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The global landscape of AI ethics guidelines

Anna Jobin, Marcello Ienca and Effy Vayena*

Health Ethics and Policy Lab, Department of Health Sciences and Technology, ETH Zurich, Zurich, Switzerland. *e-mail: effy.vayena@hest.ethz.ch

Supplementary Information for

Artificial Intelligence: the global landscape of ethics guidelines

This PDF file includes:

Tables S1 to S3

Table S1. Screening and Eligibility (details)

Screening		
Sources considered:	-	Types: websites and documents published online or parts thereof such as policy documents, principles, guidelines, recommendations, dedicated webpages, institutional reports and declarations;
	-	Issuers: institutions, associations and organizations such as companies, corporations, NGOs, NPOs, academic and professional societies, governmental institutions and affiliated organizations;
	-	Language: English, German, French, Italian, Greek (the languages spoken by the researchers).
Sources excluded:	-	Types: videos, images, audio/podcasts, books, blog articles, academic articles, journalistic articles, syllabi, legislation, official standards, conference summaries;
	-	Issuers: individual authors;
	-	Language: others than those above.
Eligibility		
Sources included:	-	which refer to "artificial intelligence" and/or "AI", either explicitly in their title or within their description (example: UK, House of Lords: "AI in the UK: ready, willing and able"); or
	-	which do not contain the above reference in their title but mention "robot" or "robotics" instead *and* reference AI or artificial intelligence explicitly as being part of robots and/or robotics (example: "Principles of robotics"); or
	-	which do not contain the above reference in their title but are thematically equivalent (by referring to "algorithms", "predictive analytics", "cognitive computing", "machine learning", "deep learning", "autonomous" or "automated" instead (example: "Automated and Connected Driving: Report").
	-	which self-proclaim to be a principle or guideline (including "ethics/ethical", "principles", "tenets", "declaration", "policy", "guidelines", "values" etc.); or
	-	which is expressed in normative or prescriptive language (i.e. with modal verbs or imperatives); or
	-	which is principle- or value-based (i.e. indicating a preference and/or a commitment to a certain ethical vision or course of action).
Excluded sources:	-	websites and documents about robotics that do not mention artificial intelligence as being part of robots/robotics; and
	-	websites and documents about data or data ethics that do not mention artificial intelligence as being part of data;

Table S2. Ethics guidelines for AI by date of publishing (incl. details)

