A Glossary for Discussion of Ethics of Autonomous and Intelligent Systems, Version 1

Prepared for The IEEE Global Initiative for *Ethically Aligned Design*

Glossary Committee

Dr. Sara Jordan with assistance from Ms. Rosalie Day and Ms. L. Maria Ingram

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The mission of the Glossary Committee (Dr. Sara Jordan with assistance from Ms. Rosalie Day and Ms. L. Maria Ingram) is to make language regarding ethical issues involving autonomous and intelligent systems (A/IS) consistent and aligned within IEEE communities working in these areas. This tool was compiled as a resource of common definitions used by professionals in the multiple disciplines that inform the study and writing related to A/IS ethics.

The remit of the Glossary Committee evolved out of a desire to align the process of arriving at consensus within *Ethically Aligned Design* (EAD) Committees, and IEEE P7000 Standards Working Groups in regards to consistent terminology of key terms. By providing a shared, multidisciplinary, and evolving resource for exploration of key concepts and development of specific, specialized, concepts our goal is to provide an updated version of the Glossary upon the release of the final version of *Ethically Aligned Design* that all Committees and Working Groups can utilize based on the context of their specific efforts.

We also hope this Glossary will serve as a pragmatic and helpful resource for any academic, technologist or policy expert focusing on issues related to A/IS ethics.

The Glossary Committee hopes that this resource will be used in STEM education settings and to help lay persons interested in the exciting topic of autonomous and intelligent systems to make sense of the terms used.

If you'd like to provide feedback on specific definitions or the Glossary in general, *please email Dr. Jordan by clicking here.*

METHOD:
Solicitations were made to The Chairs of The IEEE Global Initiative Committees and IEEE P7000 Standards Working Group Chairs to nominate key terms they believe needed explication in this document.[1] Further terms and concepts were identified by Dr. Jordan and the Committee. Identification of candidate definitions was made using a "most commonly cited" and/or "most capacious definition" approach. Potential definitions for inclusion were extracted from disciplinary journal literature from 1970 until 2017. Simple key word searches of "defin*" and the relevant keyword were performed and the paragraph level text extracted. When references were included, these references were examined for other candidate definitions. Those definitions cited frequently or those pieces of literature cited frequently associated with a given definition were excerpted. Final selection was made based upon careful reading by the Dr. Jordan and the Committee. Where definitions could not be found using this approach, simple searches of common utilities—Google Scholar and disciplinary dictionaries (e.g., Oxford Dictionary of Politics)—were referenced.

[1] A special "thank you" is due to Dr. Sarah Spiekermann, Dr. Paola DiMaio, and Dr. Edson Prestes for their thoughtful insights into the composition and construction of the Glossary.

Where no common definitions occur, a call has been posted for nomination of candidate definitions by IEEE Global Initiative or P7000 Working Group Members as well as members of the public.

USES:
The definitions included are not meant to be definitive, final, mandatory, or to reflect a nomination of a particular definition as archetypal for the discussion of ethics in any IEEE document or process.

These definitions should be used as a repository of possibilities for discussions and conceptual development within EAD Committees and P7000 Working Groups and among any professionals that will use this document in their own work.

NOTES:
Definitions included here were drawn from sources in English, using both American and British spellings. The authors' original spelling is preserved.

TERM	Ordinary language	Computational Disciplines	Engineering	Government, Policy, and Social Sciences	Ethics and Philosophy
ACCOUNTABILITY	Liability to account for and answer for one's conduct; judgment of blameworthiness; obligation to provide a satisfactory answer to an external oversight agent	A set of mechanisms, practices and attributes that sum to a governance structure which "consists of accepting responsibility for the stewardship of personal and/or confidential data with which it [data organization] is entrusted in a cloud	National Society for Professional Engineers, Fundamental Canon #6, "6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession."	"Accountability involves the means by which public agencies and their workers manage the diverse expectations generated within and outside the organization"(Romzek and Dubnik 1987, 228). "Administrative accountability is the concept that officials	Accountability is a component of the state of being responsible, alongside being answerable and being attributable. "To be answerable . . . is to be susceptible for assessment of, and respond to, the reasons one takes to justify one's actions. …To be

		environment, for processing, storing, sharing, deleting and otherwise using data according to contractual and legal requirements from the time it is collected until when the data are destroyed (including onward transfer to and from third parties). Accountability involves committing to legal and ethical obligations, policies, procedures and mechanism, explaining and demonstrating ethical implementation to internal and external stakeholders and remedying any failure to act properly" (Felici, Loulours, Pearson 2013).		are to be held answerable for general notions of democracy and morality as well as for specific legal mandates" (Shafritz 1992, 10).	accountable, on the other hand, is to be susceptible to being held to account if one flouts relationship-defining demands" (Shoemaker 2011, 623). To "hold someone to account," in turn, "is precisely to sanction that person, whether it be via the expression of a reactive attitude, public shaming, or something more psychologically or physically damaging" (Shoemaker 2011, 623).

AFFECT	"The manner in which one is inclined or disposed; a mental state, mood, or emotion, esp. one regarded as an attribute of a more general state" (OED).	Rosalind Picard ([1995] 2010) defines affective computing as "computing that relates to, arises from, or influences emotions".	**We welcome recommendations!**	"Affect corresponds to a sensorial experience in response to internal or external stimuli. It is expressed with physiological and motor responses… Affect also comprises and expressive social response; it plays a determining role in the thoughts and actions of a person in relation to self and others, and influences how the individual copes with situational stressors and interpersonal relations" (Renaud and Zacchia 2013, 299)	**We welcome recommendations!**
AGENCY	Capacity to decide and act	Agency is an essential characteristic that is useful to define or classify agents. Agency requires capacity to act on sense data, within an environment, over time, to pursue goals (see Franklin and Graesser 1996).	Agents are "systems" with "the following properties: autonomy (make decisions about what to do), reactivity (situated in an environment and are able to perceive and respond), pro-activeness (take initiative), and social ability (interact with	The "law of agency 'encompasses the legal consequences of consensual relationships in which one person (the 'principal') manifests assent that another person (the 'agent') shall, subject to the principal's right of control, have power to affect the principal's	Ethical agency is "that which enables us to act in the interest of another, to put the well-being of another before our own" (Hofmeyr 2009, v)

			other agents via some kind of agent-communication language)" (Woolridge 1997, 2-3).	legal relations through the agent's acts and on the principal's behalf (American Law Institute 2001, p. 1)" (Shapiro 2005).	
AGENT	An intelligent being who acts by will, from intention, whether for its own ends or those of other agents	"Autonomous decision-making entities" (Bonabeau 2002) "An agent can be a physical or virtual entity that can act, perceive its environment (in a partial way) and communicate with others, is autonomous and has skills to achieve its goals and tendencies. It is in a multi-agent system (MAS) that contains an environment, objects and agents (the agents being the only ones to act), relations between all the entities, a set of operations that can be performed by the entities and the	"Agent[s] have state and engage in actions which move it [the agent] among states… agents repeatedly and simultaneously take action, which leads them from their previous state to a new one. The actions of an agent are taken from a given repertoire. The problem in defining the transition functions of agents is due to the fact that the state in which the agent ends up after taking a particular action at a particular state depends also on actions and states of other agents" (Shoham and Tennenholtz 1995, 242-243).	Within agency theory, agents are actors who fulfill, with varying degrees of accuracy and completeness, the tasks specified for them by their principals (see Eisenhardt 1989).	An agent is an entity able to act based upon its own judgment and under its own will. "In doing x an agent acts incontinently if and only if: 1) the agent does x intentionally; 2) the agent believes there is an alternative action y open to him; and 3) the agent judges that, all things considered, it would be better to do y than to do x" (Davidson 1969, 22). "Artificial agents extend the class of entities that can be involved in moral situations. For they can be conceived of as moral patients

		changes of the universe in time and due to these actions" (Ferber 1999)			(as entities that can be acted upon for good or evil) and also as moral agents (as entities that can perform actions, again for good or evil) (Floridi and Sanders 2004, 349).
AIS Acronym for Autonomous Intelligent Systems	Unity of concerns or techniques related to development of Artificial Intelligence that leads to design or development of Autonomous Agent Systems	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**
ANTICIPATORY ETHICS	Analysis of the standards for good or bad actions taken when designing, developing, deploying, or decommissioning emerging technologies	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**	"*Anticipatory ethics* refers here to: (1) engagement with the ethical implications of a technology while the technology is still in the earliest stages of development; and (2) engagement that is targeted to influence the development of the technology" (Johnson 2011).

