act, sentiment analysis

Introduction

The field of artificial intelligence has seen a tremendous leap in its capabilities in the 2019-2024 period, effectively expanding what was once exclusive to highly advanced research centers to businesses and consumers – effectively, artificial intelligence has reached a stage of development at which it can be packaged and sold as various services which even the least digitally-learned members of society can derive value from.

At the same time, organizations began to experiment and implement AI models in order to improve their processes, enhance products or employee productivity, and on a larger scale, attempt to contribute or solve the main challenges of not only the organization, but the world as a whole. In September 2015 the members of the United Nations unanimously approved the organization's 2030 agenda for sustainable development goals (SDGs), outlining the 17 most critical pain points of the world, which necessitated a worldwide effort in order to improve or solve these issues. Of the SDGs, we can mention "No Poverty", "Zero Hunger" and "Good Health and Well-being" as just the first three objectives the world has undertaken to complete.

Now, noticing the velocity of divergent technologies such as AI, organizations are tasked with contributing to the SDGs by harnessing this technology. Increasingly readily available and seemingly unchecked models have thus raised an alarm for regulators, which were prompted by their charters, governments, and overall societal consciousness to bring them under control in an effective and timely manner. In a first-of-its-kind regulator response, the European Union (EU), through the Commission and Parliament, developed and passed a comprehensive risk-based legal

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act aiming to control the development and usage of artificial intelligence models within its borders, and by extension, protect the data of EU citizens used by foreign companies as well.

Within this article we will analyse the requirements of the AI act within the context of models being used for the advancement of sustainable development goals, how this might impact the velocity or level of completion otherwise possible with fewer restrictions, and what is expected of such AI models in terms of controls.

Literature review

Artificial Intelligence – Research & Development Speed, Models &Usage

The pace at which can currently be called "exponential disruptive technologies" (Bongomin et al., 2020) has historically been largely tied to the general advancement in technology as a whole, becoming "exponentially disruptive" only in recent decades, when different uses of artificial intelligence, machine learning (ML), blockchain, Internet of Things (IoT) and others came to be more easily defined and understood. The evolution of artificial intelligence technology has largely been categorized into an initial phase of discovery between 1956 and 1980 when Alan Turing first proposed that machines had the potential to become "intelligent" and the Turing Test was constructed. Machine learning and artificial intelligence would begin to get some attention from research centers and investments began to be made between 1980 and 2000, ultimately exploding in the following decade (Lu, 2019), and entering a deep learning / end-user consumption phase starting in 2010. (Klinger et al., 2021). As a simple metric for demonstrating the change in the speed of development, it was found that in 2019 preprints were being submitted to arXiv 148 times faster than they were in 1994, indicating an immense evolution of priority in technology research. (Tang et al., 2019)

Once fellow disruptive technologies such as machine learning, blockchain, Internet of Things, and more became widely used, the turn for artificial intelligence had finally come, pulled together in what a proposed theory calls technological parasitism (Coccia & Watts, 2020), the versatility of machine learning and AI technology came to be realized in more concrete ways for organizations and people in general, various different types of models were conceptualized and eventually implemented, which in turn cascaded into ML/AI being considered for more and more possible solutions. Artificial intelligence can be categorized in many different ways, depending on the view required, such as in terms of technical architecture, properties, users, or usage. From a usage standpoint, the most viable fields for AI are education (Moreno-Guerrero et al., 2020), (Beck et al., 1996), healthcare (Jiang et al., 2017), finance (Cao, 2021), agriculture (Eli-Chukwu, 2019), disaster management (Sun et al., 2020), smart cities (Allama & Dhunny, 2019; Ullah et al., 2020), as well as rule of law (Kaplan & Haenlein, 2020; Rissland et al., 2003), the military (Svenmarck et al., 2018), and many more (Das et al., 2015). One such important field in current society is sustainability, namely sustainable artificial intelligence. This terminology has two meanings, namely using AI sustainably and reducing carbon emissions generated during its training, or using AI for sustainability-related purposes, in what is called "AI4Sustainability" or "AI4Good". (van Wynsberghe, 2021)

Sustainable Development Goals

Following a landmark proposal from the United Nations, on September 2015 the world came together and unanimously approved the "Sustainable Development Goals" or "SDGs" initiative, defining 17 pain-point areas of the world that require the cooperation of all countries in order to protect the planet and ensure prosperity for all. The program has thus set 169 targets spread across the goals which had to be reached under its central "Leave No One Behind" pledge (United Nations, 2015).

Research predating the Sustainable Development Goals highlighted the benefits of a global mobilisation in ensuring that progress in critical causes such as poverty, social inequity, education, or healthcare is made uniformly across the entire world, with several mentions being made to the SDG precursor, the Millenium Development Goals and their benefits in the 15-year timespan they were planned for (Sachs, 2012).

Considering private and public sector contributions, the lines drawn appear to be clear – the work of the public sector is expected and generally done in publishing the general guidelines or policies for supporting the private sector, essentially enabling and encouraging economic actors to contribute to the SDG targets as set out by the UN (Meuleman, 2021). The private sector is an important, if not the deciding factor in the world's success on SDG targets. Most large companies mention SDGs in their sustainability reports and stakeholders have been found to be more and more interested in whether an organization is doing enough for sustainability. Literature has indicated that the internal factors of a company matter significantly in whether it will participate in sustainability-related activities, depending heavily on the sector, age of the company and board, and the proportion of female board members in the company (Rosati & Faria, 2019).

What is clear is that SDG progress can only be made by sustainability permeating every aspect of every society, in public and private sectors alike, down to every person on earth in order for any of it to make a difference.

