Unit V-CCS45- Ethics AND AI Notes

Ethics and AI (Anna University)

UNIT V

AI AND ETHICS- CHALLENGES AND OPPORTUNITIES

Challenges – Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.

CHALLENGES

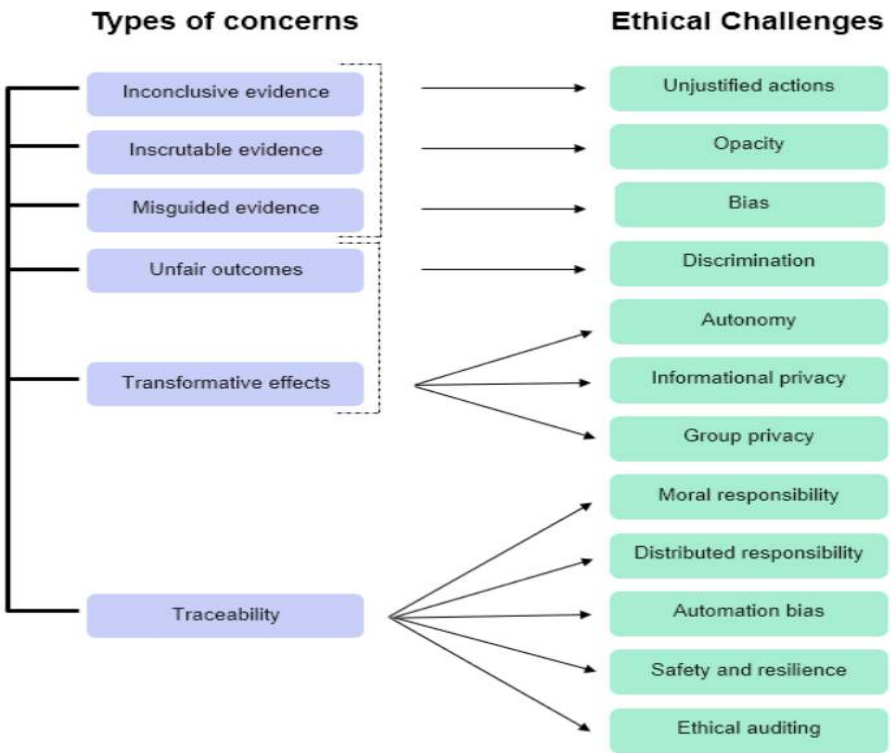
Ethical challenges facing AI has identified six types of concerns that can be traced to the operational parameters of decision-making algorithms and AI systems.

The map reproduced and adapted in Figure 1 takes into account decision-making algorithms

1) turn data into evidence for a given outcome (henceforth conclusion), and that this outcome is then used to

(2) trigger and motivate an action that (on its own, or when combined with other actions) may not be ethically neutral. This work is performed in ways that are complex and (semi-)-autonomous, which

(3) complicates apportionment of responsibility for effects of actions driven by algorithms."



- The proposed types of concerns can cause failures involving multiple human, organisational, and technological agents.
- This mix of human and technological actors leads to difficult questions concerning how to assign responsibility and liability for the impact of AI behaviours.
- These difficulties are captured in traceability as a final, overarching, type of concern.

Unjustified actions

- Much algorithmic decision-making and data mining relies on inductive knowledge and correlations identified within a dataset.
- Correlations based on a 'sufficient' volume of data are often seen as sufficiently credible to direct action without first establishing causality and gain knowledge.
- Even if strong correlations or causal knowledge are found, this knowledge may only concern populations while actions with significant personal impact are directed towards individuals

Opacity

Opacity in machine learning algorithms is a product of the high dimensionality of data, complex code and changeable decision-making logic.[

1] Transparency and comprehensibility are generally desired because algorithms that are poorly predictable or interpretable are difficult to control, monitor and correct

[2] Transparency is often naively treated as a panacea for ethical issues arising from new technologies.

Bias

The automation of human decision-making is often justified by an alleged lack of bias in AI and algorithms. This belief is unsustainable; AI systems unavoidably make biased decisions. Development is not a neutral, linear path. Inclusiveness and equity in both the design and usage of AI is thus key to combat implicit biases.

(1) pre-existing social values found in the "social institutions, practices and attitudes" from which the technology emerges,

(2) technical constraints and

(3) emergent aspects of a context of use.

Discrimination

- Discrimination against individuals and groups can arise from biases in AI systems.
- Discriminatory analytics can contribute to self-fulfilling prophecies and stigmatisation in targeted groups, undermining their autonomy and participation in society.

- The goals of equality law (e.g., formal and substantive equality), and appropriate thresholds for distribution of outcomes across groups. In this context, embedding considerations of non-discrimination and fairness into AI systems is particularly difficult.

Autonomy

- Value-laden decisions made by algorithms can also pose a threat to autonomy. Personalisation of content by AI systems, such as recommender systems, is particularly challenging in this regard.
- Personalisation can be understood as the construction of choice architectures which are not the same across a sample.
- Different information, prices, and other content can be offered to profiling groups or audiences within a population defined by one or more attributes,
- for example the ability to pay, which can itself lead to discrimination. Personalisation reduces the diversity of information users encounter by excluding content deemed irrelevant or contradictory to the user's beliefs or desires.

Informational privacy and group privacy

- Algorithms also transform notions of privacy.
- Responses to discrimination, personalisation, and the inhibition of autonomy due to opacity often appeal to informational privacy, or the right of data subjects to "shield personal data from third parties."
- Informational privacy concerns the capacity of an individual to control information about herself, and the effort required by third parties to obtain this information.
- In a healthcare setting this could include insurers, remote care providers (e.g., chatbot and triage service providers), consumer technology companies, and others. Opaque decision-making inhibits oversight and informed decision-making concerning data sharing.
- Data subjects cannot define privacy norms to govern all types of data generically because the value or insightfulness of data is only established through processing.

Moral responsibility and distributed responsibility

- When a technology fails, blame and sanctions must be apportioned.
- Blame can only be justifiably attributed when the actor has some degree of control and intentionality in carrying out the action.

- Traditionally, developers and software engineers have had "control of the behaviour of the machine in every detail" insofar as they can explain its overall design and function to a third party.
- This traditional conception of responsibility in software design assumes the developer can reflect on the technology's likely effects and potential for malfunctioning, and make design choices to choose the most desirable outcomes according to the functional specification.

Automation bias

- A related problem concerns the diffusion of feelings of responsibility and accountability for users of AI systems, and the related tendency to trust the outputs of systems on the basis of their perceived objectivity, accuracy, or complexity. Delegating decision-making to AI can shift responsibility away from human decision-makers.
- Similar effects can be observed in mixed networks of human and information systems as already studied in bureaucracies, characterised by reduced feelings of personal responsibility and the execution of otherwise unjustifiable actions.
- Algorithms involving stakeholders from multiple disciplines can, for instance, lead to each party assuming others will shoulder ethical responsibility for the algorithm's actions. Machine learning adds an additional layer of complexity between designers and actions driven by the algorithm, which may justifiably weaken blame placed upon the former.

Safety and resilience

- The need to apportion responsibility is acutely felt when algorithms malfunction. Unethical algorithms can be thought of as malfunctioning software artefacts that do not operate as intended.
- Useful distinctions exist between errors of design (types) and errors of operation (tokens), and between the failure to operate as intended (dysfunction) and the presence of unintended side-effects (misfunction). Misfunctioning is distinguished from mere negative side effects by 'avoidability', or the extent to which comparable types of systems or artefacts accomplish the intended function without the effects in question.
- Machine learning in particular raises unique challenges, because achieving the intended or "correct" behaviour does not imply the absence of errors or harmful actions and feedback loops.

Ethical auditing

- How best to operationalise and set standards for testing of these ethical challenges remains an open question, particularly for machine learning.
- Merely rendering the code of an algorithm transparent is insufficient to ensure ethical behaviour. One possible path to achieve interpretability, fairness, and other ethical goals in AI systems is via auditing carried out by data processors, external regulators, or empirical researchers, using ex post audit studies, reflexive ethnographic studies in development and testing, or reporting mechanisms designed into the algorithm itself.
- For all types of AI, auditing is a necessary precondition to verify correct functioning. For systems with foreseeable human impact, auditing can create an ex post procedural record of complex automated decision-making to unpack problematic or inaccurate decisions, or to detect discrimination or similar harms.

OPPORTUNITIES IN AI ETHICS

Ethical Design and Development:

Integrating ethical considerations into the design and development of AI systems presents a significant opportunity for promoting responsible AI. By embedding ethical principles from the outset, developers can create AI technologies that align with human values and respect users' rights. A notable example is Google's **"Ethical AI Principles"**, which guide the development and deployment of AI technologies to ensure they are designed with ethical considerations in mind, including transparency, privacy, and fairness.