ART	Products of creativity intended to evoke emotion or give meaning Craftsman-like, or creative aspects of a profession	"Art refers to the useful practices of a field, not to drawings or sculptures. Programming, design, software and hardware engineering, building and validating models, and building user interfaces are all "computing arts." If aesthetics is added, the computing arts extend to graphics, layout, drawings, photography, animation, music, games, and entertainment. All this computing art complements and enriches the science" (Denning 2005, 29).	**We welcome recommendations!**	"The term ''the arts'' includes, but is not limited to, music (instrumental and vocal), dance, drama, folk art, creative writing, architecture and allied fields, painting, sculpture, photography, graphic and craft arts, industrial design, costume and fashion design, motion pictures, television, radio, film, video, tape and sound recording, the arts related to the presentation, performance, execution, and exhibition of such major art forms, all those traditional arts practiced by the diverse peoples of this country. (sic) and the study and application of the arts to the human environment" (20 U.S.C. 952 (b))	"Something is a work of art when it has a meaning—is about something—and when that meaning is embodied in the object in which the work of art materially consists… works of art are embodied meanings" (Danto 2013, 149; quoted in Haynes 2015).

ARTIFICIAL	Of a thing: made or constructed by human skill, esp. in imitation of, or as a substitute for, something which is made or occurs naturally; man-made (OED)	**We welcome recommendations!**	Ninsberg adapts Newell and Simon (1976) physical-symbol systems as definitive for an artificial entity: "A physical symbol system consists of a set of entities, called symbols which are physical patterns that can occur as components of another type of entity called an expression (or symbol structure). Thus, a symbols structure is composed of a number of instances (or tokens) of symbols related in some physical way (such as one token being next to another). At any instant of time the system will contain a collection of these symbol structures. Besides these structure, the system also contains a collection of	"The term artificial flavor or artificial flavoring means any substance, the function of which is to impart flavor, which is not derived from a spice, fruit or fruit juice, vegetable or vegetable juice, edible yeast, herb, bark, bud, root, leaf or similar plant material, meat, fish, poultry, eggs, dairy products, or fermentation products thereof. Artificial flavor includes the substances listed in 172.515(b) and 582.60 of this chapter except where these are derived from natural sources" (21 CFR 501(22)(a)(1))	"The artificial is the result of the overlap between nature and conventional technology" (Negrotti 1999, 185). Those objects agents which are artificial are part of an "unavoidable selection process—of an observation level, an exemplar or an essential performance—will cause transfiguration of the feature and the behavior of the exemplar once it is rebuilt as the artificial" (Negrotti 1999, 185).

			processes that operate on expressions to produce other expressions: processes of creation, modification, reproduction, and destruction. A physical symbol system is a machine that produces through time and evolving collection of symbol structures. Such a system exists in a world of objects wider than just these symbolic expressions themselves".		
ARTIFICIAL INTELLIGENCE	"The capacity of computers or other machines to exhibit or simulate intelligent behaviour" (OED)	"AI will be such a program which in an arbitrary world will cope not worse than a human" (Dobrev 2004, 2). "Artificial intelligence is the enterprise of constructing a symbol system that can reliably pass the Turing test" (Ginsberg 2012, 9)	Artificial intelligence engineering has been compared to knowledge engineering. A "knowledge based system design" of AI encompasses 3 levels: "the 'knowledge level' view of a knowledge-based system describes the knowledge that is	"AI approaches can be divided into "narrow AI" and "general AI." Narrow AI systems perform individual tasks in specialized, well-defined domains, such as speech recognition, image recognition, and translation. In contrast, the long-term goal of general	"We shall say that an entity is intelligent if it has an adequate model of the world (including the intellectual world of mathematics, understanding of its own goals and other mental processes), if it is clever enough

		See Figure 1.1 Russell and Norvig (1995 page 5).	used by and embedded in that system. The 'algorithm level' view escribes the system as a search algorithm, configured out of standard component types (e.g., generators, testers, patchers, constraint propagators, belief revisers, etc). The 'program level' view expresses the system in terms of the elements of existing programming paradigms (rules, objects, procedures, etc) (Tong and Sriram 2012, 8-9)	AI is to create systems that exhibit the flexibility and versatility of human intelligence in a broad range of cognitive domains, including learning, language, perception, reasoning, creativity, and planning" (NITRD 2016, 19)	to answer a wide variety of questions on the basis of this model, if it can get additional information from the external world when required, and can perform such tasks in the external world as its goals demand and its physical abilities permit" (McCarthy and Hayes 1969, 4)
ASSISTIVE TECHNOLOGY	Software and hardware purposively combined to augment or replace human sensory or cognitive tasks	**We welcome recommendations.**	**We welcome recommendations.**	""Assistive technology" consists of devices and other solutions that assist people with deficits in physical, mental, or emotional functioning. Assistive technology devices are items frequently used by people with functional	**We welcome recommendations.**

				deficits as alternative ways of performing actions, tasks, and activities. Assistive technology also includes ways of controlling these devices. Software may control ordinary hardware systems in ways that facilitate their use by persons with functional deficits, like text-to-speech conversion software that runs on ordinary computers" (LaPlante, Hendershot and Moss 1992, 2).	
AUGMENTED REALITY	Augmented reality is virtual content layered over the real environment	"Augmented Reality (AR) allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it... AR is any system that has the following three characteristics: 1.	"An AR system supplements the real world with virtual (computer-generated) objects that appear to coexist in the same space as the real world… an AR system [will] have the following properties: combines real and virtual objects in a real environment; runs interactively, and in	"Augmented reality is the material/virtual nexus mediated through technology, information and code, and enacted in specific and individualised space/time configurations" (Graham, Zook, and Boulton 2012, 466).	**We welcome recommendations!**