Sustainable Development with AI

The use of AI in supporting sustainable development goals and their applicable fields has been widely published about, especially in terms of monitoring (Falk & van Wynsberghe, 2023) in areas such as water/waste management, agriculture and general industry and consumption, and improving existing processes, such as in healthcare, education, smart cities and the reduction of energy consumption. Particularly, education artificial intelligence systems are being used to provide students of all levels with a more comprehensive learning experience by analyzing and determining their gaps more easily and across a multitude of subjects (Luckin, et al., 2016). In healthcare artificial intelligence is becoming an important tool for optimizing pharmacology, symptomology, and cause-effect analysis, assisting in determining the optimal treatment options and even helping reduce the risk of surgery complications by providing a more personalized approach catered to each patient (Davenport T, 2019).

Models of artificial intelligence used in conjunction with IoT delivers value on the societal effort to reduce the energetic consumption of cities and therefore reduce carbon emissions by analyzing and optimizing device electricity consumption from both micro (individual households) and macro (smart cities, smart countries) levels of usage (Kumar, 2020; Ullah et al., 2020). This leads however to the indirect or even direct influence of AI in critical infrastructure such as local, regional, or national electricity grids, which may pose risks for national security (Niet et al., 2021) and thus any positive impact of such models would be of a very limited impact overall in a country's contribution to the sustainable development goals (Wirtz et al., 2018).

AI models may also prove to be detrimental to the SDGs in various fields of application, depending on the intended usage (Galaz et al., 2021). For example, AI models have been shown to discriminate against various categories of minorities due to the bias introduced by the training datasets' majority's features, an issue that could potentially set back the world's progress in reducing inequalities. In order for AI to be used successfully in advancing progress on the SDGs and sustainability in general, Tomašev et al. (2020) proposed 10 guidelines that artificial intelligence technologies have to respect in order for them to be effective in solving sustainabiliy-related problems, as follows:

G1 Expectations of what is possible with AI need to be well-grounded.
G2 There is value in simple solutions.
G3 Applications of AI need to be inclusive and accessible, and reviewed at every stage for ethics and human rights compliance.
G4 Goals and use cases should be clear and well-defined.
G5 Deep, long-term partnerships are required to solve large problems successfully.
G6 Planning needs to align incentives, and factor in the limitations of both communities.
G7 Establishing and maintaining trust is key to overcoming organisational barriers.
G8 Options for reducing the development cost of AI solutions should be explored.
G9 Improving data readiness is key.
G10 Data must be processed securely, with utmost respect for human rights and privacy.

Figure 1. Guidelines for AI For Sustainable Goals

Source: creation by Tomašev et al. (2020) in "AI for social good: unlocking the opportunity for positive impact", https://doi.org/10.1038.

The proposed guidelines are of both technical and natural perspectives, hinting that the issue of AI is not only one of technical readiness but also one of change and stakeholder management. Of the 10 guidelines, only G8-G10 are of a predominantly technical nature, which only enforces the importance of people in such issues, and less so the models themselves. To this end, the EU AI Act may be the key to providing the confidence people require in order to accept such technologically advanced, and for many people incomprehensible, solutions. Of course, this being "localized" legislation the impact on the scale of the world may be reduced, but it could very well become the first wave in what seems to have become a race for world-wide AI/ML regulations. (Smuha, 2021).

Methodology

Our analysis aims to determine the level of impact stemming from the newly passed EU AI Act on the contribution of AI in sustainable development goals. We would have to first understand the impact on AI overall, determine how a model used in a particular SDG would behave and the regime of regulation it would be brought under in the near future. For a start, we conducted rudimentary sentiment analysis on the text content of the EU AI Act itself using Python's NLTK (Natural Language Toolkit) in order to tokenize all of the act's words, remove stop-words such as "so; a; for; be", followed by lemmatizing which extracts the root meaning of the word (e.g. vizualizing -> vizualize). We lastly compute the compound sentiment scores, calculated as the net sentiment score for each of the pages in the document.

Following the sentiment analysis stage, a text analysis is done on each page together with a list of SDG-related keywords from the University of Auckland SDG Keywords Mapping

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project (University of Auckland, 2021) in which we flag each of the pages with the relevant SDG keyword mentions, if any. Lastly, by mapping these with the related pages and sentiments, we are able to find the most "directly" affected SDGs. This approach is feasible due to the fact that a stricter regulatory proposal typically translates into a harsher wording used in the reasoning used, which would then lead to a more negative sentiment score for that page and the mapped SDG. We visualize the results using Tableau matplotlib.pyplot. Diagrams created using draw.io. The process is summarized in the following process flow diagram.