Leveraging AI for Social Good:

Leveraging AI for positive social impact offers great potential. AI applications in healthcare, powered by technologies like natural language processing and machine learning, education,

environmental protection, and disaster response can improve people's lives and address societal challenges. For instance, IBM's **"Watson for Oncology"** uses AI to assist doctors in cancer treatment decisions, enhancing accuracy and efficiency in diagnoses.

Robust Ethical Frameworks:

Developing comprehensive ethical frameworks for AI can guide policymakers, developers, and users in making responsible choices. These frameworks provide a set of guiding principles and standards to ensure the ethical use of AI. An example of this is the **"Asilomar AI Principles"**, a set of 23 principles proposed by AI researchers to ensure the safe and beneficial development of AI technologies.

Public Engagement and Awareness:

Raising public awareness about AI ethics fosters informed discussions and ensures that ethical considerations are at the forefront of AI adoption. Organizations like the **AI Now Institute - Symposium** hold symposiums to bring together experts and the public to discuss AI's social impact and ethical implications, promoting an inclusive and transparent conversation about AI ethics.

Interdisciplinary Collaboration:

Engaging experts from various fields, including ethics, law, sociology, psychology, and philosophy, can lead to more holistic and nuanced approaches to AI ethics. Collaborative efforts among diverse stakeholders can help identify and address

omplex ethical challenges effectively. The **Partnership on AI** is an example of a multi-stakeholder organization that fosters collaboration among industry, academia, and civil society to address AI challenges responsibly.

ETHICAL ISSUES IN ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) provides many new and exciting capabilities. We see AI in our daily lives in the form of virtual assistants, instructional programs and autonomous operations:

- Self-driving cars? Check.
- Instantaneous translation of phrases into another language. Check.
- Write code. Check.

Legal Considerations for AI

In the United States, AI regulation is decentralized which can cause uncertainty surrounding what legal implications can result from the usage of artificial intelligence. While we do have some rules that regulate the outcomes, there is often confusion around the actual operational usage of AI tools.

Here are some legal considerations:

- Violations to intellectual property rights
- Data privacy issues that violate General Data Protection Regulation (GDPR)
- Data privacy issues that violate the California Consumer Privacy Act (CCPA)
- Violations of employment regulations
- Inappropriate usage of copyright data
- Disputes concerning contract law when generative AI is used
- Consumer confidentiality and issues with personally identifiable information (PII)
- Inaccurate usage of generative AI output

11 AI Ethical Issues

Artificial intelligence has the potential to make your business more efficient. That's a win. But increasing your output could come at a cost regardless of any savings. Making the ethics of AI a focal point will help ensure your business remains in good standing from an operational, regulatory and reputational standpoint. Here are 11 ethical issues you should know about when it comes to AI.

Issue 1: Job Displacement

Job displacement is a concern that is frequently cited in discussions surrounding AI. There is fear that automation will replace certain aspects or entire job roles, causing unemployment rates to spike industries. According to CompTIA's *Business Technology Adoption and Skills Trends* report, 81% of U.S. workers have recently seen articles which focus on the replacement of workers with AI. The same report found that 3 out of 4 workers are very or somewhat concerned about how automated technologies will impact the workforce.

Issue 2: Privacy

Training of AI models requires massive amounts of data, some of which includes PII. There is currently little insight into how the data is being collected, processed and stored which raises concerns about who can access your data and how they can use it. There are other privacy concerns surrounding the use of AI in surveillance. Law enforcement agencies use AI to monitor and track the movements of suspects. While highly valuable, many are worried

about the misuse of those capabilities in public spaces, infringing upon individual rights to privacy.

Issue 3: Bias

There is another ethical concern surrounding AI bias. Although AI does not inherently come with bias, systems are trained using data from human sources and deep learning which can lead to the propagation of biases through technology. For instance, an AI hiring tool could omit certain demographics if the data sets used to train the algorithm contained a bias against a particular group. This could also have legal implications if it leads to discriminatory practices.

Issue 4: Security

Security remains a top priority when it comes to AI (and really any branch of computer science). Lax security can have a wide-ranging impact. For example, AI is susceptible to malicious attacks which can compromise outcomes. The Cybersecurity Infrastructure and Security Agency (CISA) references documented instances of attacks leadings to misbehaviors in autonomous vehicles and the hiding of objects in security camera footage. Experts and governmental entities are urging for more security measures to limit potentially negative effects.

Issue 5: Explainability

It's not enough to simply put AI tools out into the world and watch them work. It can be particularly important to understand the decision-making process with certain AI applications. In some cases, it can be difficult to understand why certain AI tools came to conclusions. This can have sizeable implications, especially in industries such as healthcare or law enforcement where influencing factors must be considered, and real human lives are at stake.

Issue 6: Accountability

The increasing prevalence of AI in all industries means that we use AI tools to make decisions daily. In cases where those decisions lead to negative outcomes, it can be difficult to identify who is responsible for the results. Are companies on the hook for validating the algorithms of a tool they buy? Or do you look to the creator of an AI tool? The quest for accountability can be a deep rabbit hole which can make it difficult to keep people and companies accountable.

Issue 7: Deepfakes

The usage of deepfakes creates ethical concerns. Deepfakes are now able to circumvent voice and facial recognition which can be used to override security measures. One study even showed that a Microsoft API was tricked more than 75% of the time using easily generated deepfakes. Other ethical challenges arise when it comes to impersonation. The usage of deepfakes to sway public opinion in political races can have far-reaching implications. There is also concern over whether deepfakes could be used to influence the stock market if a CEO were believed to be making decisions or taking actions that were considered questionable. With no oversight and easy access to the software, the abuse of deepfakes presents a significant security gap.

Issue 8: Misinformation

Misinformation has a way of creating social divides and perpetuating untrue opinions to the detriment of organizations and others. A topic that gained scrutiny in the context of the political upheaval seen in recent years, misinformation can affect public opinion and cause severe reputational damage. Once misinformation becomes widely shared on social media, it can be difficult to determine where it originated and challenging to combat. AI tools have been used to spread misinformation, making it appear as though the information is legitimate, when it is in fact not.

Issue 9: Exploitation of Intellectual Property

A recent lawsuit against ChatGPT involving several popular writers who claim the platform made illegal use of their copyrighted work has brought attention to the issue of AI exploitation of intellectual property. Several authors, including favorites as Jodi Picoult and John Grisham, recently sued OpenAI for infringing on copyright by using their content to train their algorithms. The lawsuit further claims that this type of exploitation will endanger the ability of authors to make a living from writing. This kind of exploitation has owners of intellectual property concerned about how AI will continue to impact their livelihoods.

Issue 10: Loss of Social Connection

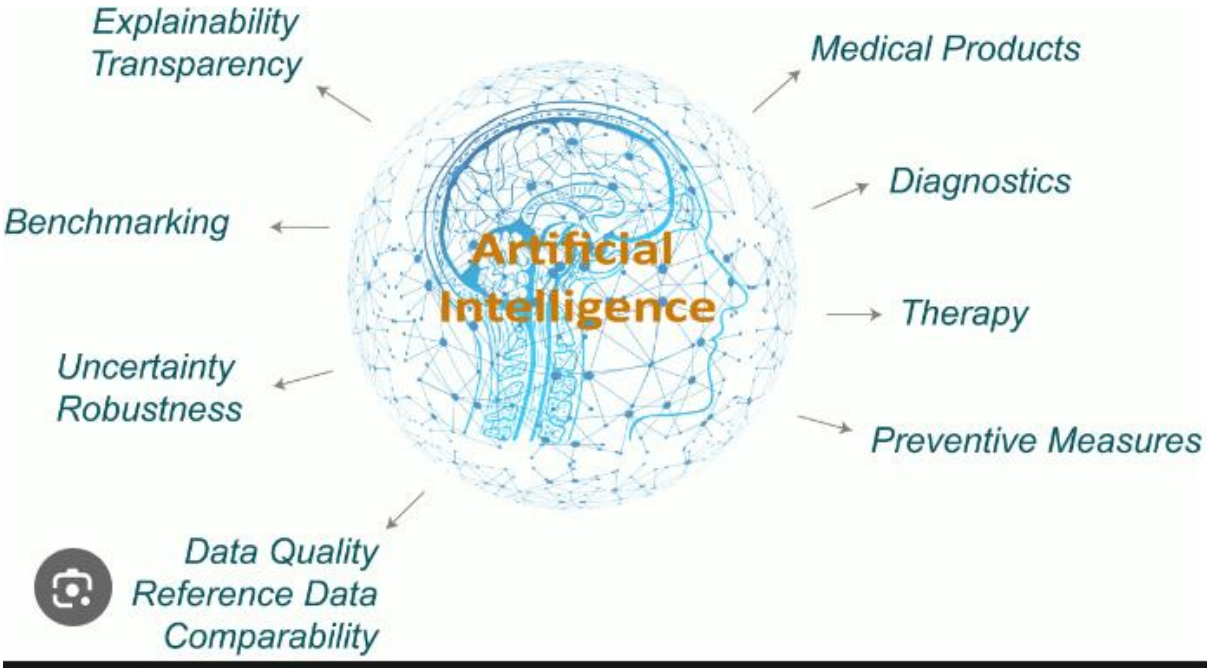
While AI has the potential to provide hyper-personalized experiences by customizing search engine content based on your preferences and enhancing customer service through the use of chatbots, there is concern that this could lead to a lack of social connection, empathy for others and general well-being. If all you see on social media are opinions that reinforce your own, you're unlikely to develop a mindset that allows you to empathize with others and engage in actions for social good.