		Combines real and virtual, 2. Is interactive in real time, [and] 3. Is registered in three dimensions" (Azuma 1997, 356).	real time; and registers (aligns) real and virtual objects with each other" (Azuma et al 2001, 34)		
AUTONOMY	The ability of a person or artifact to govern itself including formation of intentions, goals, motivations, plans of action, and execution of those plans, with or without the assistance of other persons or systems.	Agents that are autonomous have control both over their internal state and over their own behavior" and "autonomy means that the problem solvers have their own persistent thread of control (i.e., they are active) and that they decide for themselves which actions they should perform at what time" (Jennings 2000, 280 and 283). Multiple forms of autonomy have been proposed by Maes and User-Autonomy: "an agent is autonomous with respect to the user for choosing	"Where an agent acts autonomously, it is not possible to hold any one else responsible for its actions. In so far as the agent's actions were its own and stemmed from its own ends, others cannot be held responsible for them" (Sparrow 2007, 63).	"we define local [government] autonomy conceptually as a system of local government in which local government units have an important role to play in the economy and the intergovernmental system, have discretion in determining what they will do without undue constraint from higher levels of government, and have the means or capacity to do so" (Wolman et al 2008, 4-5).	"Put most simply, to be autonomous is to be one's own person, to be directed by considerations, desires, conditions, and characteristics that are not simply imposed externally upon one, but are part of what can somehow be considered one's authentic self" (Christman 2015). "Two conditions are ordinarily required before a decision can be regarded as autonomous. The individual has to have the relevant internal capacities for self-government and has to be free from external

		what action to perform if it can make the choice without the user's intervention." Social Autonomy: "an agent X is autonomous with respect to another agent Y for the adoption of a goal G if X can refuse the adoption of the goal G from Y." Norm-Autonomy: "an agent is autonomous with respect to a norm if it can violate that norm" Environmental-Autonomy: "the environment can only influence the behaviour of an agent, it cannot impose it" (Self) Agent-Autonomy: "the property that allows an agent to have and choose between several possible behaviours" (See Carabelea, Boissier			constraints. In a medical context a decision is ordinarily regarded as autonomous where the individual has the capacity to make the relevant decision, has sufficient information to make the decision and does so voluntarily" (British Medical Association 2016).

		and Florea 2004, 104-107).			
BENEFICENCE	Performing those acts which promote good for others	**We welcome recommendations!**	"Providing the greatest possible balance of benefits to risks" (Singer and Vinson 2002, 4)	"The term "beneficence" is often understood to cover acts of kindness or charity that go beyond strict obligation. In this document, beneficence is understood in a stronger sense, as an obligation. Two general rules have been formulated as complementary expressions of beneficent actions in this sense: (1) do not harm and (2) maximize possible benefits and minimize possible harms" (Belmont Report, 1978).	"The simplest principle of beneficence requires each person to perform the action, of those available to her, that will make the outcome best" (Murphy 1993, 268).
COGNITION	Conscious knowledge	"Cognitive ontology could be a nomenclature: that is a standardized set of terms which researchers intend to use in a systematic way in	**We welcome recommendations.**	A functional ontology for cognitive function includes 3 primary functions: "phonology (phonetic encoding and articulation), semantics (perceptual knowledge and	"Cognition is defined as the symbolic (or conceptual) processing of information that is required for central representation and organized

		order to promote mutual understanding…. A Cognitive ontology could refer to a domain, not a set of term but a set of entities to which a cognitive theory refers…. A cognitive ontology could be a set of basic metaphysical categories: when we carve up or structure cognitive systems, what kind of entities make up that structure? A cognitive ontology in this third sense should indicate whether the relationship between levels is one of composition, constitution, or something else" (Janssen, Klein and Slors 2017, 24).		functional knowledge), and orthography (visual synthesis of feature extraction and colour processing)" (Price and Friston 2005, 270).	expression of a response" (Lang 1984, 192).

COGNITIVE COMPUTING	Programming designed to mimic human cognition	"Cognitive computing is an emerging paradigm of intelligent computing methodologies and systems based on cognitive informatics that implements computational intelligence by autonomous inferences and perceptions mimicking the mechanisms of the brain" (Wang et al 2010, p. 1).	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**
COMPUTATION	Computation is the integration of numerical simulation, mathematical modeling, algorithm development and other forms of quantitative analysis to solve problems that theorization, experimentation, and/or observation cannot.	Computation is construed 6 ways: "1. Formal symbol manipulation, 2. Effective computability, 3. Execution of an algorithm, 4. Digital state machines, 5. Information processing, 6. Physical symbol systems (Smith 2002, 3).	**We welcome recommendations!**	**We welcome recommendations!**	"Computation = Programming Language Syntax + Programming Language Semantics" (Zenil 2014, 401)

CONSCIOUSNESS	The state or ability to be aware of self and environment	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**	Two concepts of consciousness appear in the literature: Creature consciousness which may include: sentience, wakefulness, self-consciousness, ability to know "what it is like", being subject to conscious states, and aware of transitive consciousness. State consciousness include six major states: of awareness, of qualitative senses, of phenomena, of "what it is like", or access to others, and as narrative making (See Van Gulick 2017).
CONSENT	Agreement	**We welcome recommendations!**	**We welcome recommendations!**	"the attachment of an agent's will to a proposal, action, or outcome, such that the agent accepts (some share of the) responsibility for the consequences and/or	Within applied ethics, informed consent is argued to be the act necessary to demonstrate respect for persons. "Respect for persons requires that

				legitimizes an action or state of affairs which, in the absence of consent, would lack legitimacy or legality" (Reeve 2016)	subjects, to the degree that they are capable, be given the opportunity to choose what shall or shall not happen to them. The consent process can be analyzed as containing three elements: information, comprehension and voluntariness" (Belmont Report).
CONSENSUS	General agreement among a group	"Two processes are necessary to solve group decision making problems: A consensus process and a selection process. The consensus reaching process is necessary to obtain a final solution with a certain level of agreement between the experts; and the selection process is necessary to obtain such a final solution" (Herrera-Viedma et al 2007, 863).	**We welcome recommendations!**	A consensus government is one in which multiple, independent perspectives are taken into account during decision-making, rather than domination of decision-making by a winning party.	Philosopher John Rawls describes the source of political stability as achievement of an overlapping consensus concerning government legitimacy. "In an overlapping consensus, citizens all endorse a core set of laws for different reasons. In Rawlsian terms, each citizen supports a political conception of justice for reasons internal to her own comprehensive doctrine" (Wenar 2017)

CONTROL	The action or fact of holding in check or restraining; restraint	"An adaptive controller is a controller that can modify its behavior in response to changes in the dynamics of the process and the disturbances. It can be considered as a special type of nonlinear feedback control in which the stages of the process can be separated in to two categories, which can change at different rates" (Bhatt and Shah 2002).	**We welcome recommendations!**	"Engineering controls implement physical change to the workplace, which eliminates/ reduces the hazard on the job/ task. [These include] change processes to minimize contact with hazardous chemicals, isolate or enclose the process, use of wet methods to reduce generation of dusts or other particulates, general dilution ventilation, use of fume hoods" (Occupational Safety and Health Administration, no date).	Control is restriction of choice or action possibilities by a superior actor
CULTURE	"culture is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society" (Tylor 1871)	Programming and product development styles including personal and organizational commitments to quality, efficiency, and expertise in writing, reviewing, testing, and/or marketing software and hardware.	"'Tech's strong culture' is the context of work life, a set of rules that guides the relationship between the company and "it's people". At one level, the culture offers a description of the social characteristics of the company that also	"Culture is a well organized unity divided into two fundamental aspects—a body of artifacts and a system of customs" (Malinowski 1931, 623). "Culture is an historically transmitted pattern of meanings embodied in	Culture is discussed within developments of the ethical position of multiculturalism.