Name of Document/Website	Name of guidelines/principles	Issuer	Country of issuer	Type of issuer	Date of publishing	Target audience	Retrieval
Principles of robotics	Principles for designers, builders and users of robots	Engineering and Physical Sciences Research Council UK (EPSRC)	UK	Science foundation	1-Apr-2011	multiple (public, developers)	Linkhubs
Ethique de la recherche en robotique	Préconisations	CERNA (Allistene)	France	Research alliance	xx-Nov-2014	researchers	Citation chaining
Unified Ethical Frame for Big Data Analysis. IAF Big Data Ethics Initiative, Part A	Values for an Ethical Frame	The Information Accountability Foundation	USA	NPO/Charity	xx-Mar-2015	unspecified	Citation chaining
Ethics Policy	IIIM's Ethics Policy	Icelandic Institute for Intelligent Machines (IIIM)	Iceland	Academic and research institution	31-Aug-2015	self	Linkhubs
The AI Now Report. The Social and Economic Implications of Artificial Intelligence Technologies in the Near-Term	Key recommendations	AI Now Institute	USA	Academic and research institution	22-Sep-2016	unspecified	Citation chaining
Tenets	Tenets	Partnership on AI	n.a.	Private sector alliance	29-Sep-2016	self	Web search results 1-30
Preparing for the future of Artificial Intelligence	Recommendations in this Report	Executive Office of the President; National Science and Technology Council; Committee on Technology	USA	Governmental agencies/organizations	xx-Oct-2016	multiple (stakeholders engaged at variouspoints in the production, use, governance, and assessment of AI systems)	Linkhubs
The National Artificial Intelligence Research and Development Strategic Plan	R&D Strategy	National Science and Technology Council; Networking and Information Technology Research and Development Subcommittee	USA	Governmental agencies/organizations	xx-Oct-2016	self	Linkhubs
Position on Robotics and Artificial Intelligence	3. Principles // 6. Recommendations Green position on Robotics and Artificial Intelligence	The Greens (Green Working Group Robots)	EU	Political Party	22-Nov-2016	multiple (EU parliament, public, self)	Web search results 31-200
Principles for Accountable Algorithms and a Social Impact Statement for Algorithms	Principles for Accountable Algorithms	Fairness, Accountability, and Transparency in Machine Learning (FATML)	n.a.	n.a.	24-Nov-2016	multiple (developers and product managers)	Linkhubs
Statement on Algorithmic Transparency and Accountability	Principles for Algorithmic Transparency and Accountability	Association for Computing Machinery (ACM)	USA	Prof. Association/Society	12-Jan-2017	multiple (developers, deployers)	Linkhubs
Report with recommendations to the Commission on Civil Law Rules on Robotics	Motion for a European Parliament Resolution	European Parliament	EU	IGO/supra-national	27-Jan-2017	public sector (lawmakers)	Linkhubs
AI Principles	AI Principles	Future of Life Institute	USA	Miscellaneous (mixed crowdsourced, NPO)	30-Jan-2017	unspecified	Linkhubs
The Japanese Society for Artificial Intelligence Ethical Guidelines	The Japanese Society for Artificial Intelligence Ethical Guidelines	Japanese Society for Artificial Intelligence	Japan	Prof. Association/Society	28-Feb-2017	self (incl AI)	Linkhubs
Report on Artificial Intelligence and Human Society (Unofficial translation)	4.1 Ethical issues	Advisory Board on Artificial Intelligence and Human Society (initiative of the Minister of State for Science and Technology Policy)	Japan	Governmental agencies/organizations	24-Mar-2017	multiple (researchers, government, businesses, public, educators)	Web search results 31-200
Artificial Intelligence and Machine Learning: Policy Paper	Guiding principles and recommendations	Internet Society	international	NPO/charity	18-Apr-2017	multiple (policymakers, other stakeholders in	Web search results 31-200