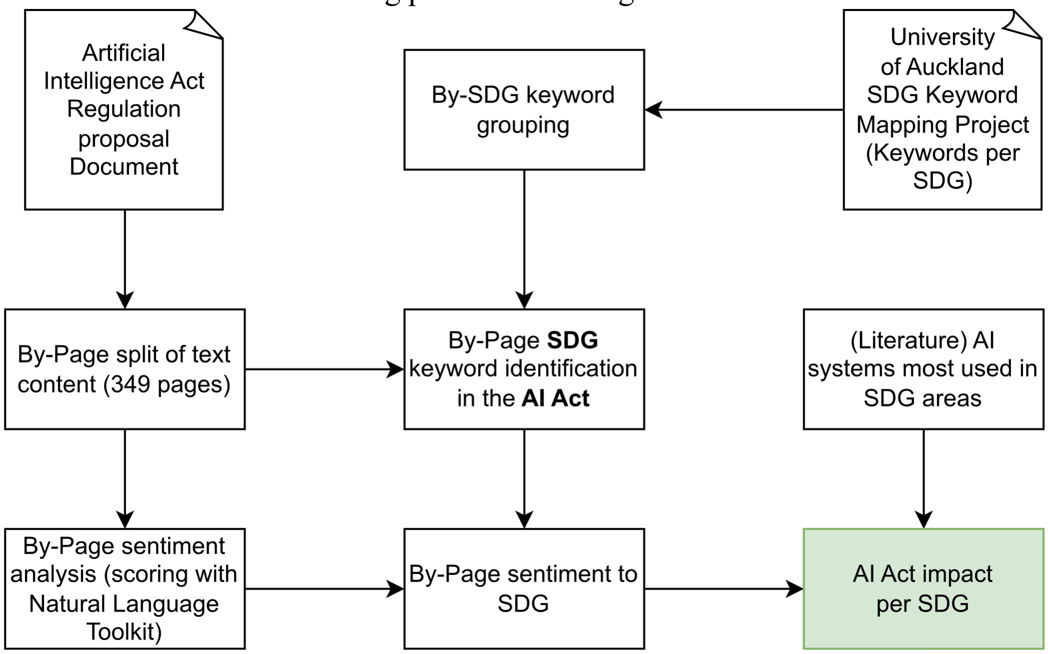

Figure 2. Process flow diagram of article analysis

Source: author's own elaboration, draw.io.

Results and discussions

AI Act – Risk Regimes and Sentiment

The AI Act details restrictions to be imposed upon AI models depending on the category of risk they fit into, which are defined as follows:

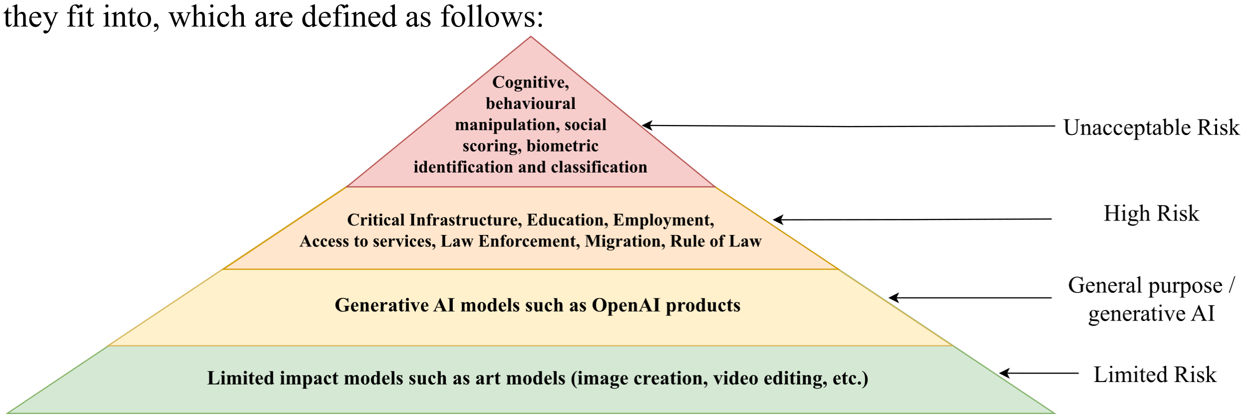

Figure 3. AI Act Risk Categories

Source: Author's own work, information adapted from EU AI Act, Tool: draw.io.

According to the area within which the model is meant to be used, the data used to build it, as well as the risks of misuse, AI models will be classed into one of the four risk categories and the risk management regime of that category will have to be implemented.
Of the examples provided by the act for fields requiring a "High Risk" regime, many would fall exactly within the boundaries of the SDGs – education, decent work, justice, access to healthcare, innovation, infrastructure and sustainable cities would be just a few falling almost certainly into "High Risk". These models will all have to be registered within an EU database as reference data and be evaluated for risks before being put on the market, as well as based on any changes occurring throughout their development which result in significant deviations from the original purpose or working model.
Considering the fact that the AI Act is a legal act meant to be as clear and un-interpretable as possible, in order for there to be a common understanding between independent readers, there are still certain parts of the document which are not fully neutral and this can be demonstrated using a simple sentiment analysis of each page's wordings, as shown below.