			embodies a specification of required work behavior… the culture also includes articulated rules for thoughts and feelings, "mindsets" and "gut reactions"… thus "the culture" is a gloss for an extensive definition of membership in the corporate community that includes rules for behavior, thought and feeling, all adding up to what appears to be a well-defined and widely shared 'member role'" (Kunda 2009, 7).	symbols" (Geertz 1973, 89).	
DATA	Symbols representing information that can be manipulated	"Data means "things given" in Latin—although we tend to use it as a mass noun in English, as if it denotes a substance—and ultimately, almost all useful data is given to us either by nature, as a reward	DeMauro, Marco and Grimaldi (2015) review definitions that capture some engineering definitions.	"A value or set of values representing a specific concept or concepts. Data become "information" when analyzed and possibly combined with other data in order to extract meaning and to provide context. The	"Big data is a term describing the storage and analysis of large and or complex data sets using a series of techniques including, but not limited to: NoSQL, MapReduce and machine learning"

		for careful observation of physical processes, or by other people, usually inadvertently (consider logs of Web hits or retail transactions, both common sources of big data). As a result, in the real world, data is not just a big set of random numbers; it tends to exhibit predictable characteristics. For one thing, as a rule, the largest cardinalities of most datasets—specifically, the number of distinct entities about which observations are made—are small compared with the total number of observations" (Jacobs 2009, 39).		meaning of data can vary depending on its context" "A dataset is an organized collection of data. The most basic representation of a dataset is data elements presented in tabular form. Each column represents a particular variable. Each row corresponds to a given value of that column's variable. A dataset may also present information in a variety of non-tabular formats, such as an extended mark-up language (XML) file, a geospatial data file, or an image file" (Data.gov, no date).	(Ward and Barker 2013). "Big data should be defined at any point in time as 'data whose size forces us to look beyond the tried-and true methods that are prevalent at that time'" (Jacobs 2009, 44)

DEVELOPMENT	A process of maturation of a plan or product from idea to fruition	**No common definition. We welcome recommendations!**	"Development Engineering is an emerging field of research that focuses on technology interventions designed to improve human and economic development within complex, low resource settings" (University of California at Berkeley, "Development Engineering").	Political development "the development of the institutions, attitudes, and values that form the political power system of a society. Political development enhances the state's capacity to mobilize and allocate resources, to process policy inputs into implementable outputs. This assists with problem-solving and adaptation to environmental changes and goal realization. The contemporary notion of good governance also dwells on efficient, effective, and non-corrupt public administration" (Burnell 2016).	**No common definition. We welcome recommendations!**

DIGITAL PERSONAL ASSISTANT (also PERSONAL DIGITAL ASSISTANT)	Interactive software which performs scheduling, coordination, and basic information seeking tasks at a user's request	**We welcome recommendations!**	Hardware and software integrated into a handheld information appliance with communication capabilities to allow people to create, share, manage and communicate information anywhere, anytime (Business Communications Review, 1995).	**We welcome recommendations!**	**We welcome recommendations!**
DISCRIMINATION	Differentiation for the purpose of separating persons to determine entitlements, rights, or eligibility	Discrimination algorithms are those that allow computer vision technologies, such as LiDAR, to differentiate types of objects or states of matter (see Hu et al 2009 for example). Algorithms which reproduce social preferences that are discriminatory may be considered to be discriminatory algorithms.	**We welcome recommendations.**	The US Equal Employment Opportunity Commission describes types of discrimination. By: age, disability, genetic information, national origin, pregnancy, race/color, religion, or sex. "Race discrimination involves treating someone (an applicant or employee) unfavorably because he/she is of a certain race or because of	"Any viable account of what discrimination is will regard it as consisting of actions, practices, or policies that are—in some appropriate sense—based on the (perceived) social group to which those discriminated against belong. Moreover, the relevant groups must be "socially salient," …, i.e., they must be groups that are "important to the structure of

				personal characteristics associated with race (such as hair texture, skin color, or certain facial features). Color discrimination involves treating someone unfavorably because of skin color complexion" (EEOC no date)	social interactions across a wide range of social contexts" (2006: 169). Discrimination against persons, then, is necessarily oriented toward them based on their membership in a certain type of social group. But it is also necessary that the discriminatory conduct impose some kind of disadvantage or harm on the persons at whom it is directed" (Altman 2016).
DUTY	An obligation based upon one's role	**We welcome recommendations!**	The NSPE defines the duties of a professional engineer as fulfillment of the fundamental cannons of practice: "1. Hold paramount the safety, health, and welfare of the public. 2. Perform services only in areas of their competence.	The duties of government officials are broadly understood to mean the duty to serve the public interest and to serve justice. This may include more specific duties such as a duty to zealously represent their clients within the bounds of law, to protect confidentiality of client	"Moral requirements are often identified with duties, and that which is good but not required is said to be above and beyond duty's call. Duties, then, are regarded as a minimal standard of moral decency, beyond which the nicer or better among us may do

			3. Issue public statements only in an objective and truthful manner. 4. Act for each employer or client as faithful agents or trustees. 5. Avoid deceptive acts. 6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession."	and litigants information, and to carefully police their personal conflicts of interest and conflicts of commitment (Berenson 2003).	something more…. One's duties are further understood as given by a set of rules. One's actual duty is to do one's prima facie duty (follow rules) I so far as is possible, and to act in accordance with the further decision procedure when conflicts among prima facie duties arise" (Wolf 1986, 131).
EQUALITY	Sameness in relevant respects (e.g., quantity, value)	Equivalence of both sides of an equation	**We welcome recommendations!**	"In the abstract, it means that people who are similarly situated in morally relevant respects should be treated similarly. Possible interpretations include equality before the law, equality of political power, equality of opportunity for social and economic advancement,	Two definitions of equality are often referred to: Equality of resources: a distribution of resources is just if it passes the envy test—no one would prefer someone else's set of resources to their own (Dworkin 1981, 285).

				equality of resources, equality of welfare, equality of freedom, and equality of respect" (Nagel 2005).	Equality of welfare: " a distributional scheme treats people as equals when it distributes or transfers resources among them until no further transfer would leave them more equal in **welfare** (Dworkin 1981, 186).
ETHICS	Of or relating to moral principles, esp. as forming a system, or the branch of knowledge or study dealing with these. (OED)	"Computer ethics is the analysis of the nature and social impact of computer technology and the corresponding formulation and justification of policies for the ethical use of such technology. I use the phrase "computer technology" because I take the subject matter of the field broadly to include computers and associated technology. For instance, I include concerns about	"Engineering ethics is professional ethics, as opposed to personal morality. It sets the standards for professional practice, and is only learned in a professional school or in professional practice. Engineering ethics is as much a part of what engineers in particular know as factors of safety, testing procedures, or ways to design for reliability, durability, or economy. Engineering ethics is part of thinking like	US executive e order 13490 "Ethics Commitments by Executive Branch Personnel" stipulates that: "Every appointee in every executive agency appointed on or after January 20, 2009, shall sign, and upon signing shall be contractually committed to, the following pledge upon becoming an appointee: "As a condition, and in consideration, of my employment in the United	Ethics is often described as moral philosophy or the philosophical study of general moral issues. The question "how should we live our lives?" (Copp 2005).

		software as well as hardware and concerns about networks connecting computers as well as computers themselves. A typical problem in computer ethics arises because there is a policy vacuum about how computer technology should be used. Computers provide us with new capabilities and these in turn give us new choices for action. Often, either no policies for conduct in these situations exist or existing policies seem inadequate. A central task of computer ethics is to determine what we should do in such cases, i.e., to formulate policies to guide our actions. Of course, some ethical situations confront us as	an engineer" (Harris et al 1996, 93).	States Government in a position invested with the public trust, I commit myself to the following obligations, which I understand are binding on me and are enforceable under law: "1. Lobbyist Gift Ban; 2. Revolving Door Ban—All Appointees Entering Government; 3. Revolving Door Ban—Lobbyists Entering Government; 4. Revolving Door ban—Appointees Leaving Government; 5. Revolving Door Ban—Appointees Laving Government to Lobby; 6. Employment Qualification Commitment; 7. Assent to Enforcement"	

		individuals and some as a society. Computer ethics includes consideration of both personal and social policies for the ethical use of computer technology" (Moor 1985, 266).			
ETHICAL THEORY	Logical, descriptive, or intellectual historical analysis of the standards of action which are describable as good or evil	**We welcome recommendations!**	No common definition.	Within government, ethics is defined with respect to either internal or external controls. Internal controls are the ethics of individuals internalized through mechanisms of professional education, personal moral development, and socialization External controls are rules, compliance frameworks, and reporting and auditing mechanisms that dictate required forms of behavior (Zajac 1996).	Sigwick distinguishes ethics from ethical science. This distinction helps identify the role of theory in ethics: "ethics is the 'study of what is right or what ought to be, so far as this depends upon the voluntary action of individuals; assuming that whatever we judge to be 'good', we implicitly judge to be something which we 'ought' to bring into existence, -- it does not yet exist, and unless something better is attainable". "The

					term ethical science might, without violation of usage, denote either the department of Psychology that deals with voluntary action and its spirits, and with moral sentiments and judgments, as actual phenomena of individual human minds; or the department of sociology dealing with similar phenomena, as manifested by normal members of the organized groups of human beings we call societies" (Sidgwick 1893, 1-2; see Mullins)