Issue 11: Balancing Ethics With Competition

New technologies present companies, tech giants and startups alike, with a particular challenge because there is a constant race to innovate. Often, success is determined by a company's ability to be the first to release a particular technology or application. When it comes to AI systems, companies often aren't taking the time to ensure their technology is ethically designed or that it contains stringent security measures.

Societal Issues Concerning the Application of Artificial Intelligence in Medicine

Medicine is becoming an increasingly data-centred discipline and, beyond classical statistical approach-es, artificial intelligence (AI) and, in particular, machine learning (ML) are attracting much interest for the analysis of medical data.



The application of artificial intelligence (AI) in medicine holds great promise for improving healthcare outcomes, but it also raises several societal issues that need careful consideration. Here are some key societal issues concerning the application of AI in medicine:

1. Equity and Access

Healthcare Disparities: There is a risk that AI applications may inadvertently exacerbate existing healthcare disparities if not implemented carefully. For example, if AI algorithms are trained primarily on data from certain demographics, they may not perform as well for others.

Access to Technology: Not all healthcare facilities or regions have equal access to AI technologies. This could lead to unequal access to the benefits of AI-driven healthcare, creating a "digital divide."

2. Data Privacy and Security

Patient Data Protection: AI systems rely heavily on patient data, raising concerns about privacy. How this data is collected, stored, and used must align with strict regulations like GDPR and HIPAA.

Data Bias: Biases in healthcare data, such as historical disparities in treatment, can be inadvertently perpetuated by AI systems, leading to unequal treatment.

3. Transparency and Accountability

Black Box Problem: Many AI algorithms are complex "black boxes" where it's challenging to understand how they arrive at decisions. This lack of transparency raises questions about accountability and the ability to challenge or appeal decisions made by AI.

Responsibility for Errors: When errors occur in AI-driven diagnosis or treatment recommendations, it's crucial to define who is responsible—whether it's the developer, healthcare provider, or the AI system itself.

4. Job Displacement and Training

Impact on Healthcare Jobs: As AI automates certain tasks, there's concern about the potential displacement of healthcare workers. This includes administrative roles as well as some clinical tasks.

Training and Education: Healthcare professionals need training to effectively use AI tools. There's a need to ensure that healthcare workers are equipped with the skills to work alongside AI systems.

5. Medical Liability and Malpractice

Legal Frameworks: Existing medical liability frameworks may not be well-suited for cases involving AI errors. New legal frameworks may be needed to determine liability when AI is involved.

Ensuring Safe Use: Ensuring that AI systems are rigorously tested and validated is essential to minimize the risk of errors leading to malpractice claims.

6. Bias and Discrimination

Algorithmic Bias: AI algorithms can inherit biases present in the data used to train them, which can lead to discriminatory outcomes. This is particularly concerning in healthcare, where biased algorithms could perpetuate disparities in diagnosis and treatment.

7. Regulation and Standardization

Regulatory Oversight: Governments and regulatory bodies need to develop frameworks to ensure the safe and ethical use of AI in healthcare. This includes standards for data quality, algorithm transparency, and patient consent.

Interoperability: As AI systems are integrated into healthcare systems, ensuring they can work together and share data seamlessly is crucial for maximizing their potential benefits.

8. Overreliance on Technology

Human Oversight: There's a risk of overreliance on AI systems, leading to a decrease in critical thinking or decision-making by healthcare professionals. AI should be seen as a tool to enhance, not replace, human expertise.

9. Cost and Resource Allocation

Financial Barriers: Implementing AI in healthcare can be costly, which could create disparities in access based on the financial resources of healthcare organizations.

Resource Allocation: Determining where to allocate resources for AI implementation—whether in research, development, or patient care—raises complex ethical questions.

10. Changing Doctor-Patient Relationships

Impact on Communication: The introduction of AI into healthcare settings may change the dynamics of doctor-patient relationships. Patients may feel alienated if they perceive AI as replacing human care and empathy.

Trust: Building and maintaining patient trust in AI systems is crucial for their acceptance and effective use in healthcare.

Addressing these societal issues requires collaboration among policymakers, healthcare providers, AI developers, ethicists, patients, and other stakeholders. Ethical guidelines, transparency in AI systems, ongoing education, and robust regulatory frameworks are essential to ensure that AI in medicine benefits society as a whole while minimizing potential harms.

DECISION-MAKING ROLE IN INDUSTRIES

Advancements in artificial intelligence (AI) can help with the decision-making process by evaluating data and variables in complex situations. This enables companies and organizations to make faster, more well-informed decisions than when humans tackle the problems without assistance.

The purpose of AI in decision making is not complete automation. Rather, the goal is to help humans make quicker and better decisions through streamlined processes and effective use of data.

some of the most common challenges individuals and companies face when they incorporate AI into their business decision making and problem-solving.

Importance of AI in decision making

AI can play a significant role in data-driven decision making, providing benefits such as:

- Enhanced accuracy. AI can use advanced algorithms and data science and analysis to provide accurate and objective insights repeatably, reducing the likelihood of human error and bias.
- Faster decision making. AI can process vast amounts of data at incredible speeds, enabling quick analysis and generating insights in real time. This ultimately leads to faster and more efficient decision-making processes, especially when you're able to incorporate automation in many components of the process.
- Improved efficiency. AI automates time-consuming and repetitive tasks in decision-making processes, freeing up valuable human resources to focus on more complex and strategic aspects.
- Better risk assessment and mitigation. AI can assess and analyze various risk factors, helping decision makers identify potential risks and devise effective mitigation strategies.
- Data-driven insights. AI leverages large volumes of data to uncover patterns, trends, and correlations that may go unnoticed by humans. Understanding data can be a complicated endeavor, but incorporating the computer science of AI into your analysis can simplify the process.

AI Is Used in Decision-Making Processes in Industries

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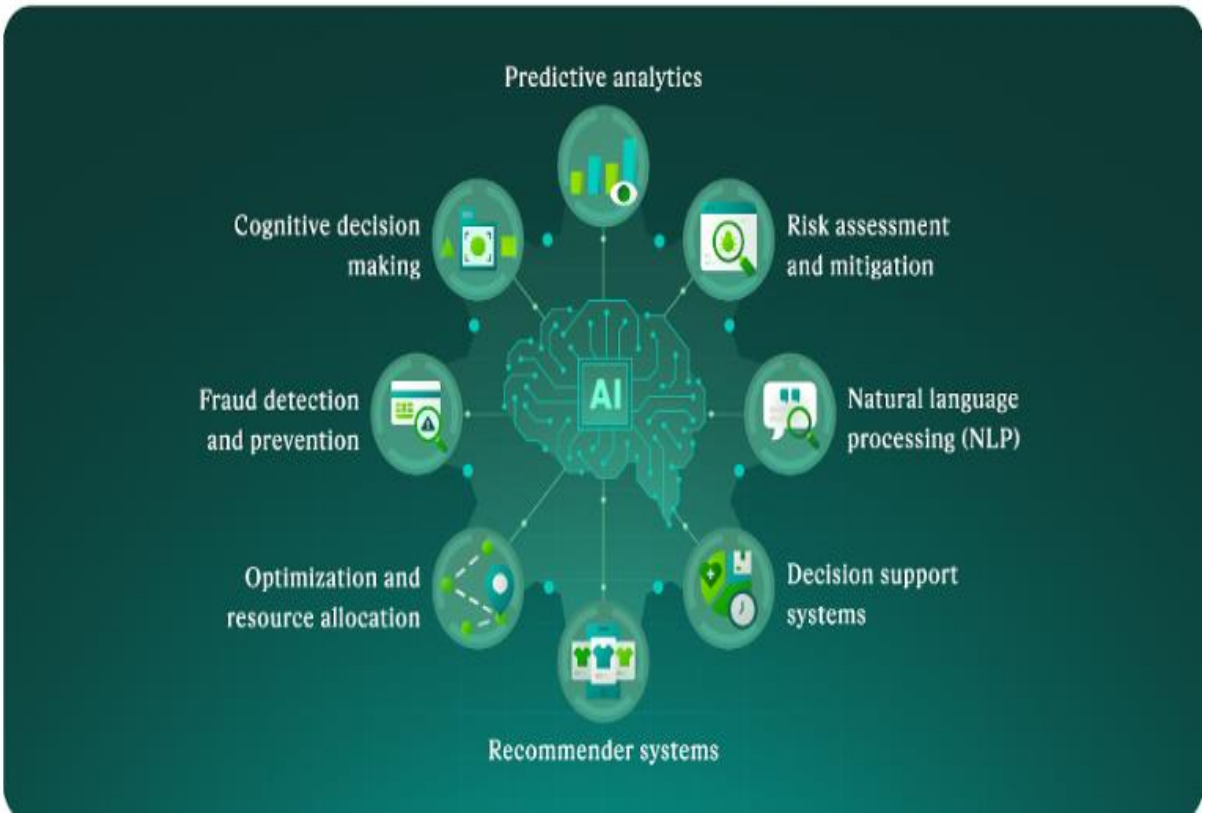

- **Predictive analytics**

AI uses predictive analytics to analyze historical data, identify patterns, and make accurate predictions

As big data systems continue to grow, companies will have larger sets of data to work from, which should increase the accuracy of predictive analytics.