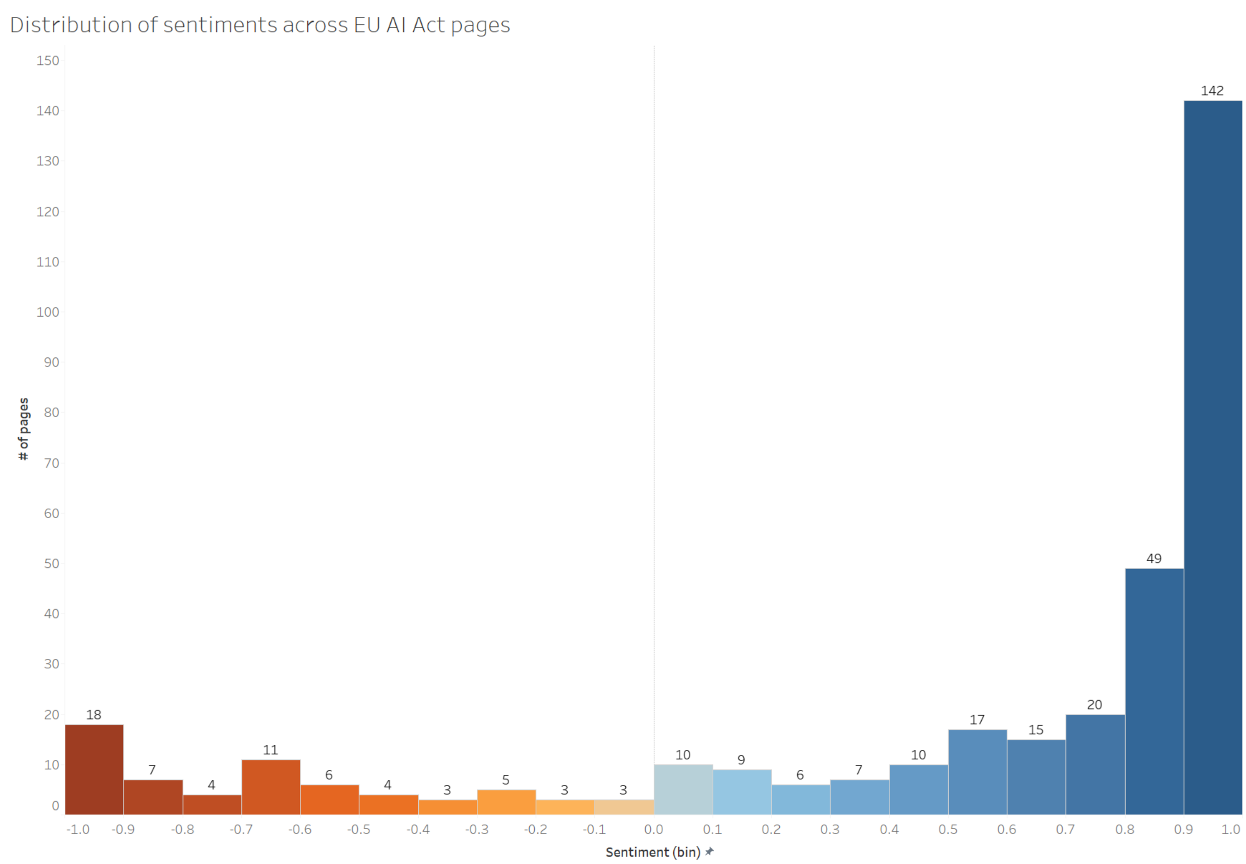

Figure 4. EU AI Act Sentiment distribution

Source: author's own work

The most "negative" compound scores, falling between -0.9 and -1.0, are those highlighting the risks of AI technology misuse and the potential consequences that can befall not only the users themselves but society as a whole. For instance, page 24 (S: -0.988) of the act contains the suggestion of using a risk-based approach in regulating AI technologies in order to

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block the development and usage of certain types of models while allowing others, albeit under the conditions required by the risk regime. Page 28 (S: -0.996) contains the proposal for regulation of real-time biometric identification models due to the risk of systematic bias being generated against members of society based on their age, disability, sex, ethnicity. The proposals for regulation often underline the fundamental attack upon fundamental rights by the usage of AI models and thus recommend one of the four levels of regulation depending on the risk, at times allowing small exceptions, for instance in biometric AI models which can be used in law enforcement activities that have judicially pre-cleared targeted searches connected to serious criminal offences which have already occurred (i.e., the usage cannot be proactive or based on suspicion), but otherwise biometric AI is prohibited. Similar negative sentiment pages include but are not limited to: performance metrics used to measure the resource and energetic efficiency of the models in relation to SDGs (p. 64-65), applicable sanctions and fines upon parties infringing upon the AI Act regulations (p. 308-312), details on the risk management framework implementation (p. 34-35), risks of low quality data (p. 51), regulations affecting AI that are already in place within the EU (p. 57), risks of black-box (uninterpretable/uncontrollable) AI models (p.76), prohibitions with regards to personal, sensitive data and profiling systems (p. 120-122), measures imposed onto producers with regards to raising the level of AI literacy across their organizations, such that its members cannot be deceived or mislead by the AI (p. 130-133), details regarding the critical risk areas detailed in Annex III of the act (p. 140-143), followed by a number of negative pages of the aforementioned in Annex III.

On the other side of the distribution, in the 0.9 to 1.0 bin (very positive) there is usually mentioned the benefits (positive) in the proposed regulations, and sometimes these regulations become positive through exemptions – pages 7 through 9 (S: 0.990 – 0.999) prove this very fact, as their contents emphasize the supporting role this regulation should have in AI-related scientific endeavors, claiming as follows: "*It is therefore necessary to exclude from its scope AI systems specifically developed for the sole purpose of scientific research and development and to ensure that the Regulation does not otherwise affect scientific research and development activity on AI systems*" (EU Commission, 2023). A large amount of the remaining pages focus on highlighting the importance of AI models in cross-sectoral innovation, methods of impact assessment and successful fields of application (p. 71-100), the authorities and their duties in the compliance process (p. 182-199), recommendations and proposals for harmonization of standards across the Union (p. 215-234), proposal for an "AI sandbox" simulation space (p. 242-256) and the roles & responsibilities of the AI Office to be established within each AI model producing organization (p. 257-264). These examples are not exhaustive of the content captured within the document, but the general idea of what separates "negative" from "positive" sentiment in the text can clearly be seen from the chosen sample. A number of pages are more or less neutral, typically those setting out to technical/legal/procedural specifications.