EXPERT SYSTEM	Also described as multi-criteria decision-making models (MCDM)	Quinn (1990) defined an expert system as "an interactive computer program that asks the same questions a human expert would ask, and from the information given to it by the user, provides the same answer the expert would provide" (1).	"Computer programs using AI techniques to assist people in solving difficult problems involving knowledge, heuristics, and decision-making are called expert systems, intelligent systems, or smart systems. An expert system is an 'intelligent' interactive computer program that can play the role of a human expert by using heuristic knowledge or rules of thumb. Components of an expert system include: 1. Knowledge base, 2. Inference mechanism, 3. Working memory, 4. Explanation facility, 5. Knowledge acquisition, 6. Debugging facility, 7. Help facility,	"An expert system consists of three main pairs: 1. Knowledge base. The actual information in the expert system. 2. Inference engine. The name given to the software that makes the expert system work. The software works with input data supplied by the user to search the knowledge base in order to reach a conclusion. 3. User interface. Screens and or menus through which the expert system communicates with users (Duval and Main 1994, 44).	**We welcome recommendations!**

			8. Intelligent interfaces, 9. Knowledge base editors" (Adeli 2003, 5, 8)		
EVIL	'In the widest sense: that which is the reverse of good; Whatever is censurable, mischievous, or undesirable; (OED);	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**	In ethics, evil is considered either as a concept or as a problem. Concept of evil: "The concept of evil applies to persons, to intentions, to motives, to conduct, and to organizations, institutions, practices, arrangements, programmes, agencies, endeavours, and situations. The term 'evil' is the worst possible term of opprobrium imaginable. The concept… applies primarily to persons and organizations, secondarily to conduct and practices. Evil deeds must flow from evil motives, the volition

					to do something evil… one cannot do something evil by accident or through thoughtlessness." (Singer 2004, 189-190). The problem of evil is a matter of theological and epistemic discussions of the question: "whether the world contains undesirable states of affairs that provide the basis for an argument that makes it unreasonable to believe in the existence of God" (Tooley 2015)
GOVERNANCE	"The process of collective decision-making and policy implementation, used distinctly from government to reflect broader concern with norms and processes relating to the delivery of public	"Governance: a paradigmatic change in the constellation of power relations between individuals, governments and social institutions" (Loader 1997, 1).	"Governance starts at the corporate level and provides a framework to guide managers in their daily work of decision making and action taking. At the level of projects governance is often implemented	"Governance consists of the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to	Ethics and ethical standards are often referred to as part of good corporate governance.

	goods" (McLean and McMillan 2016)		through defined policies, processes, roles and responsibilities, which set the framework for peoples' behavior, which, in turn, influences the project. Governance sets the boundaries for project management action by: defining the objectives of a project, providing the means to achieve those objectives, [and] controlling progress" (Muller 2011, 87)	effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them" (World Bbank 2017).	
HARM	'Evil (physical or otherwise) as done to or suffered by some person or thing; hurt, injury, damage, mischief; To do harm (to); to injure (physically or otherwise); to hurt, damage.' (OED)	**We welcome recommendations!**	The injurious consequence of a fault or failure (see Del Frate 2013).	John Stuart Mill's harm principle is widely referenced in political arguments "the only purpose for which power can be rightly exercised over any member of a civilized community against his will, is to prevent harm to others… the only part of the conduct of anyone, for which his	In theoretical ethics and law, harm is defined as either tangible or intangible. Tangible harms are damages a person suffers to their physical, emotional, or social self. Tangible harms cause cost or pain, or an appreciable risk of pain,

				is answerable to society, is that which concerns others. In the part which merely concerns himself, his independent is, of right, absolute. Over himself, over his body and mind, the individual is sovereign" (Ripstein 2006, 215).	disability, or death (Saver 2005). Intangible harms, at least as described by Lord Devlin, are those damages to the harmonious fabric of society. Other intangible harms can include frustrations to access, affronts to personal dignity, and having one's efforts wasted.
HEALTH	An equilibrium state of physical, emotional, and mental fitness	Health data used in computational disciplines like bioinformatics may use any of a number of types of data related to medical and health states of patients. This may include: "The Electronic Medical Record (EMR) is a longitudinal electronic record of patient health information generated by one or more encounters in a care delivery setting. Included in	**We welcome recommendations!**	The construct "social determinant of health" is discussed in some social scientific literature: "a social determinant of health is a socially controllable factor outside the traditional health care system that is an independent partial cause of an individual's health status. Candidate examples include income, education, occupational rank, and social class" (Sreenivasan 2014).	"The state of optimum capacity for the effective performance of valued tasks" (Parsons 1958, 168).

		this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports. The EMR is designed to automate and streamline the clinician's workflow"; "whereas the EMR stores institutional data, the EHR shares health information across providers [25]. Thus, the EMR contains partial patient medical history whereas the EHR is more complete in terms of the data provided to physicians. EHR systems are the building blocks of HIEs—Health Information Exchange networks" (Heart, ben-Assuli			

		and Shabtai 2017, 21-23).			
HUMAN RIGHTS	Essential claims all humans have by virtue of their species membership alone	**We welcome recommendations!**	**We welcome recommendations!**	"Human rights are rights inherent to all human beings, regardless of race, sex, nationality, ethnicity, language, religion, or any other status. Human rights include the right to life and liberty, freedom from slavery and torture, freedom of opinion and expression, the right to work and education, and many more. Everyone is entitled to these rights, without discrimination." (UN, no date)	"Human rights are norms that help to protect all people everywhere from severe political, legal, and social abuses. Examples of human rights are the right to freedom of religion, the right to a fair trial when charged with a crime, the right not to be tortured, and the right to engage in political activity. These rights exist in morality and in law at the national and international levels. 1. Human rights are rights. Lest we miss the obvious, human rights are rights (see the entry on rights and Cruft 2012). Most if not all human rights are claim rights that impose duties or responsibilities on their addressees or duty bearers. Rights

					focus on a freedom, protection, status, or benefit for the rightholders.2. Human rights are plural. 3. Human rights are universal. All living humans have human rights. People have human rights independently of whether they are found in the practices, morality, or law of their country or culture. 4. Human right shave high-priority (Nickel 2017)..
HUMANITY	The collection of human persons	**We welcome recommendations!**	Technology which benefits humanity is that which aids achievement of broad development goals, such as the United Nations Millennium Development Goals. (Hernandez-Ramos 2006).	**We welcome recommendations!**	**We welcome recommendations!**