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						the wider Internet ecosystem)	
Machine learning: the power and promise of computers that learn by example	Chapter six – A new wave of machine learning research	The Royal Society	UK	Prof. Association/Society	xx-Apr-2017	unspecified	Citation chaining
The Ethics of Code: Developing AI for Business with Five Core Principles	The Ethics of Code: Developing AI for Business with Five Core Principles	Sage	UK	Company	27-Jun-2017	self	Citation chaining
Automated and Connected Driving: Report	Ethical rules for automated and connected vehicular traffic	Federal Ministry of Transport and Digital Infrastructure, Ethics Commission	Germany	Governmental agencies/organizations	xx-Jun-2017	multiple (automated & connected vehicular traffic)	Linkhubs
Mid- to Long-Term Master Plan in Preparation for the Intelligent Information Society	Tasks (8-12)	Government of the Republic of Korea	South Korea	Governmental agencies/organizations	20-Jul-2017	self (gov)	Linkhubs
Draft AI R&D Guidelines for International Discussions	AI R&D Principles	Institute for Information and Communications Policy (IICP), The Conference toward AI Network Society	Japan	Governmental agencies/organizations	28-Jul-2017	multiple (systems and developers)	Linkhubs
Big data, artificial intelligence, machine learning and data protection	Key recommendations	Information Commissioner's Office	UK	Governmental agencies/organizations	4-Sep-2017	organisations	Web search results 1-30
Report of COMEST on Robotics Ethics (only section "Recommendations" taken into account)	Relevant ethical principles and values	COMEST/UNESCO	international	IGO/supra-national	14-Sep-2017	unspecified	Citation chaining
Ethical Principles for Artificial Intelligence and Data Analytics	Ethical Principles for Artificial Intelligence and Data Analytics	Software & Information Industry Association (SIIA), Public Policy Division	international	Private sector alliance	15-Sep-2017	private sector (industry organizations)	
AI - Our approach	AI - Our approach	Microsoft	USA	Company	7-Oct-2017	self	Web search results 1-30
DeepMind Ethics & Society Principles	Our Five Core Principles	DeepMind Ethics & Society	UK	Company	10-Oct-2017	self	Citation chaining
Human Rights in the Robot Age Report	Recommendations	The Rathenau Institute	Netherlands	Academic and research institution (Gov)	11-Oct-2017	public sector (Council of Europe)	Citation chaining
Artificial Intelligence. The Public Policy Opportunity	Summary of Recommendations	Intel Corporation	USA	Company	18-Oct-2017	public sector (policy makers)	Citation chaining
ITI AI Policy Principles	ITI AI Policy Principles	Information Technology Industry Council (ITI)	international	Private sector alliance	24-Oct-2017	self (members)	Citation chaining
AI Now 2017 Report	Recommendations, Executive Summary	AI Now Institute	USA	Academic and research institution	xx-Oct-2017	multiple (core public agencies, companies, industry, universities, conferences, other stakeholders)	Citation chaining
Montréal Declaration: Responsible AI	Montréal Declaration: Responsible AI	Université de Montréal	Canada	Academic and research institution	3-Nov-2017	multiple (public, developers, policy makers)	Linkhubs
Ethically Aligned Design. A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems, version 2	Ethically Aligned Design. A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems, version 2	Institute of Electrical and Electronics Engineers (IEEE), The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems	international	Prof. Association/Society	12-Dec-2017	unspecified	Linkhubs
How can humans keep the upper hand? Report on the ethical matters raised by AI algorithms (only section "From principles to policy recommendations")	From principles to policy recommendations	French Data Protection Authority (CNIL)	France	Governmental agencies/organizations	15-Dec-2017	unspecified	Linkhubs
Top 10 Principles for Ethical Artificial Intelligence	Top 10 Principles for Ethical Artificial Intelligence	UNI Global Union	international	Federation/Union	17-Dec-2017	multiple (unions, workers)	Linkhubs
Business Ethics and Artificial Intelligence	Fundamental Values and Principles	Institute of Business Ethics	UK	Private sector alliance	11-Jan-2018	private sector (users of AI in business)	Web search results 31-200