Predictive analytics enables decision makers to anticipate future outcomes and make proactive decisions in various domains, such as sales forecasting and demand planning.

Several types of predictive analytics exist. In addition to using predictive analytics to imagine what the future could look like, the same technology can be helpful when trying to understand what happened in the past and what events led to a certain result.

Example: predictive analytics is applied in the management of equipment maintenance. Historical breakdown analysis is combined with real-time process metrics and operational schedules to determine the most cost-effective times to shut equipment down for necessary maintenance.

- **Risk assessment and mitigation**

Risk assessment takes time and careful planning to ensure a company is aware of and protected against potential threats. Effective risk management relies on the proper analysis of data; situations can become problematic if the data that's used is incomplete or inaccurate.

AI algorithms can assess and analyze complex risk factors, such as credit risk or cybersecurity threats. Since an AI-powered tool can quickly analyze large sets of data and detect anomalies,

This data can support decision makers in evaluating risks, identifying vulnerabilities, and devising effective mitigation strategies, minimizing potential negative impacts. Risk managers and auditors can use AI tools to ensure they are using a larger range of available data, and not just the evidence they have detected on their own.

Example:

- Banks can use risk AI assessment and mitigation for fraud prevention.
- Health care systems may apply this approach for patient-specific disease prevention or community epidemic prevention.

- **Natural language processing (NLP)**

Natural language processing (NLP) refers to a computer's ability to automatically analyze and process language in a conversational manner. Conversational chatbots such as ChatGPT use NLP to analyze human prompts and questions to produce a coherent response. NLP techniques enable AI systems to analyze human language in ways that facilitate decision-making processes that involve text data, such as sentiment analysis, contract review, or customer feedback analysis.

Here are a few of the main ways NLP can help with decision making:

- Sentiment analysis. NLP can provide insight into the sentiment (or emotional tone) of textual documents and data in addition to analyzing the actual information presented.
- Text classification. NLP can sort text into predefined labels or classes. This can help you organize large amounts of data into preset categories, making the information easier to understand and utilize.
- Information extraction. By extracting relevant information, you can better identify trends and patterns during the decision-making process.

- Summarization. NLP can help you condense long documents into summaries so that you can have the relevant information without going through all the material yourself.
- Question answering. You can use NLP systems to ask questions about various documents and datasets to find answers quickly.

Example:

Marketing organizations are already using this approach for managing programs across channels to optimize revenue. Individuals can use these generative AI tools for wide-ranging decision-making in activities such as planning trips, determining who to vote for, or simply creating menus from available ingredients.

- **Decision support systems**

AI-powered decision support systems assist decision makers by providing relevant information, data analysis, and insights in real time, empowering them to make well-informed decisions across various domains, including healthcare, logistics, or supply chain management.

These systems use machine learning models and operational data to develop insights and access real-time information. Since this involves nonstop data processing, systems must be equipped to quickly analyze and process the data consistently.

However, as mentioned above, critical thinking is necessary to ensure that the data being used is accurate and trustworthy. Make sure you feel confident about where the system is pulling the data from and how it is using all available information for the validation of conclusions.

- **Recommender systems**

AI-based recommender systems analyze user preferences, historical behavior, and contextual data to provide personalized recommendations. These systems use big data to analyze relevant information such as past purchases, demographic information, and other factors that help companies learn about customers' preferences.

This approach is helpful because it reveals insights companies may not have been able to identify on their own. The findings can equip decision makers in areas such as product recommendations, content suggestions, or personalized marketing campaigns to deliver effective campaigns and advertisements tailored to the user's specific taste.

Exmaple:

Netflix currently includes a recommender system as a part of its algorithm. The platform uses your past viewing history to predict what might interest in the future based on the history of similar consumers. The purpose of this system is to eliminate the time and frustration that may happen when you're deciding what to watch next.

- **Optimization and resource allocation**

AI optimization algorithms enable decision makers to allocate resources efficiently, optimize processes, and solve complex optimization problems. This can help in areas such as workforce scheduling, supply chain optimization, or route planning.

Using AI, teams can better allocate their resources by quickly analyzing availability, utilization, and performance. This data will enable you to identify potential bottlenecks and ensure that all team members are working on the most important tasks.

Many supply chain managers are using AI to improve their route optimization. They can automatically create the most efficient routes for their drivers by inputting a list of stops. The system will consider factors such as traffic and consumer demand to determine what routes will be the most efficient and cost-effective.

- **Fraud detection and prevention**

AI algorithms can analyze large volumes of data and detect anomalies and patterns associated with fraudulent activities. The findings can assist decision makers in fraud detection and prevention efforts, mitigating financial losses and protecting businesses and consumers.

A current example is American Express, which has developed an AI-based system that can analyze billions of transactions in real time to identify patterns of fraudulent activity. This platform employs machine learning algorithms and big data analytics to effectively detect potential fraudulent transactions.

- **Cognitive decision making**

AI technologies, such as cognitive computing and machine learning, can facilitate decision-making processing by analyzing vast amounts of data, recognizing patterns, and recommending optimal solutions. This can help decision makers in complex scenarios, such as medical diagnosis or strategic planning.

Remember, this information should be used to inform the human decision-making process rather than replace it entirely. While the data produced by AI technologies can be helpful, it may sometimes have fallacies or errors. Human discernment should be

used to evaluate the findings produced by AI and check for any potential errors or mistakes.

Applications of AI in decision making

Let's introduce a few prominent companies already using AI to help with their decision making.

- Google. Google uses a deep learning system to better understand search prompts and provide personalized results.
- IBM. IBM has optimized its decision making to solve complex problems in a fraction of the time it once required. This innovation has saved customers significant time and money.
- Microsoft. Microsoft believes AI can help individuals tackle life's biggest challenges with ease. Their philosophy is that AI can provide people with a wider range of information, but humans ultimately must make the decisions.
- Deloitte. Deloitte's team is working on creating automated processes that improve human decision making by predicting and simulating future outcomes.
- Salesforce. Salesforce incorporates AI to gain further insight into customer behavior and buying patterns. The company has improved its decision making by forecasting sales trends, which enables them to quickly respond to an ever-changing market.

NATIONAL AND INTERNATIONAL STRATEGIES ON AI.

As the technology behind AI continues to progress beyond expectations, policy initiatives are springing up across the globe to keep pace with these developments.

The first national strategy on AI was launched by Canada in March 2017, followed soon after by technology leaders Japan and China. In Europe, the European Commission put forward a communication on AI, initiating the development of independent strategies by Member States.

An American AI initiative is expected soon, alongside intense efforts in Russia to formalise their 10-point plan for AI.

These initiatives differ widely in terms of their goals, the extent of their investment, and their commitment to developing ethical frameworks, reviewed here as of May 2019.

Figure 3: National and International Strategies on AI published as of May 2019.

An overview of national AI strategies and policies

As artificial intelligence (AI) advances across economies and societies, policy makers and AI actors around the world seek to move from principles to practice.

To harness the benefits of AI while mitigating the risks, governments are investing in AI R&D; leveraging AI in specific industries such as transportation and healthcare; building human capacity on AI; ensuring a fair labour market transformation; reviewing and adapting relevant policy and regulatory frameworks and developing standards; and co-operating internationally.

This Going Digital Toolkit note provides an overview of the various AI policy initiatives undertaken by governments and analyses these initiatives throughout the AI policy cycle:

1) Policy design;

2) policy implementation;

3) Policy intelligence;

4) approaches for international and multi-stakeholder cooperation on AI policy

The development of national policies and strategies focusing specifically on AI is a relatively new phenomenon. To track these initiatives, the OECD (The Organization for Economic Cooperation and Development) AI Policy Observatory (OECD.AI) comprises over 620 national AI policies from over 60 countries and the European Union (EU).