HUMANITARIAN	Motivated by a spirit of service to humanity	**We welcome recommendations!**	"Humanitarian engineering as the artful drawing on science to direct the resources of nature with active compassion to meet the basic needs of all -- especially the powerless, poor, or otherwise marginalized" (Mitcham and Munoz 2010, 27).	According to the ReliefWeb Glossary of Humanitarian terms, "As per UN General Assembly Resolution 46/182 (19 December 1991), humanitarian assistance must be provided in accordance with the principles of humanity, neutrality and impartiality. Adherence to these principles reflects a measure of accountability of the humanitarian community. - Humanity: Human suffering must be addressed wherever it is found, with particular attention to the most vulnerable in the population, such as children, women and the elderly. The dignity and rights of all victims must be respected and protected. - Neutrality: Humanitarian	"Devoted to the promotion of human welfare" (Park and Allaby 2017).

				assistance must be provided without engaging in hostilities or taking sides in controversies of a political, religious or ideological nature. - Impartiality: Humanitarian assistance must be provided without discriminating as to ethnic origin, gender, nationality, political opinions, race or religion. Relief of the suffering must be guided solely by needs and priority must be given to the most urgent cases of distress. (OCHA)" (ReliefWeb Project 2008).	
IMPACT ASSESSMENT	"Impact Assessment is a means of measuring the effectiveness of organisational activities and judging the significance of changes brought about by those	**We welcome recommendations!**	**We welcome recommendations!**	"Environmental Impact Assessment (EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and	"Social impact assessment can be defined as the process of assessing or estimating, in advance, the social consequences that are likely to follow from specific policy actions or project development,

	activities. It is neither Art or Science, but both" (IFRC no date).			human-health impacts, both beneficial and adverse" (Convention on Biological Diversity, no date).	particularly in the context of appropriate national, state, or provincial environmental policy legislation. Social impacts include all social and cultural consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs, and generally cope as members of society. Cultural impacts involve changes to the norms, values, and beliefs of individuals that guide and rationalize their cognition of themselves and their society" (Burdge and Vanclay 1996, 59).

IMPLEMENTATION	Putting a plan or policy into action	**We welcome recommendations!**	**We welcome recommendations!**	"The process of bringing any piece of legislation into force" (Law 2015).	**We welcome recommendations!**
INDIVIDUALLY IDENTIFIABLE DATA (IID)	Information which can be linked to a single person	"Individually Identifiable Data is data that identifies the person that the data is about, or that can be used to identify that individual. This generally refers to data that contains either an identification number, or factors relating to physical, mental, economic, cultural, or social identity that could be used to link the data to an individual. Regulatory requirements for privacy generally apply (only) to individually identifiable data" (Clifton 2009, 1471-1472)	**We welcome recommendations!**	"Per the Executive Office of the President, Office of Management and Budget (OMB) and the U.S. Department of Commerce, Office of the Chief Information Officer, "The term "personally identifiable information" refers to information which can be used to distinguish or trace an individual's identity, such as their name, Social Security Number, biometric records, etc. alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name, etc." (iDASH no date)	**We welcome recommendations!**

INFORMATION	Statements that carry meaning	"the technical concept of information is defined as the probability of a signal being transmitted from device A to device B, which can be mathematically quantified" (Shannon and Weaver 1949)	**We welcome recommendations!**	No common definition	Philosophy of information is understood as the effort to define formally the concept of information. At least 6 general formal theories of information persist in philosophy of information: 1. Fisher information, 2. Shannon information, 3. Kolmogorov complexity, 4. Quantum information, 5.information as a state of an agent, and 6. Semantic information (Adriaans 2013).
INTELLIGENCE	The faculty of understanding; intellect. Also as a count noun: a mental manifestation of this faculty, a capacity to understand (OED) "Intelligence measures an	"Intelligent systems are expected to work, and work well, in many different environments. Their property of intelligence allows them to maximize the probability of success even if full knowledge of the	"Intelligence is the ability to use optimally limited resources – including time – to achieve goals." R. Kurzweil	"Knowledge of the enemy" (Troy 1991, 433).	Psychologists define intelligence as: "Intelligence A: the biological substrate of mental ability, the brains' neuroanatomy and physiology; Intelligence B: the manifestation of intelligence A, and

	agent's ability to achieve goals in a wide range of environments." S. Legg and M. Hutter (for a review of 70+definitions, See Legg and Hutter 2007).	situation is not available. Functioning of intelligent systems cannot be considered separately from the environment and the concrete situation including the goal." R. R. Gudwin "Intelligence is the ability to process information properly in a complex environment. The criteria of properness are not predefined and hence not available beforehand. They are acquired as a result of the information processing." H. Nakashima			everything that influences its expression in real life behavior; Intelligence C: the level of performance on psychometric tests of cognitive ability." H. J. Eysenck. "Intelligence is the ability to learn, exercise judgment, and be imaginative." J. Huarte
INTELLIGENT AGENT	An autonomous entity capable of successfully adapting to its environment by effecting is own will	"Intelligent agents continuously perform three functions: perception of dynamic conditions in the environment; action to affect conditions in the environment; and	"By an agent, we mean a system that enjoys the following properties autonomy: agents encapsulate some state (that is not accessible to other agents), and	**We welcome recommendations!**	For ethicists, intelligent agents and ethical agents are often one and the same. "According to Moor, a machine that is an implicit ethical agent is one that has been

		reasoning to interpret perceptions, solve problems, draw inferences, and determine actions" (Hayes-Roth) "Intelligent agents are software entities that carry out some set of operations on behalf of a user or another program with some degree of independence or autonomy, and in so doing, employ some knowledge or representation of the user's goals or desires" (IBM quoted in Franklin and Graesser 1996, 23).	make decisions about what to do based on this state, without the direct intervention of humans or others; reactivity: agents are situated in an environment, (which may be the physical world, a user via a graphical user interface, a collection of other agents, the INTERNET, or perhaps many of these combined), are able to perceive this environment (through the use of potentially imperfect sensors), and are able to respond in a timely fashion to changes that occur in it; pro-activeness: agents do not simply act in response to their environment, they are able to exhibit goal-directed behaviour by taking the initiative; social ability: agents		programmed to behave ethically, or at least avoid unethical behavior, without an explicit representation of ethical principles. It is constrained in its behavior by its designer who is following ethical principles. A machine that is an explicit ethical agent, on the other hand, is able to calculate the best action in ethical dilemmas using ethical principles. It can "represent ethics explicitly and then operate effectively on the basis of this knowledge." Using Moor's terminology, most of those working on machine ethics would say that the ultimate goal is to create a machine that is an explicit ethical agent" (Anderson

			interact with other agents (and possibly humans) via some kind of agent-communication language, and typically have the ability to engage in social activities (such as cooperative problem solving or negotiation) in order to achieve their goals" (Woodridge 1997, 2).		and Anderson 2007, 15).
LAW	"In general, a scientific law is the description of an observed phenomenon. It doesn't explain why the phenomenon exists or what causes it. The explanation of a phenomenon is called a scientific theory" (Bradford 2017).	An axiomatic statement	**We welcome recommendations!**	"International law is a collection of rules governing relations between states"	"The Rule of Law is one of the ideals of our political morality and it refers to the ascendancy of law as such and of the institutions of the legal system in a system of governance. The Rule of Law comprises a number of principles of a formal and procedural character, addressing the way in which a community is governed. The

					formal principles concern the generality, clarity, publicity, stability, and prospectivity of the norms that govern a society. The procedural principles concern the processes by which these norms are administered, and the institutions—like courts and an independent judiciary that their administration requires" (Waldron 2016).
LEGAL PERSONHOOD	An individual who has legal status with a state, such as citizenship. "The function of legal personhood is to attribute value and rights to the individual" (Dyschkant 2015, 2107).	**We welcome recommendations!**	**We welcome recommendations!**	"While there is disagreement about how precisely to formulate a definition of legal personhood, the key element of legal personhood seems to be the ability to bear rights and duties. Black's Law Dictionary defines a legal person as an entity "given certain legal rights and duties of a human being; a	If legal persons are those who have meaningful agency, then corporations might also have meaningful agency. "For a corporation to be treated as a Davidsonian agent it must be the case that some things that happen, some events, are describable in a way that makes certain

				being, real or imaginary, who for the purpose of legal reasoning is treated more or less as a human being" (Dyschkant 2015, 2076)	sentences true, sentences that say that some of the things a corporation does were intended by the corporation itself. That is not accomplished if attributing intentions to a corporation is only a shorthand way of attributing intentions to the biological persons who comprise e.g., its board of directors. If that were to turn out to be the case then on metaphysical if not logical grounds there would be no way to distinguish between corporations and mobs" (French 1979, 211)