IBM's Principles for Trust and Transparency	IBM's Principles for Trust and Transparency	IBM	USA	Company	17-Jan-2018	self	Web search results 1-30
Artificial intelligence and privacy	Recommendations for privacy friendly development and use of AI	The Norwegian Data Protection Authority	Norway	Governmental agencies/organizations	xx-Jan-2018	multiple (developers, system suppliers, organisations, end users, authorities)	Web search results 31-200
The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation	Four High-Level Recommendations	Future of Humanity Institute; University of Oxford; Centre for the Study of Existential Risk; University of Cambridge; Center for a New American Security; Electronic Frontier Foundation; OpenAI	international	Miscellaneous (mixed academic, NPO)	20-Feb-2018	unspecified	Citation chaining
White Paper: How to Prevent Discriminatory Outcomes in Machine Learning	Executive summary	WEF, Global Future Council on Human Rights 2016-2018	international	NPO/Charity	12-Mar-2018	private sector (companies)	Citation chaining
For a meaningful Artificial Intelligence. Towards a French and European strategy	"Part 5 — What are the Ethics of AI?; Part 6 — For Inclusive and Diverse Artificial Intelligence"	Mission Villani	France	Governmental agencies/organizations	29-Mar-2018	public sector (French government/parliament)	Linkhubs
Statement on Artificial Intelligence, Robotics and 'Autonomous' Systems	Ethical principles and democratic prerequisites	European Commission, European Group on Ethics in Science and New Technologies	EU	IGO/supra-national	xx-Mar-2018	public sector (EU Commission)	Linkhubs
L'intelligenzia artificiale al servizio del cittadino	Sfida 1: Etica	Agenzia per l'Italia Digitale (AGID)	Italy	Governmental agencies/organizations	xx-Mar-2018	multiple (government, schools, healthcare institutions)	Linkhubs
OpenAI Charter	OpenAI Charter	OpenAI	USA	NPO/charity(*)	9-Apr-2018	self	Linkhubs
AI in the UK: ready, willing and able? (report, only section "An AI Code" taken into account)	no title. P. 125: "…we suggest five overarching principles for an AI Code:"	UK House of Lords, Select Committee on Artificial Intelligence	UK	Governmental agencies/organizations	16-Apr-2018	public sector (UK government)	Linkhubs
Privacy and Freedom of Expression In the Age of Artificial Intelligence	Conclusions and Recommendations	Privacy International & Article 19	international	NPO/Charity	25-Apr-2018	multiple (states, companies, civil society)	Citation chaining
AI Guidelines	AI Guidelines	Deutsche Telekom	Germany	Company	11-May-2018	self	Web search results 1-30
The Toronto Declaration: Protecting the right to equality and non-discrimination in machine learning systems	The Toronto Declaration: Protecting the right to equality and non-discrimination in machine learning systems	Access Now ; Amnesty International	international	Miscellaneous (mixed NGO, NPO)	16-May-2018	multiple (states, private sector actors)	Linkhubs
Discussion Paper on Artificial Intelligence (AI) and Personal Data - Fostering Responsible Development and Adoption of AI	Principles for responsible AI	Personal Data Protection Commission Singapore	Singapore	Governmental agencies/organizations	5-Jun-2018	multiple (business; Trade associations and chambers, professional bodies and interest groups)	Linkhubs
Our principles	Our principles	Google	USA	Company	7-Jun-2018	self	Web search results 1-30
Discussion Paper: National Strategy for Artificial Intelligence (only section "Ethics, Privacy, Security and Artificial Intelligence. Towards a "Responsible AI"")	Ethics, Privacy, Security and Artificial Intelligence. Towards a "Responsible AI"	National Institution for Transforming India (Niti Aayog)	India	Governmental agencies/organizations	8-Jun-2018	self (Indian government)	Linkhubs
Charlevoix Common Vision for the Future of Artificial Intelligence	Charlevoix Common Vision for the Future of Artificial Intelligence	Leaders of the G7	international	IGO/supra-national	9-Jun-2018	self (gov)	Linkhubs
Policy Recommendations on Augmented	Policy Recommendations on Augmented	American Medical Association (AMA)	USA	Prof. Association/Society	14-Jun-2018	self	Web search results 31-200