These resources provide a baseline to map countries' AI policy initiatives according to the recommendations to governments contained in the OECD AI Principles (Box 1).

Box 1. OECD AI Principles

The OECD Principles on Artificial Intelligence promote AI that is innovative, trustworthy and respects human rights and democratic values. They were adopted in May 2019 by OECD member countries when they approved the OECD Council Recommendation on Artificial Intelligence. The OECD AI Principles identify five complementary values-based principles for the responsible stewardship of trustworthy AI:

- AI should benefit people and the planet by driving inclusive growth, sustainable development and well-being.
- AI systems should be designed in a way that respects the rule of law, human rights, democratic values and diversity, and they should include appropriate safeguards – for example, enabling human intervention where necessary – to ensure a fair and just society.
- There should be transparency and responsible disclosure around AI systems to ensure that people understand AI-based outcomes and can challenge them.
- AI systems must function in a robust, secure and safe way throughout their life cycles and potential risks should be continually assessed and managed.
- Organisations and individuals developing, deploying or operating AI systems should be held accountable for their proper functioning in line with the above principles

Consistent with these principles, the OECD also provides five recommendations to governments:

- Facilitate public and private investment in research & development to spur innovation in trustworthy AI.
- Foster accessible AI ecosystems with digital infrastructure and technologies and mechanisms to share data and knowledge.
- Ensure a policy environment that will open the way to the deployment of trustworthy AI systems.
- Empower people with the skills for AI and support workers for a fair transition.
- Co-operate across borders and sectors to progress on responsible stewardship of trustworthy AI.

AI policy design

Countries are at different stages of the development and implementation of national AI strategies and policies.

Some countries, such as Canada and Finland, developed their national AI strategies as early as 2017, closely followed by Japan, France, Germany and the United Kingdom in 2018.

Other countries, such as Brazil, Egypt, Hungary, Poland and Spain, launched a national AI strategy more recently. Several countries are currently in AI policy consultation and development processes.

Effective implementation of national AI initiatives hinges on coordination

Countries pursue different national governance models to co-ordinate the implementation of their national AI policies across government, offering regulatory and ethical oversight (Figure 1). Models include:

• Assigning oversight of the development and implementation strategies to an existing ministry, department or body. Among existing ministries or agencies tasked with developing or implementing an AI strategy, the following tend to drive the creation of AI strategies most often:

1) information technology and communications ministries;

2) economics or finance ministries; or

3) education, science (and technology) and innovation ministries.

• Creating a new governmental or independent AI co-ordination entity.

• Establishing AI expert advisory groups. These are generally multistakeholder groups comprising AI experts tasked with identifying and reporting on current and future opportunities, risks and challenges arising from the use of AI in society. These AI councils also provide recommendations to the government.

• Setting up oversight and advisory bodies for AI and data ethics.

Figure 1. A selection of national AI governance approaches

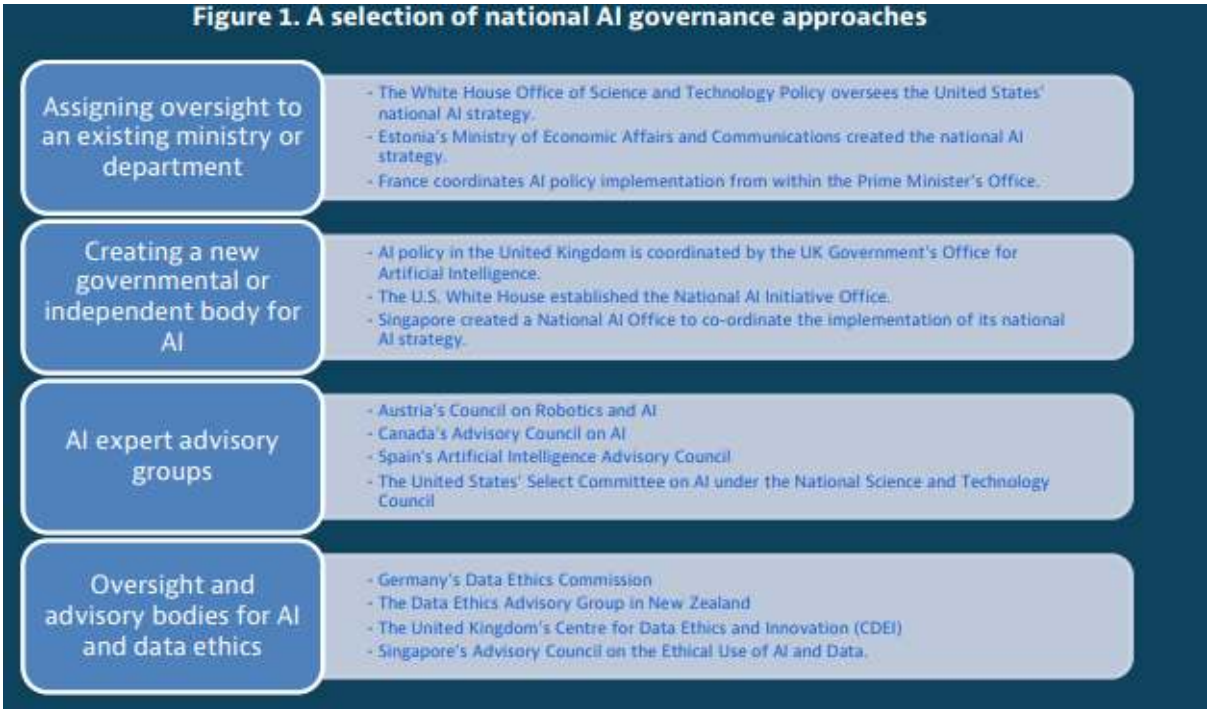

Figure 2. National AI strategies and policies prioritise a number of sectors

Sector(s) targeted	Australia	Czech Rep.	Denmark	France	Finland	Hungary	Japan	Korea	Latvia	Netherlands	Norway	Poland	Turkey	U.K.	U.S.	China	India	Singapore	Malta	Saudi Arabia	U.A.E.
Agriculture and food	✓		✓			✓	✓	✓	✓	✓		✓	✓		✓	✓	✓				
Cybersecurity							✓					✓	✓					✓			
Defence/ Security				✓				✓	✓				✓		✓	✓		✓			✓
Education		✓				✓	✓	✓					✓		✓		✓	✓	✓		
Energy			✓		✓	✓			✓	✓	✓	✓		✓	✓	✓			✓	✓	✓
Environment	✓			✓		✓				✓				✓	✓					✓	
Finance								✓	✓									✓			
Health care	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manufacturing						✓	✓	✓					✓	✓	✓					✓	
Mobility and transportation		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Productivity					✓		✓					✓	✓								
Public administration				✓	✓	✓	✓	✓	✓		✓	✓	✓						✓		
Seas and oceans/Marine								✓	✓		✓										
Smart cities/ Construction	✓								✓			✓	✓				✓			✓	✓
Aerospace/ Space		✓						✓							✓						
Telecomms and IT							✓	✓	✓				✓		✓				✓		

Note: The Pan-Canadian AI strategy and the German AI strategy do not have a significant focus on specific sectors.

World Economic Forum

The World Economic Forum (WEF) formed a Global AI Council in May 2019, co-chaired by speech recognition developer Kai-Fu Lee, previously of Apple, Microsoft and Google, and current President of Microsoft Bradford Smith. One of six 'Fourth Industrial Revolution' councils, the Global AI Council will develop policy guidance and address governance gaps, in order to develop a common understanding among countries of best practice in AI policy (World Economic Forum, 2019a).

In October 2019, they released a framework for developing a national AI strategy to guide governments that are yet to develop or are currently developing a national strategy for AI. The WEF describe it as a way to create a 'minimum viable' AI strategy and includes four main stages:

1) Assess long-term strategic priorities
2) Set national goals and targets
3) Create plans for essential strategic elements
4) Develop the implementation plan

The WEF has also announced plans to develop an 'AI toolkit' to help businesses to best implement AI and to create their own ethics councils, which will be released at 2020's Davos conference (Vanian, 2019).

Government Readiness for AI

A report commissioned by Canada's International Development Research Centre (Oxford Insights, 2019) evaluated the 'AI readiness' of governments around the globe in 2019, using a range of data including not only the presence of a national AI strategy, but also data protection laws, statistics on AI startups and technology skills.

Singapore was ranked number 1 in their estimation, with Japan as the only other Asian nation in the top 10 (Table 3). Sixty percent of countries in the top 10 were European, with the remainder from North America.