MALEFICENCE	Acts intentionally taken to promote evil or confound good	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**	Within applied ethics, the principle of non-maleficence is invoked. Non maleficence: is the avoidance of doing harm (Gillon 1985, 130).
MALFEASANCE	Acts intentionally taken by persons or organizations in a position of power to promote evil or confound good	**We welcome recommendations!**	**We welcome recommendations!**	Malfeasance is failure of officials to faithfully execute their duties, whether as enforcement of rightful law or policy, chiefly for their own gain in funds or leisure (Becker and Stigler 1974)	**We welcome recommendations!**
METHODOLOGY	"Methodology is defined as the research strategy that outlines the way one goes about undertaking a research project, whereas methods identify means or modes of data collection" (Howell 2012, viii)	**We welcome recommendations!**	"We consider a methodology to encompass (i) a set of concepts used; (ii) notations for modelling aspects of the software (requirements, designs, implementation); and (iii) a process that is followed in order to produce the software" (Padgham and Winikoff 2002, 1)	OECD glossary of statistical terms defines methodology as "a structured approach to solve a problem".	**We welcome recommendations!**

MIND	'A person's cognitive, rational, or intellectual powers; the intellect; esp. as distinguished from the emotions; a person of intellectual prowess; an intellectual' (OED) combination of the neural architecture and effects of the transmissions of this architecture on the formation of emotions, mental representations, correspondences between sensation and mental representations of that which is sensed, computation of internal and external data, and decisions, plans and intentions made on the basis of the unity of all of these	"According to a Classical Computational Theory of Mind), the mind is a computational system similar in important respects to a Turing machine, and core mental processes (e.g., reasoning, decision-making, and problem solving) are computations similar in important respects to computations executed by a Turing machine" (Rescorla 2015)	Fodor (1983) stipulates nine features of a modular cognitive system: 1. Domain specificity 2. Mandatory operation 3. Limited central accessibility 4. Fast processing 5. Informational encapsulation 6. Shallow outputs 7. Fixed neural architecture 8. Characteristic and specific breakdown patterns 9. Characteristic ontogenetic pace and sequencing (Robbins 2017)	**We welcome recommendations!**	John R. Searle suggest that "just manipulating the symbols is not itself enough to guarantee cognition, perception, understanding, thinking, and so forth. And, since computers qua computers, are symbol manipulating devices, merely running the computer program is not enough to guarantee cognition" (1990, 26). A representational theory of mind according to Fodor is "a system of mental representations, including both primitive representations and complex representations formed from primitive representations" (Rescorla 2015).

MITIGATION	Plan to lessen the impact of a harm	**We welcome recommendations!**	"Risk mitigation planning is the process of developing options and actions to enhance opportunities and reduce threats to project objectives. Risk mitigation implementation is the process of executing risk mitigation actions. Risk mitigation progress monitoring includes tracking identified risks, identifying new risks, and evaluating risk process effectiveness throughout the project" (Project Management Institute 2008).	Mitigation is "abatement or diminution of a penalty or punishment imposed by law" (Black's Law Dictionary)	**We welcome recommendations!**
MIXED REALITY	A type of virtual reality system	"The most straightforward way to view a Mixed Reality environment, therefore, is one in which real world and virtual world objects are presented together within a	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**

		single display, that is, anywhere between the extrema of the virtuality continuum" (Milgram and Kishino 1994)			
MORAL	Thought and discourse about moral questions; moral philosophy, ethics (OED); Pertaining to the meaning of good and evil and establishment of ethical standards to foster those Meanings	"A moral Turing test (MTT) might similarly be proposed to bypass disagreements about ethical standards by restricting the standard Turing test to conversations about morality. If human `interrogators' cannot identify the machine at above chance accuracy, then the machine is, on this criterion, a moral agent" (Allen et al 2000, quoted in Arnold and Schuetz 2016, 104).	**We welcome recommendations!**	**We welcome recommendations!**	Moral is used as an adjective to describe patterns of reasoning and belief. "Moral reasoning is a species of practical reasoning—that is, as a type of reasoning directed towards deciding what to do and, when successful, issuing in an intention" (Richardson 2014). Moral relativism is a topic of concern for the implementation of ethical AI. "Descriptive Moral Relativism (DMR). As a matter of empirical fact, there are deep and widespread moral

					disagreements across different societies, and these disagreements are much more significant than whatever agreements there may be. Metaethical Moral Relativism (MMR). The truth or falsity of moral judgments, or their justification, is not absolute or universal, but is relative to the traditions, convictions, or practices of a group of persons" (Gowans 2016)
MORAL AGENT	An agent able to define and implement their meaning of good and evil	"A suitably generic characterization might be that a moral agent is an individual who takes into consideration the interests of others rather than acting solely to advance his, her, or its self interest" (Allen et al 2000, 252).	**We welcome recommendations!**	Cua defines moral agents with respect to the principle of impartiality, "As moral agents, the principle of autonomy appears to be the basis for applying the principle of impartiality, for in the notion of balance implicit in the moral point of view it is suggested that the	"For any user of moral language, the class of moral agents—the group of agents to whom a moral judgment is universalized—is independent of, not a function of, not defined by that or any particular moral judgments. It may be the case, as a

				interests of all individuals in dispute have an equal claim to respect in adjudication. Unless morality is to be viewed primarily as a product of external factors, every moral agent is entitled to administer its function so long as the principle of impartiality is applied and maintained" (Cua 1967, 164-165).	contingent matter of fact, that a particular moral judgment which I make can only be acted upon by some (but not all) of the members of my class of moral agents. This does not however furnish groups for claiming that... the class of moral agents is purely a function of each moral judgment" (Steiner 1973, 264)
MORAL AUTONOMY	Cognitive capacity to self-define the meaning of good and evil, with or without the ability to fully act upon it	An artificial system's achievement to pass the moral Turing test	**We welcome recommendations!**	**We welcome recommendations!**	Moral autonomy "refers to the capacity to impose the (putatively objective) moral law on oneself, and, following Kant, it is claimed as a fundamental organizing principle of all morality" (Christman 2015).