Sentiment on Sustainable Development Goals

In the following charts we will observe the visualization of identified SDG-related keywords within the text of the AI Act, mapped to the sentiment as red for negative or green for positive. The lengths of the bars signify the number of counts, with the sum of keywords identified at 130 (including multiple mentions of the same SDG on one page) or 113 unique mentions, i.e. "SDG per page". As we can see in the following stacked bar chart, SDG 11 – "Sustainable Cities and Communities" takes the lead by a considerable margin with it being mentioned on 34 different pages or 9.7% of the total page count. SDG 11 seeks to make cities safer and more inclusive of its citizens, with a focus on affordable and social housing. Goal 11 has ten targets of which seven focus primarily on the aforementioned affordable housing and making housing accessible for all, while the remaining three emphasize resource and urban planning with the goal of supporting developing nations also achieve sustainable and resilient building standards (United Nations, 2015).

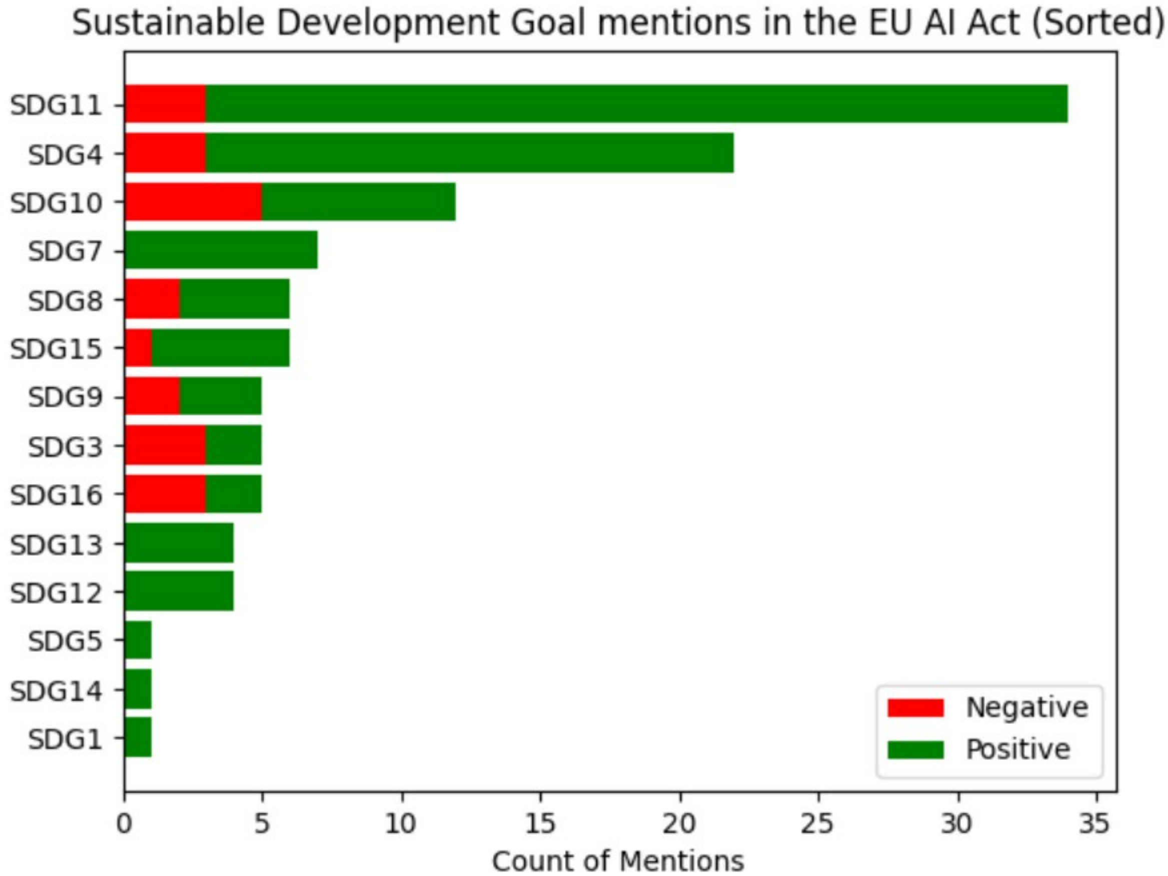

Figure 5. SDG mentions in the EU AI ACT, sorted by count, color-coded by sentiment

Source: author's own elaboration, matplotlib.pyplot.

We can observe that while there is a high number of SDG-related mentions captured within the AI Act, most of them are positive, highlighting that while the purpose of the act is to bring this technology under regulation, the European Commission nonetheless mentioned the merits of AI model development, giving credit where it is due and being similarly harsh where it was required. We notice that stacked, the counts for SDGs 1 (No Poverty), 5 (Gender Equality), 7 (Affordable & Clean Energy), 12 (Responsible Consumption and Production), 13 (Climate Action), 14 (Life below Water) are strictly positive in identified sentiment. That being said, these SDGs also have small total counts relative to SDG 11, save for SDG 7 (Affordable & Clean Energy), which could be more relevant than the others given the higher mention count. This is to say that, especially for the bottom 3 SDGs with only one mention (SDG 1, 5, 14) the technology may not have any impact worth mentioning explicitly, even though by extension these goals will be impacted by the newly imposed risk regimes – for instance, AI used in critical water / wastewater infrastructure can impact both SDG 13 and 14, and the prohibited biometric classifiers could have had a negative impact on the poverty- and gender equality- related targets.

The development and usage of AI models in itself is highly related to affordable & clean energy as training such models is resource and emission intensive, additionally linking it to responsible consumption/production and climate action.