Table 3: Top 10 rankings for Government AI Readiness 2018/19. Source: Oxford Insights, 2019.

Rank	Country	Score
1	Singapore	9.19
2	United Kingdom	9.07
3	Germany	8.81
4	USA	8.80
5	Finland	8.77
6	Sweden	8.67
6	Canada	8.67
8	France	8.61
9	Denmark	8.60
10	Japan	8.58

National Strategy In AI

The first national strategy on AI was launched by Canada in March 2017, followed soon after by technology leaders Japan and China. In Europe, the European Commission put forward a communication on AI, initiating the development of independent strategies by Member States. An American AI initiative is expected soon, alongside intense efforts in Russia to formalise their 10-point plan for AI.

These initiatives differ widely in terms of their goals, the extent of their investment, and their commitment to developing ethical frameworks, reviewed here as of May 2019.

Europe

The European Commission's Communication on Artificial Intelligence (European Commission, 2018a), released in April 2018, paved the way to the first international strategy

on AI. The document outlines a coordinated approach to maximise the benefits, and address the challenges, brought about by AI.

The EU's seven requirements for trustworthy AI:

1. Human agency and oversight
2. Technical robustness and safety
3. Privacy and data governance
4. Transparency
5. Diversity, non-discrimination and fairness
6. Societal and environmental wellbeing
7. Accountability

Source: European Commission High-Level Expert Group on Artificial Intelligence, 2019

The EU's High-Level Expert Group on AI shortly after released a further set of policy and investment guidelines for trustworthy AI (European Commission High-Level Expert Group on AI, 2019b), which includes a number of important recommendations around protecting people, boosting uptake of AI in the private sector, expanding European research capacity in AI and developing ethical data management practices

Finland was the first Member State to develop a national programme on AI (Ministry of Economic Affairs and Employment of Finland, 2018a). The programme is based on two reports, *Finland's Age of Artificial Intelligence* and *Work in the Age of Artificial Intelligence* (Ministry of Economic Affairs and Employment of Finland, 2017, 2018b). Policy objectives focus on investment for business competitiveness and public services. Although recommendations have already been incorporated into policy, Finland's AI steering group will run until the end of the present Government's term, with a final report expected imminently.

Denmark's National Strategy for Artificial Intelligence (The Danish Government, 2019) was released in March 2019 and follows its 'Strategy for Digital Growth' (The Danish Government, 2018). This comprehensive framework lists objectives including establishing a responsible foundation for AI, providing high quality data and overall increasing investment in AI (particularly in the agriculture, energy, healthcare and transport sectors)

Germany's AI Strategy was adopted soon after in November 2018 (Die Bundesregierung, 2018) and makes three major pledges: to make Germany a global leader in the development and use of AI, to safeguard the responsible development and use of AI, and to integrate AI in society in ethical, legal, cultural and institutional terms. Individual objectives include developing Centres of Excellence for research, the creation of 100 extra professorships for AI, establishing a German AI observatory, funding 50 flagship applications of AI to benefit the environment, developing guidelines for AI that are compatible with data protection laws, and establishing a 'Digital Work and Society Future Fund' (De.digital, 2018).

The Federal Government

Nationale Strategie für Künstliche Intelligenz
AI Made in Germany

Artificial Intelligence Strategy

Status: November 2018

Summary "AI made in Germany"

The Federal Government will take on the task of providing a policy response to the rapid advances in the field of AI and will make comprehensive use of the innovations triggered by the technology for the benefit of society at large. We want to safeguard Germany's outstanding position as a research centre, to build up the competitiveness of German industry, and to promote the many ways to use AI in all parts of society in order to achieve tangible progress in society in the interest of its citizens. We will focus on the benefits for people and the environment, and continue the intensive dialogue with all sections of society.

Germany is already extremely well positioned in many areas of AI. This Strategy builds on existing strengths and transfers them to areas where no or little use has been made of the potential.

In the 2019 federal budget, the Federation has taken a first step, allocating a total of €500 million to beef up the AI strategy for 2019 and the following years. **Up to and including 2025, the Federation intends to provide around €3 billion for the implementation of the Strategy.** The leverage effect this will have on business, science and the Länder will mean that the overall amount available is at least doubled.

1. **We want to make Germany and Europe a leading centre for AI and thus help safeguard Germany's competitiveness in the future.**

- We will further develop our existing Centres of Excellence for AI at supra-regional level, establish additional ones, and develop them into a **national network of at least twelve centres and application hubs**. As we do so, we will be offering working conditions and remuneration that are internationally attractive and competitive. We will launch a programme to support junior researchers and to reinforce academic teaching in the field of AI. We want to create **at least 100 additional professorships** for AI to ensure that AI has a strong foothold within the higher education system.
- Working with France, we will drive forward the **development of a Franco-German research and development network ("virtual centre")** that is based on existing structures and the particular skills offered by each of the two countries.
- We will make AI one of the priorities for the envisaged **Agency for Breakthrough Innovations**.
- We will form a **European innovation cluster** providing funding for cooperative research projects over the next five years.
- We will increase our AI-specific support for small and medium-sized companies. **The Mittelstand 4.0 centres of excellence will have 'AI trainers' contact at least 1,000 companies per year.**
- The Federal Government wants to help companies **establish test beds**.
- The **EXIST** (Business Start-ups in Science) programme's budget for 2019 will be twice as high as in the previous years.
- We are creating new **funding opportunities for venture capital and venture debt** and will launch a **Tech Growth Fund Initiative**.
- We are further expanding our **advisory and funding services targeted at start-ups**.
- The Federal Government will improve incentives and the policy framework for the voluntary sharing of data in compliance with data protection rules, and will progress the establishment of a trustworthy **data and analysis infrastructure** including the building of a cloud platform with upgradable storage and computing capacity on which this infrastructure can be run.

Sweden's approach to AI (Government Offices of Sweden, 2018) has less specific terms, but provides general guidance on education, research, innovation and infrastructure for AI. Recommendations include building a strong research base, collaboration between sectors and with other countries, developing efforts to prevent and manage risk and developing standards to guide the ethical use of AI. A Swedish AI Council, made up of experts from industry and academia, has also been established to develop a 'Swedish model' for AI, which they say will be sustainable, beneficial to society and promote long-term economic growth (Swedish AI Council, 2019).

Singapore. 'AI.SG'

AI Singapore is a five-year, S$150 million national program launched in May 2017 to enhance Singapore's capabilities in AI. Its goals are to invest in the next wave of AI research, address major societal and economic challenges, and broaden adoption and use of AI within industry.

In June 2018, the government announced three new initiatives on AI governance and ethics. The new Advisory Council on the Ethical Use of AI and Data will help the Government develop standards and governance frameworks for the ethics of AI.

NATIONAL RESEARCH FOUNDATION
PRIME MINISTER'S OFFICE
SINGAPORE

PRESS RELEASE

3 May 2017

AI.SG: NEW NATIONAL PROGRAMME TO CATALYSE, SYNERGISE AND BOOST SINGAPORE'S ARTIFICIAL INTELLIGENCE CAPABILITIES

1. The National Research Foundation (NRF) Singapore will launch a national programme in Artificial Intelligence (AI) to catalyse, synergise and boost Singapore's AI capabilities to power our future, digital economy. AI.SG will be an initiative driven by a government-wide partnership comprising NRF, the Smart Nation and Digital Government Office (SNDGO), the Economic Development Board (EDB), the Infocomm Media Development Authority (IMDA), SGInnovate, and the Integrated Health Information Systems (IHiS). AI.SG will also bring together all Singapore-based research institutions and the vibrant ecosystem of AI start-ups and companies developing AI products, to grow the knowledge, create the tools and develop the talent to power Singapore's AI efforts.

2. This initiative builds on Singapore's vision of becoming a Smart Nation and answers the call by the Committee on the Future Economy to build stronger digital capabilities, so that Singapore and Singaporeans better seize the growth opportunities offered by the digital economy.

3. AI.SG has three objectives:

a. Use AI to address major challenges that affect society and industry. For example, to increase traffic throughput during peak hour, or to address healthcare challenges that are to come with an ageing population. **Mr Bruce Liang, Chief Executive Officer of IHiS and Chief Information Officer of Ministry of Health said:** "Healthcare is currently both a knowledge and human-touch-intensive industry. Coupled with the progress in the digitisation of Singapore's healthcare over the years, we see significant applicability of AI in the future for safeguarding the health of Singaporeans. AI could play a big role in supporting prevention, diagnosis, treatment plans, medication management, precision medicine and drug creation. Healthcare manpower, augmented with AI tools, could better address increased healthcare demands in the future. There is enormous potential and we look forward to collaborating with other agencies and organisations in AI.SG to enhance the delivery of health for the Singapore population."

b. Invest in deep capabilities to catch the next wave of scientific innovation. These may include next-generation "explainable" AI systems exhibiting more human-like learning abilities, as well as adjacent technologies such as computing architectures (integrating software, firmware and hardware) and cognitive science. The NRF Fellowship and Investigatorship schemes[1] will be deployed to support such scientific activities. Local talent in AI will also be trained though their involvement in the development of these deep capabilities in AI.