Intelligence in Health Care H-480.940	Intelligence in Health Care H-480.940						
Artificial Intelligence: open questions about gender inclusion	Proposals	W20	international	IGO/supra-national	2-Jul-2018	public sector (states/countries)	Web search results 31-200
Everyday Ethics for Artificial Intelligence. A practical guide for designers & developers	Five Areas of Ethical Focus	IBM	USA	Company	2-Sep-2018	designers	Web search results 1-30
Artificial Intelligence (AI) in Health	Key recommendations	Royal College of Physicians	UK	Prof. Association/Society	3-Sep-2018	multiple (industry, doctors, regulators)	Web search results 31-200
Initial code of conduct for data-driven health and care technology	10 Principles	UK Department of Health & Social Care	UK	Governmental agencies/organizations	5-Sep-2018	developers	Web search results 31-200
Work in the age of artificial intelligence. Four perspectives on the economy, employment, skills and ethics (only section "Good application of artificial intelligence technology and ethics")	Values of a good artificial intelligence society	Ministry of Economic Affairs and Employment	Finland	Governmental agencies/organizations	10-Sep-2018	multiple (Finnish world of work)	Linkhubs
SAP's guiding principles for artificial intelligence	SAP's guiding principles for artificial intelligence	SAP	Germany	Company	18-Sep-2018	self	Web search results 1-30
Sony Group AI Ethics Guidelines	Sony Group AI Ethics Guidelines	SONY	Japan	Company	25-Sep-2018	self (group)	Web search results 1-30
Ethics Framework - Responsible AI	Framework	Machine Intelligence Garage Ethics Committee	UK	n.a.	28-Sep-2018	private sector (start-ups)	Web search results 31-200
Dutch Artificial Intelligence Manifesto	Multidisciplinary challenges	Special Interest Group on Artificial Intelligence (SIGAI), ICT Platform Netherlands (IPN)	Netherlands	Academic and research institution	xx-Sep-2018	multiple (Dutch government, researchers)	Web search results 31-200
Governing Artificial Intelligence. Upholding Human Rights & Dignity	Recommendations	Data & Society	USA	Research (NPO)	10-Oct-2018	multiple (companies, researchers, governments, policy makers, UN)	Citation chaining
Tieto's AI ethics guidelines	Tieto's AI ethics guidelines	Tieto	Finland	Company	17-Oct-2018	self	Web search results 31-200
Intel's AI Privacy Policy White Paper. Protecting individuals' privacy and data in the artificial intelligence world	Six Policy Recommendations	Intel Corporation	USA	Company	22-Oct-2018	public sector (policy makers)	Web search results 31-200
Universal Guidelines for Artificial Intelligence	Universal Guidelines for Artificial Intelligence	The Public Voice	international	Mixed (coalition of NGOs, ICOs etc.)	23-Oct-2018	multiple (institutions, governments)	Web search results 1-30
Declaration on ethics and data protection in Artificial Intelligence	"… guiding principles …"	ICDPPC	international	IGO/supra-national	23-Oct-2018	unspecified	Web search results 1-30
AI Principles of Telefónica	AI Principles of Telefónica	Telefónica	Spain	Company	30-Oct-2018	self	Web search results 1-30
Introducing Unity's Guiding Principles for Ethical AI – Unity Blog	Unity's six guiding AI principles are as follows	Unity Technologies	USA	Company	28-Nov-2018	self	Manual inclusion
Responsible bots: 10 guidelines for developers of conversational AI	Guideline	Microsoft	USA	Company	xx-Nov-2018	developers	Manual inclusion
AI Now 2018 Report	Recommendations	AI Now Institute	USA	Academic and research institution	xx-Dec-2018	multiple	Manual inclusion
Ethics of AI in Radiology: European and North American Multisociety Statement	Conclusion	American College of Radiology; European Society of Radiology; Radiology Society of North America; Society for Imaging Informatics in	international	Prof. Association/Society	26-Feb-2019	self	Manual inclusion