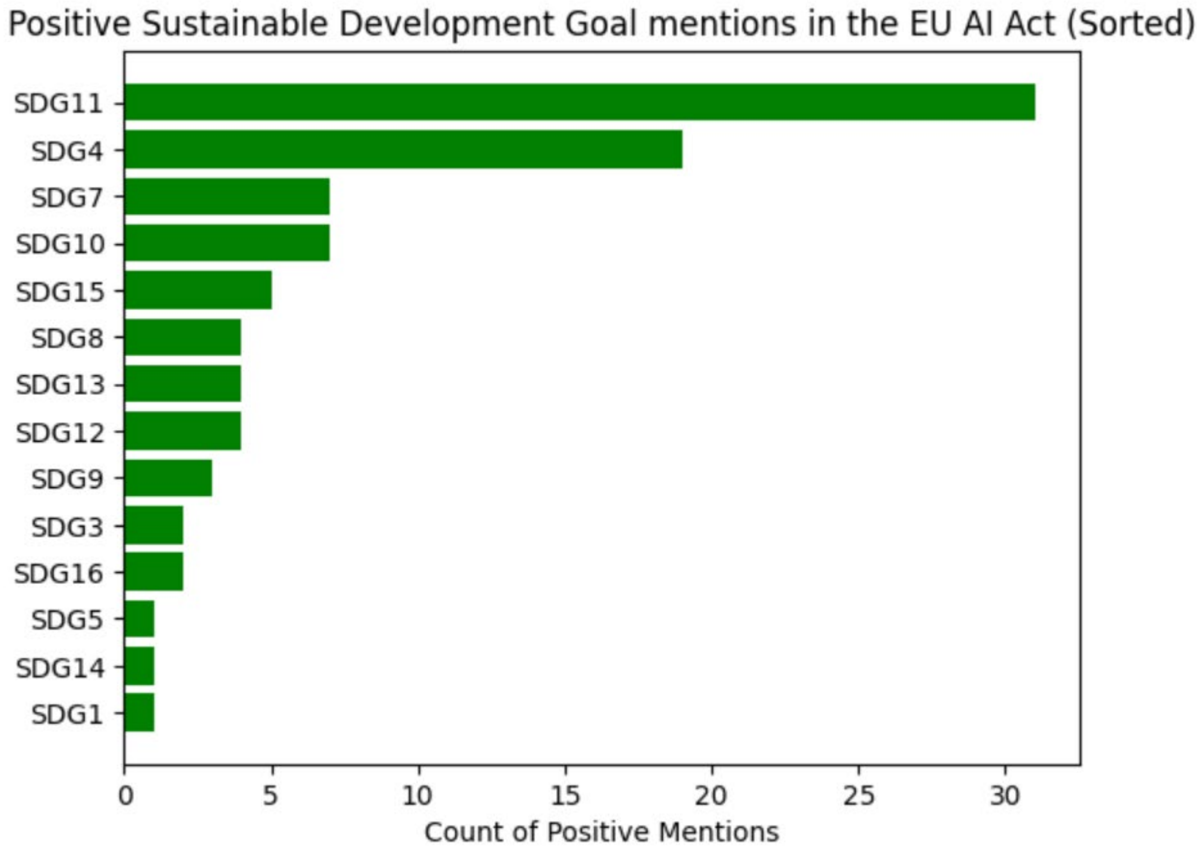

Figure 6. Positive SDG mentions in the EU AI ACT, sorted by count

Source: author's own elaboration, matplotlib.pyplot.

With respect to SDG 4 – "Quality Education", the act outlines the competitive advantage AI models can provide in (among others) the field of education, such as aiding in the act of teaching. In line with the right to education, utilizing AI systems in such a way that they aid both student and teacher could be very beneficial, especially in contexts where there is a shortage of teaching staff or the student cannot attend the educational institution physically due to socioeconomic or physical obstacles. The positive mentions relating to the remaining SDGs take a similar but briefer approach, typically being packed together inside proposals or amendments relating to the role and special consideration given to these areas by the Commission in the drafting of the act.

Lastly, we will take a look at the strictly negative mentions of SDGs and briefly explain what the overall impact will be upon each. In the negative mention overview, we find that the counts are much more concentrated in 8 of the 16 SDGs detected, of course excluding SDG 17 – international cooperation due to the missing keywords in the sourced mapping project and the fact that the EU AI Act itself is an international partnership/cooperation extended between all EU member states.