[1] The NRF Fellowship provides opportunities for early career researchers to carry out independent research in Singapore. The NRF Investigatorship provides opportunities for established, innovative and active scientists and researchers, in their mid-career, to pursue ground-breaking research in Singapore.

9. **Professor Ho Teck Hua, Executive Chairman of AI.SG**, also Deputy President (Research & Technology) and Tan Chin Tuan Centennial Professor at NUS, said: "AI.SG provides unparalleled opportunities for universities and research institutions working in AI. The scale and approach of AI.SG are unique. The multi-disciplinary project teams in AI.SG will work collaboratively across institutional affiliations, disciplines and national borders to investigate fundamentally different approaches to develop innovative AI technology and solutions. A key feature of AI.SG will be a series of Grand Challenges that will inspire both the researchers and the end users to tackle major societal challenges that are not only relevant for Singapore but also the global community. AI.SG aspires to develop smart technologies that transform societies."

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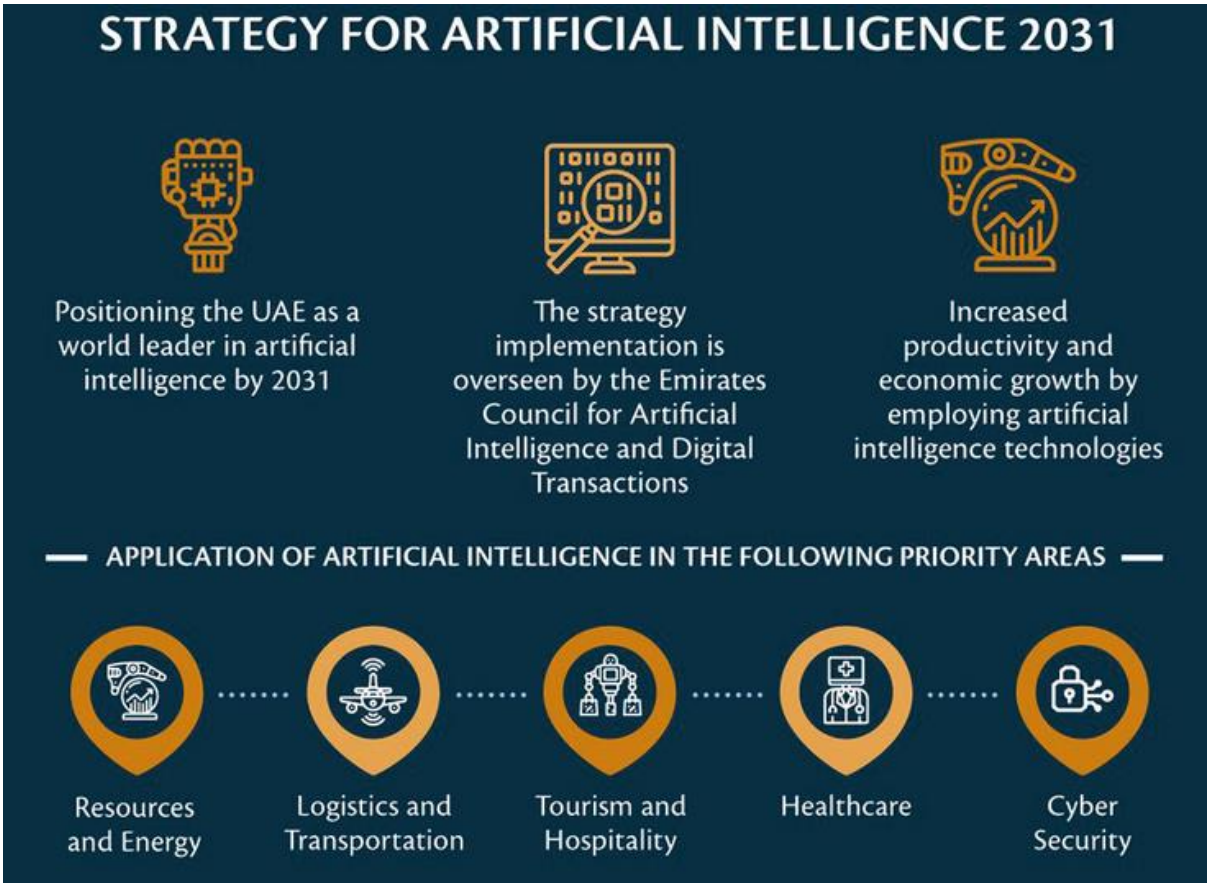
Saudi Arabia

King Salman issued a royal decree to establish an artificial intelligence (AI) center to enhance the drive toward innovation and digital transformation in Saudi Arabia in Sep 2019. The establishment of the center aligns with the Kingdom's Vision 2030 program. The Government of Saudi Arabia is now drafting a national AI strategy that aims to build an innovative and ethical AI ecosystem in the country by 2030.

Australia does not yet have a national strategy on AI. It does however have a' Digital Economy Strategy' (Australian Government, 2017) which discusses empowering Australians through 'digital skills and inclusion', listing AI as a key emerging technology. A report on 'Australia's Tech Future' further details plans for AI, including using AI to improve public services, increase administrative efficiency and improve policy development (Australian Government, 2018).

UAE

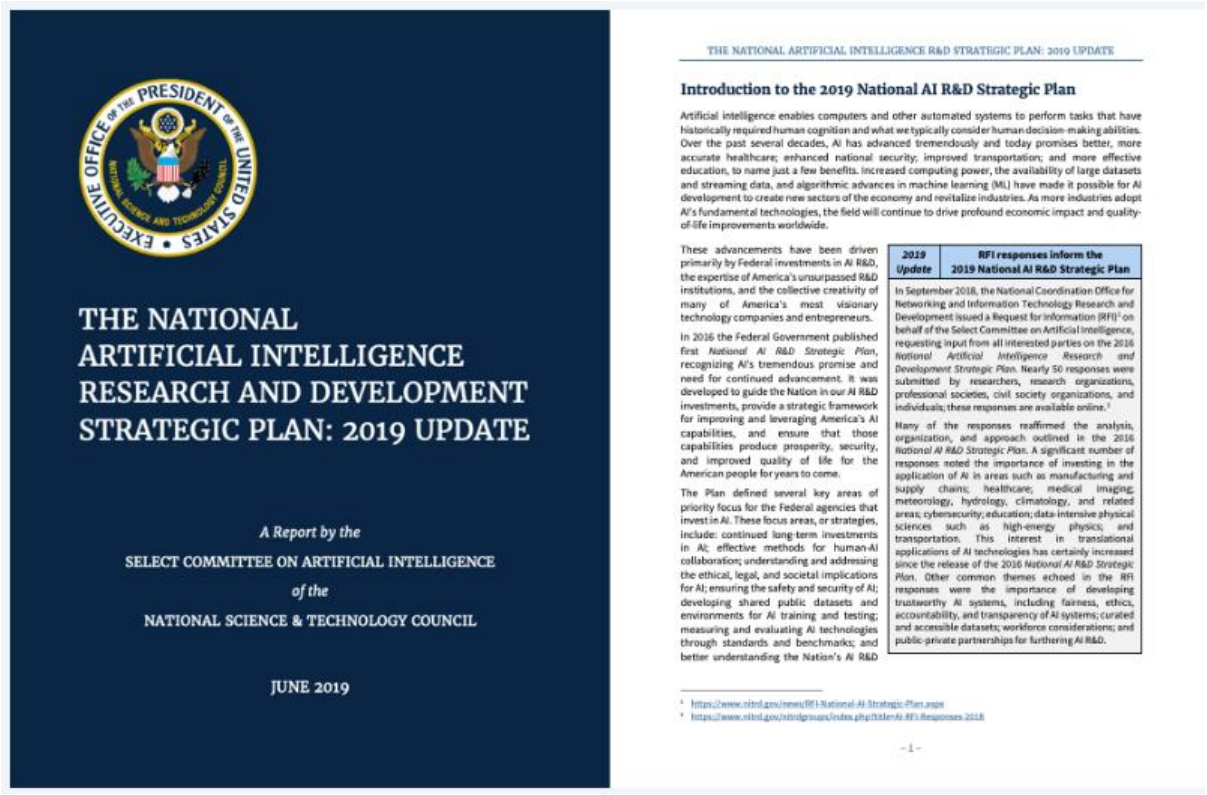
The UAE Strategy for Artificial Intelligence, was announced in October 2017. The UAE became the first country in the world to create a Ministry of Artificial Intelligence and first in the Middle East to launch an AI strategy. The strategy is the first initiative of the UAE Centennial 2071 Plan and its main objective is to enhance government performance and efficiency. The government will invest in AI technologies in nine sectors: transport, health, space, renewable energy, water, technology, education, environment, and traffic. In doing so, the government aims to diversify the economy, cut costs across the government and position the UAE as a global leader in the application of AI.