		Medicine; European Society of Medical Imaging Informatics; Canadian Association of Radiologists; American Association of Physicists in Medicine					
European ethical Charter on the use of Artificial Intelligence in judicial systems and their environment	"The five principles of the Ethical Charter on the Use of Artificial Intelligence in Judicial Systems and their environment"	Concil of Europe: European Commission for the efficiency of Justice (CEPEJ)	EU	IGO/supra-national	xx-Feb-2019	multiple (public and private stakeholders)	Manual inclusion
Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems, First Edition (EAD1e)	General Principles	Institute of Electrical and Electronics Engineers (IEEE), The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems	international	Prof. Association/Society	25-Mar-2019	multiple (technologists, educators, and policy maker)	Manual inclusion
Artificial Intelligence. Australia's Ethics Framework. A discussion Paper	Core principles for AI; A toolkit for ethical AI	Department of Industry Innovation and Science	Australia	Governmental agencies/organizations	5-Apr-2019	unspecified	Manual inclusion
Ethics Guidelines for Trustworthy AI	Ethical Principles in the Context of AI Systems	High-Level Expert Group on Artificial Intelligence	EU	IGO/supra-national	8-Apr-2019	multiple (all stakeholders)	Manual inclusion
Ethical, social, and political challenges of Artificial Intelligence in Health	Conclusion	Future Advocacy	UK	Company	xx-Apr-2019	unspecified	Manual inclusion
The responsible AI framework	Operating AI	PriceWaterhouseCoopers UK	UK	Company	n.a.	multiple (clients)	Web search results 31-200
Digital Decisions	VI. Solutions Part 1: Principles	Center for Democracy & Technology	USA	NPO/charity	n.a.	unspecified	Citation chaining
Responsible AI and robotics. An ethical framework.	Our view	Accenture UK	UK	Company	n.a.	private sector	Web search results 1-30
Commitments and principles	OP Financial Group's ethical guidelines for artificial intelligence	OP Group	Finland	Company	n.a.	self	Web search results 31-200
Science, Law and Society (SLS) Initiative	Principles for the Governance of AI	The Future Society	USA	NPO/charity	n.a.	public sector (policy makers)	Linkhubs
10 Principles of responsible AI	Summary of our proposed Recommendations	Women leading in AI	n.a.	n.a.	n.a.	public sector (national and international policy makers)	Manual inclusion
AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations	Action Points	AI4People	EU	n.a.	n.a.	unspecified	Manual inclusion
AI Principles & Ethics	AI Principles; AI guidelines	Smart Dubai	UAE	Governmental agencies/organizations	n.a. 2018?	self	Manual inclusion

Table S3. Categorization after themeing and code mapping

Question addressed	Thematic family	Themes
What?	Ethical Principles & Values	**Ethical Principles** I. Beneficence II. Non-maleficence III. Trust IV. Transparency & Explainability V. Freedom and autonomy (incl. consent) VI. Privacy VII. Justice, Fairness & Equity VIII. Responsibility & Accountability IX. Dignity X. Sustainability XI. Solidarity
	Technical and methodological aspects	**Specific functionalities** I. Feedback & feedback-loop II. Decision-making **Data & datasets** I. Data origin/input II. Data use III. Metadata IV. Algorithms **Methodological challenges** I. Methodology II. Metris & measurements III. Tests, testing IV. Ambiguity & uncertainty V. Accuracy VI. Reliability VII. Evidence and validation VIII. Black-box (opacity) IX. Data security X. Quality (of data/system/etc.)
	Impact	**Benefits** I. AI strengths, advantages II. Knowledge III. Innovation IV. Enhancement **Risks** I. Risks II. Malfunction III. Misuse & dual-use IV. Deception V. Discrimination (duplicate in Justice&Fairness) VI. Surveillance VII. Manipulation VIII. Arms race **Impact assessment** I. Impact II. Goals/Purposes/Intentions III. Public opinion IV. Risk evaluation & mitigation (duplicate in Risks) V. Monitoring/Precaution VI. Future of work
Who?	Design & development	I. Industry II. AI researchers III. Designers IV. Developers

	Users	I. End users II. Organisations III. Public sector actors IV. Military V. Communities
	Specific stakeholders	I. Ethical and/or auditing committees II. Government III. Policy makers IV. Researchers & scientists V. Vulnerable groups & minorities
How?	**Social engagement**	I. Knowledge commons II. Education & training III. Public deliberation & democratic processes IV. Stakeholder involvement & partnerships
	Soft policy	I. Standards II. Certification III. Best practices IV. Whistleblowing
	Economic incentives	V. Business model & strategy VI. Funding & investments VII. Taxes/taxation
	Regulation & audits	VIII. Laws & regulation (general) IX. Data protection regulation X. IP law XI. Human rights treaties XII. Other rights & laws XIII. Audits & auditing