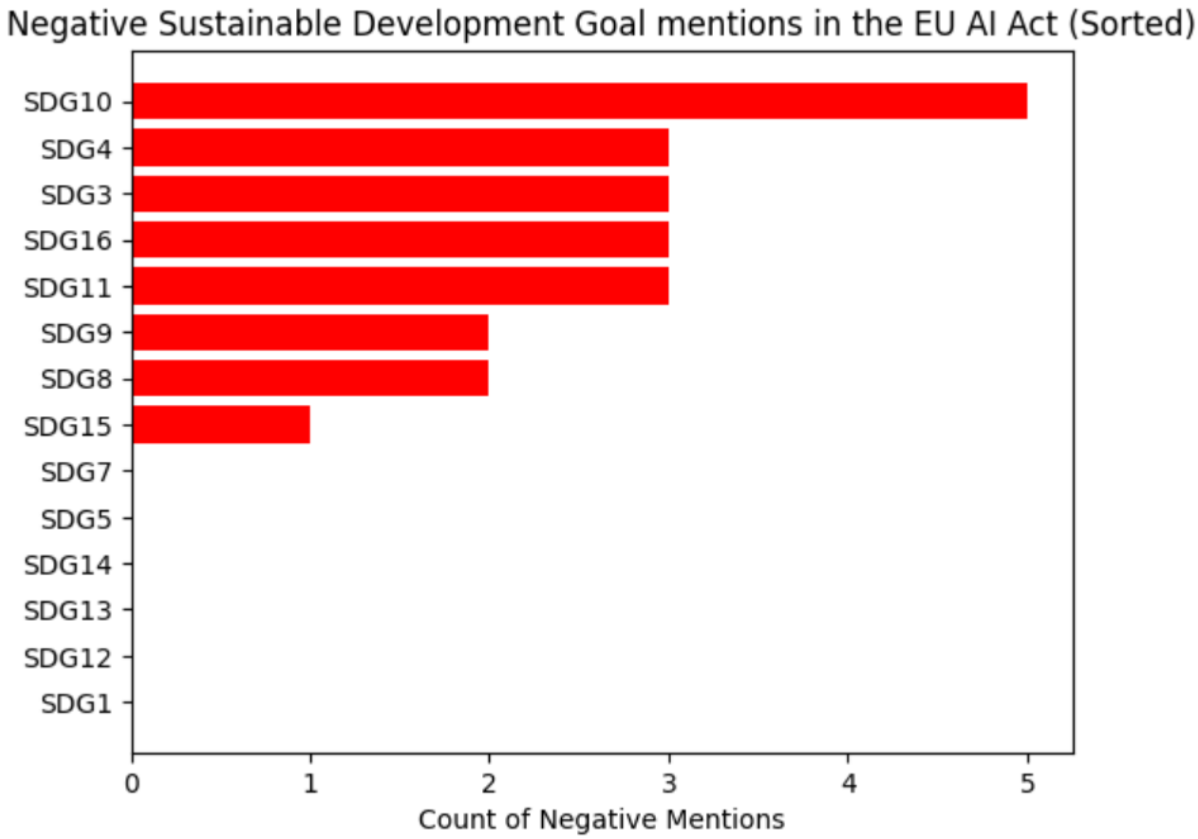

Figure 7. Negative SDG mentions in the EU AI ACT, sorted by count
Source: author's own elaboration, matplotlib.pyplot.

Standing out among the negative mentions is SDG 10 – "Reduced Inequalities". As we have mentioned briefly before, the Commission considers the use of AI biometric classifier models to be a very high risk to the charter of fundamental rights of the European Union, and proceeds to reason the proposal for a near-total ban on such systems from being developed and implemented within the EU. In summary, the level of risk as considered by the Commission stems from the risk introduced during both development and implementation, but especially implementation risk and potential for abuse. Biometric models can be used not only for social scoring which is highly infringing upon the charter of fundamental rights, but also to discriminate against minorities of various types due to the bias towards the "majority" introduced within AI during training times. This can lead to unfair treatment of citizens and abuse of authority, hence how it is strongly tied with SDG 16 – "Peace, Justice and Strong Institutions", all reasons for which the Commission has chosen to prohibit their development and use. This being said, there are two exceptions to be made for all "prohibited" AI systems – one, for strictly scientific endeavors; and two, for law enforcement activities that are cleared judicially to use such systems, and only within a set of clearly defined conditions – for example, it cannot be used proactively, i.e. to "prevent" a crime, but can be used to arrest the culprit if enforcement authorities require the use of such systems. The act raises the issue of potential abuse within SDG 4 as well, in educational institutions, stemming from reliability issues with regards to the context, situations and cultural considerations arising when using emotional classifiers, for instance. The act goes on to propose the risk category of systems used in education as high-risk, due to the impact it may have on the course of a student's life and potentially irreversible damage biased AI or flawed AI systems may have on them. Considering the potential impact on the trajectory of the "subject" of an AI system, the rationale for classing medical AI systems as similarly high-risk is the same, but the emphasis in the argument is slightly different – while the educational impact could tend to be more long-term, for instance a very hard-to-detect discrimination or differentiation between students, a medical AI error is much more likely to have an immediate and major, potentially fatal effect on the patient due to misdiagnosis. The negative mentions on to SDG 11 – "Sustainable Cities and Communities" mainly relate to the risks of using AI rater systems in applicants to social and affordable housing, which given their vulnerable position may be discriminated against by the system itself and given an unfair rating or approval/rejection when their situation could call otherwise. The mentions relating to SDG 8 – "Decent Work & Economic Growth" refer to the risks of job automation presented by AI, automation which has already disbanded a number of jobs within the European Union, and which the Commission considers a reason for which the evolution of AI in european society should happen in a harmonious, controlled manner. Lastly, the one mention relating to SDG15 - "Life on Land" appears to be a random hit due to "AI [ecosystem]" being detected erroneously as an SDG keyword.

AI in SDG – Outlook

Looking back at our findings and the framework that is being set up by the AI Act, we find that the vast majority of areas touched upon by the sustainable development goal will fall within the "high risk" regulation regime exactly because of the criticality but also the sensitivity with which they should be treated. In the following we propose an example of an Artificial Intelligence system used in healthcare, the risk regime it would be brought under according to the AI Act, and a list of controls which would allow the producers and users to comply with the expectations of the EU regulators.

To begin, one of the most impactful fields in which AI can bring innovation is medical imaging, whether they be ultrasounds, x-rays, CT or MRI scans (Ting, et al., 2018). Given the range of possible imaging devices, the quality of the data can also vary, and so training data could most likely have to be specialized to the specific device used. This reduces the bias implemented by other medical devices, but also limits the effectiveness of the model to the extent of quality that device is able of producing. On one hand, CT and MRI data would have low volume with very high image quality, while X-ray and ultrasound quality would be low in comparison but the volume of image data is very large. The goal of an AI model in this particular example would be to reduce diagnostic error between different interpretations by different doctors – for instance, an imaging doctor would have a better skill in taking higher quality images and being able to see through artefacts or difficult spots, but no specialized medical field knowledge. A doctor such as a cardiologist on the other hand would have localized specialist knowledge but also generally lower skill in taking the "picture" itself. The AI-powered guidance system would be able to guide the specialist in imaging out the part of interest, while the imagist may be able to place a better initial diagnosis through AI pattern detection.