United States.

In February 2019, the United States launched the American AI Initiative, in the form of an executive order. This "whole-of-government strategy" aims at focusing federal government resources for investing in AI research, unleashing AI resources, setting AI governance standards, building the AI workforce and protecting the US AI advantage.

Following the American AI Initiative, the US issued the National Artificial Intelligence Research and Development Strategic Plan: 2019 Update calling for developing shared public datasets and environments for AI training and testing. The Initiative was also considered in the development of the US's new Federal Data Strategy and associated Action Plan, which includes an action item to "improve data resources for AI research and development".



THE NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH AND DEVELOPMENT STRATEGIC PLAN: 2019 UPDATE

A Report by the
SELECT COMMITTEE ON ARTIFICIAL INTELLIGENCE
of the
NATIONAL SCIENCE & TECHNOLOGY COUNCIL

JUNE 2019

THE NATIONAL ARTIFICIAL INTELLIGENCE R&D STRATEGIC PLAN: 2019 UPDATE

Introduction to the 2019 National AI R&D Strategic Plan

Artificial intelligence enables computers and other automated systems to perform tasks that have historically required human cognition and what we typically consider human decision-making abilities. Over the past several decades, AI has advanced tremendously and today promises better, more accurate healthcare; enhanced national security; improved transportation; and more effective education, to name just a few benefits. Increased computing power, the availability of large datasets and streaming data, and algorithmic advances in machine learning (ML) have made it possible for AI development to create new sectors of the economy and revitalize industries. As more industries adopt AI's fundamental technologies, the field will continue to drive profound economic impact and quality-of-life improvements worldwide.

These advancements have been driven primarily by Federal investments in AI R&D, the expertise of America's unsurpassed R&D institutions, and the collective creativity of many of America's most visionary technology companies and entrepreneurs.

In 2016 the Federal Government published first *National AI R&D Strategic Plan*, recognizing AI's tremendous promise and need for continued advancement. It was developed to guide the Nation in our AI R&D investments, provide a strategic framework for improving and leveraging America's AI capabilities, and ensure that those capabilities produce prosperity, security, and improved quality of life for the American people for years to come.

The Plan defined several key areas of priority focus for the Federal agencies that invest in AI. These focus areas, or strategies, include: continued long-term investments in AI; effective methods for human-AI collaboration; understanding and addressing the ethical, legal, and societal implications for AI; ensuring the safety and security of AI; developing shared public datasets and environments for AI training and testing; measuring and evaluating AI technologies through standards and benchmarks; and better understanding the Nation's AI R&D

2019 Update	RFI responses inform the 2019 National AI R&D Strategic Plan

In September 2018, the National Coordination Office for Networking and Information Technology Research and Development issued a Request for Information (RFI)[3] on behalf of the Select Committee on Artificial Intelligence, requesting input from all interested parties on the 2016 *National Artificial Intelligence Research and Development Strategic Plan*. Nearly 50 responses were submitted by researchers, research organizations, professional societies, civil society organizations, and individuals; these responses are available online.[4]

Many of the responses reaffirmed the analysis, organization, and approach outlined in the 2016 *National AI R&D Strategic Plan*. A significant number of responses noted the importance of investing in the application of AI in areas such as manufacturing and supply chains; healthcare; medical imaging; meteorology, hydrology, climatology, and related areas; cybersecurity; education; data-intensive physical sciences such as high-energy physics; and transportation. This interest in translational applications of AI technologies has certainly increased since the release of the 2016 *National AI R&D Strategic Plan*. Other common themes echoed in the RFI responses were the importance of developing trustworthy AI systems, including fairness, ethics, accountability, and transparency of AI systems; curated and accessible datasets; workforce considerations; and public-private partnerships for furthering AI R&D.

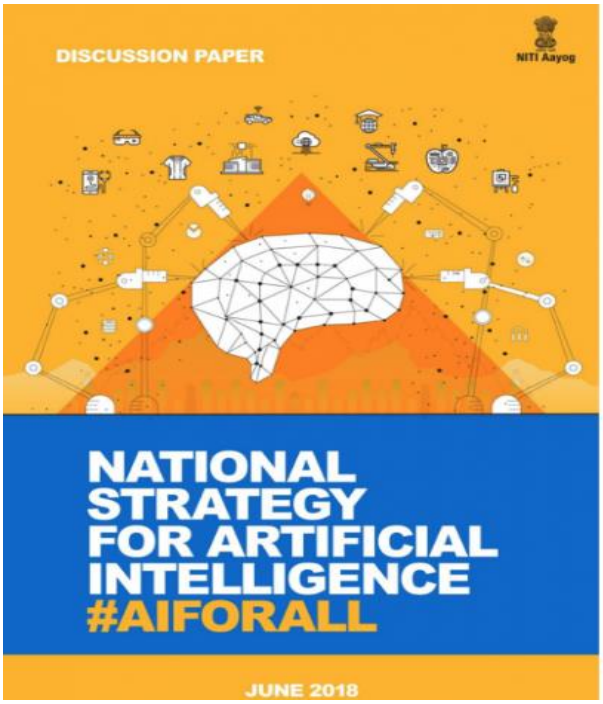
[3] https://www.nitrd.gov/news/RFI-National-AI-Strategic-Plan.aspx
[4] https://www.nitrd.gov/nitrdgroups/index.php?title=AI-RFI-Responses-2018

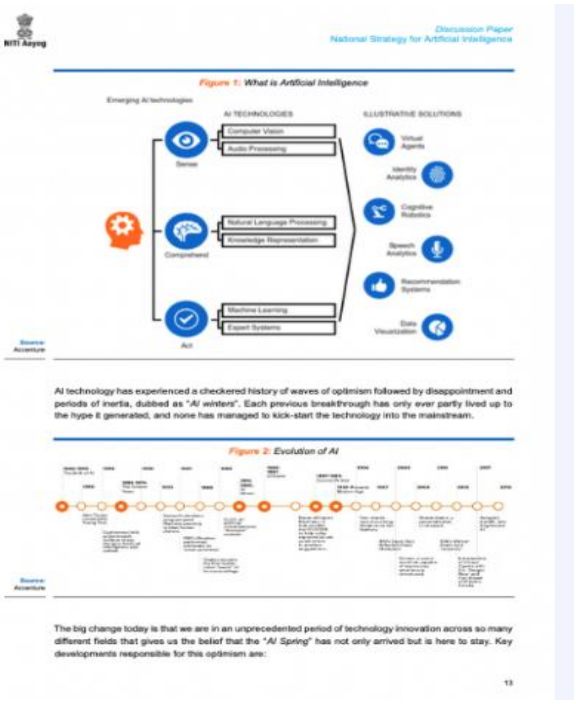
-1-

India. 'Social Inclusion and AI Garage'

India's National Strategy for Artificial Intelligence focuses on using technologies to ensure social growth, inclusion and positioning the country as a leader in AI on the global platform. Strategically, the government also seeks to establish India as an "AI Garage," incubating AI that can be applicable to the rest of the developing world.

NITI Aayog, the government think tank that wrote the report, calls this approach #AIforAll. The strategy, as a result, aims to (1) enhance and empower Indians with the skills to find quality jobs; (2) invest in research and sectors that can maximize economic growth and social impact; and (3) scale Indian-made AI solutions to the rest of the developing world.





G7 Common Vision for the Future of AI

At the 2018 meeting of the G7 in Charlevoix, Canada, the leaders of the G7 (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) committed to 12 principles for AI, summarised below:

1. Promote human-centric AI and the commercial adoption of AI, and continue to advance appropriate technical, ethical and technologically neutral approaches.
2. Promote investment in R&D in AI that generates public test in new technologies and supports economic growth.
3. Support education, training and re-skilling for the workforce.
4. Support and involve underrepresented groups, including women
5. Facilitate multi-stakeholder dialogue on how to advance AI innovation to increase trust and adoption.
6. Support efforts to promote trust in AI, with particular attention to countering harmful stereotypes and fostering gender equality. Foster initiatives that promote safety and transparency.
7. Promote the use of AI by small and medium-sized enterprises.
8. Promote active labour market policies, workforce development and training programmes to develop the skills needed for new jobs.
9. Encourage investment in AI.
10. Encourage initiatives to improve digital security and develop codes of conduct.
11. Ensure the development of frameworks for privacy and data protection.
12. Support an open market environment for the free flow of data, while respecting privacy and data protection.

(G7 Canadian Presidency, 2018).