Of the two options, the AI guidance system would presume a much lower risk due to the possible impact. The models both act as fill-ins for potential gaps in the person creating a medical image, but the system acting as a diagnosis helper may lead to misdiagnosis and potentially set a patient on an erroneous path. In order to combat this extra risk, a number of potential controls can be put in place, such as stricter data quality and delivery standards, larger volumes of data being required, and of course, a large number of validation and testing done by medical professionals.

Conclusions

The EU AI Act is an ambitious, first-of-its-kind regulation which brings to the table a number of benefits to EU citizens in terms of security from discrimination, while also affecting other areas of impact related to the UN sustainable development goals in less positive ways. Most of these areas will be affected negatively with regards to using AI to advance and innovate progress as found by our analysis. These being said, we should not forget the level of SDG completeness the EU members currently find themselves at. In the following map chart, we can observe the latest SDG scores as of 2023 for the EU member countries:

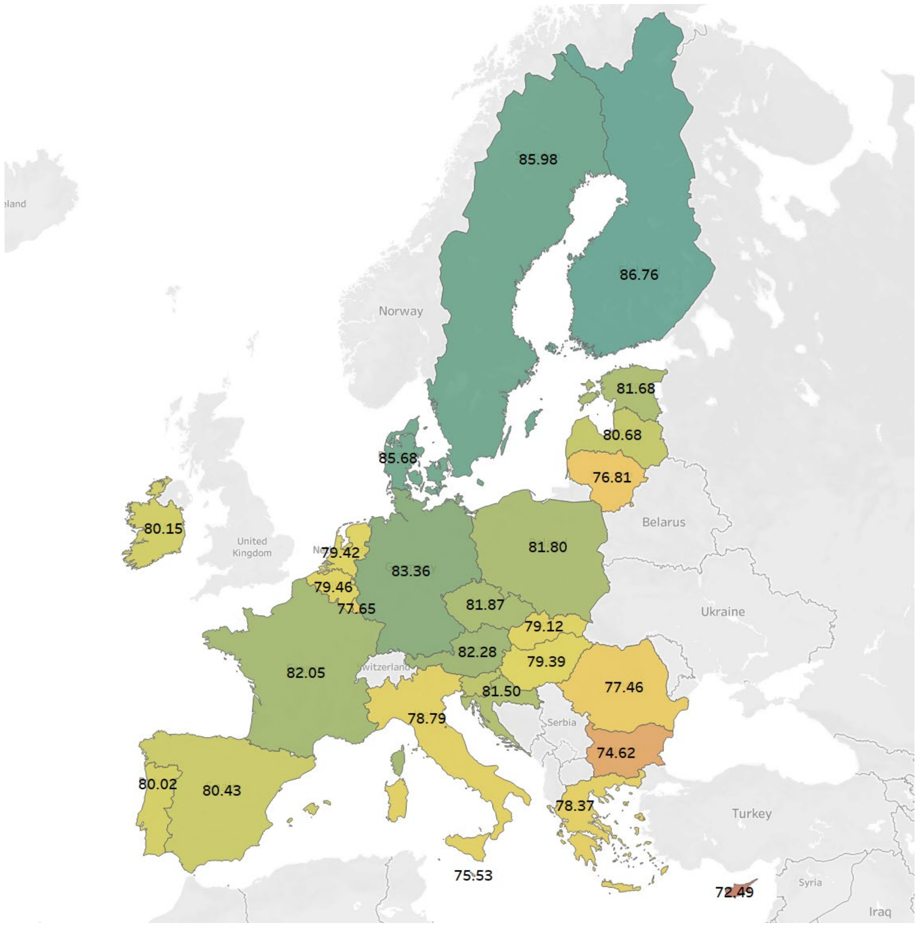

Figure 8. Sustainable Development Score, EU member states only, 2023

Source: author's own elaboration, Tableau

As we can see, due to a fairly high development level across the Union, SDG scores are similarly high. While using AI-powered solutions would certainly have contributed to near-future SDG scores, the members can nonetheless continue to progress their sustainability scores using more traditional methods, specifically cascading initiatives from higher levels of power (such as the heads of state, ministries) down to organizations in both public and private sectors, incentivizing the adoption of sustainable business models and imposing, if needed, minimum standards relating to SDG targets through legal or regulatory requirements.

Limitations of this study include the limited ability of the method of analysis. Traditional text analysis methods cannot read “context” in the text they analyze, thus often disregarding important elements of the text or over-evaluating sentiments of fragments. Another limitation is with regard to the AI Act itself – given the structure of the last proposal, the document contains both the initial proposals and the amendments, which can double the information and thus skew the sentiment scores to some extent, especially in the rare instances in which an entire proposal is deleted.

As a proposal for future research our paper opens up towards, we can mention the mode particularized investigation of AI models in the most impacted fields (education, healthcare, justice, critical infrastructure). It may be a worthwhile endeavor to create a framework within which these models would be allowed to operate optimally and within the confines of the new regulations as well, leading up to the creation of a general template process flow which small and medium-sized organizations could use in the absence of resources for tailor-made solutions.

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