MORAL NORMS	"Perceptions about the moral correctness or wrongness of actions that have been codified by a community into standards against which behaviors are judged, praised or punished;" "Standards which pertain to the meaning of good and evil and are held as such by a community"	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**	"Moral norms are the rules of morality that people ought to follow….There are different norms for different kinds of social interaction: norms of justice, norms of cooperation, and norms prescribing various kinds of altruistic behavior" (Harms and Skyrms 2008).
NORMS	'That which is a model or a pattern; a type, a standard; A value used as a reference standard for purposes of comparison' (OED)	In mathematics, norms are functions assigning a strictly positive length or size to each vector in a vector space (other than zero vectors).	"With 'norm' we mean 'a principle of right action binding upon the members of a group and serving to guide, control, or regulate proper and acceptable behavior" (Boella, van der Torre and Verhagen 2006).	"A collective evaluation of behavior in terms of what it ought to be; a collective expectation as to what behavior will be; and/or particular reactions to behavior, including attempts to apply sanctions or otherwise induce a particular kind of conduct." (Gibbs 1965, 589)	"Norms are generally accepted, sanctioned prescriptions for, or prohibitions against, others behavior, belief or feeling, i.e., what others ought to do, believe, feel—or else" (Morris 1956, 610). "All societies have rules or norms specifying appropriate and inappropriate behavior, and individuals are

					rewarded or punished as they conform to or deviate from the rules. The norms are blueprints for behavior, setting limits within which individuals may seek alternate ways to achieve their goals. Norms are based on cultural values, which are justified by moral standards, reasoning, or aesthetic judgment" (Broom and Selznick 1963, 68).
NORMATIVE SYSTEM	a system based on what is established as the norm (OED); Organized parameters of action designed to promote good	"Normative systems include systems of law, abstract models of computer systems, and hybrid systems consisting of human and computer agents in interaction" (Jones and Sergot 1993, 275).	"A normative system defines a set of constraints on the behaviour of agents, corresponding to obligations, which may or may not be observed by agents (Agotnes et al 2007, 1175)	**We welcome recommendations!**	"A normative multi agent system is a multi agent system together with normative systems in which agents on the one hand can decide whether to follow the explicitly represented norms, and on the other the normative systems specify how and in which extent the

					agents can modify the norms" (Boella, van der Torre and Verhagen 2006, 74)
NUDGING	Gentle persuasion	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**	"Nudges—liberty-preserving approaches that steer people in particular directions, but that also allow them to go their own way" (Sunstein 2014, 583).
ONTOLOGY	"The study of what there is"	"The same ontological theory may commit to different conceptualizations, as well as the same conceptualization may underlie different ontological theories. The term "ontology" will be used ambiguously, either as synonym of "ontological theory" or as synonym of conceptualization". Conceptualization: an intensional semantic structure which encodes the implicit rules constraining the	**We welcome recommendations!**	**We welcome recommendations!**	"The larger discipline of ontology can thus be seen as having four parts: 1. the study of ontological commitment, i.e. what we or others are committed to, 2. the study of what there is, 3. the study of the most general features of what there is, and how the things there are relate to each other in the metaphysically most general ways, 4. the study of meta-ontology, i.e.

		structure of a piece of reality. Formal Ontology: the systematic, formal, axiomatic development of the logic of all forms and modes of being. Ontological commitment: a partial semantic account of the intended conceptualization of a logical theory. Ontological engineering: the branch of knowledge engineering which exploits the principles of (formal) Ontology to build ontologies. Ontological theory: a set of formulas intended to be always true according to a certain conceptualization. Ontology: that branch of philosophy which deals with the nature and the			saying what task it is that the discipline of ontology should aim to accomplish, if any, how the questions it aims to answer should be understood, and with what methodology they can be answered" (Hofweber 2017).

		organisation of reality. Ontology: (sense 1) a logical theory which gives an explicit, partial account of a conceptualization; synonym of conceptualization" (Guarino and Giaretta 1995).			
PATIENTS	Agents who are acted upon by other agents	**We welcome recommendations!**	**We welcome recommendations!**	Individuals who are treated by healthcare practitioners and whose data—Protected Health Information—is covered as Individually identifiable health information which "means any information, including demographic information collected from an individual, that--"(A) is created or received by a health care provider, health plan, employer, or health care clearinghouse; and	"The patient, not the promiser, the liar, the thief, the murderer, but the promisee, the person lied to, the sufferer of the theft, the victim of murder. It is impossible even to state such typical moral situations as these without referring to patients as well as agents: no promises without someone having the promise made to him, no lies without someone lied to, no thefts, acts of violence or murders without victims, no

				"(B) relates to the past, present, or future physical or mental health or condition of an individual, the provision of health care to an individual, or the past, present, or future payment for the provision of health care to an individual, and--"(i) identifies the individual; or"(ii) with respect to which there is a reasonable basis to believe that the information can be used to identify the individual" (42USC 1301.1171(6)).	acts of kindness without recipients. In cases like these there cannot be human agents without human patients; for these are things that people do to other people" (McPherson 1984, 172).
PERSONAL DATA	Facts about an individual which may be used to identify them	**We welcome recommendations!**	**We welcome recommendations!**	"'Personal data' means any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a	**We welcome recommendations!**

				name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person" (General Data Protection Regulation, Article 4.1) ""Sensitive Personal Data" are personal data, revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, trade-union membership; data concerning health or sex life and sexual orientation; genetic data or biometric data" (General Data Protection Regulation, Article 8.1)	
PERSUASION	The action or an act of persuading or attempting to persuade; the	See Persuasive technology	**We welcome recommendations!**	The process by which agent action becomes social structure, ideas become norms, and	Aristotle suggests that persuasion rests on three technical means of

	addressing of arguments or appeals to a person in order to induce cooperation, submission, or agreement; the presenting of persuasive reasoning or compelling arguments (OED)			the subjective becomes the intersubjective'" (Finnemore and Sikkink, 1998: 914)	persuasion: ethos, pathos, and logos. Persuasion will not occur without speaker credibility. Persuasive efforts are lost unless emotional salience of the argument is conveyed. Persuasion will fail unless logically sound demonstrations of the persuasive points are made (See Aristotle's Rhetoric).
PERSUASIVE TECHNOLOGY	(Also known as "Captology") Software systems, which may or may not be integrated with specialized hardware, designed to change the behaviors or attitudes of end users in order to achieve a desirable end.	"Captology focuses on the planned persuasive effects of computer technology. Computers function as a tool or instrument to increase capabilities in order to reduce barriers, increase self-efficacy, provide information for better decision-making, change mental models; Computers function	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**

		as a medium to provide experiences in order to provide first-hand learning, insight, visualization and resolve, and to promote understanding of cause-and-effect relationships. Computers function as social actors to create relationships in order to establish social norms, invoke social rules and dynamics, and provide social support or sanction" (Fogg, Cuelar and Danielson 2009, 110; 116)			
POLICY	Authoritative plans of action	**We welcome recommendations!**	**We welcome recommendations!**	"A guide to action to change what would otherwise occur; a decision about amounts and allocations of resources; a statement of commitment to certain areas of concern; the distribution of the amount shows the	**We welcome recommendations!**

				priorities of decision makers. Public policy is policy at any level of government" (Porta 2016)	
PRINCIPLES	A fundamental source from which something proceeds; A primary element, force, or law which produces or determines particular results (OED)	Principles such as the Church-Turing Principle, are statements that may be testable hypotheses or axioms used in computation (Deutsch 1985). Use of the phrase "in principle" may be interpreted as "according to statements"	**We welcome recommendations!**	**We welcome recommendations!**	"the term "principles" to designate the most general normative standards of conduct" (Beauchamp 1995, 182)
PRIVACY	"The protection of select information through the use of mechanical or statistical masking mechanisms for the purpose of protecting individual or group dignity, desire for seclusion or concealment, property, secrets, or freedom of choice"	Freedom from surveillance (see Lyon and Zureik 1996).	Privacy engineering is defined by NIST as "privacy engineering means a specialty discipline of systems engineering focused on achieving freedom from conditions that can create problems for individuals with unacceptable consequences that arise from the	"One aspect of privacy is the withholding or concealment of information" (Posner 1977, 393). Bostwick gives a typology of privacy as: "the privacy of repose, the privacy of sanctuary, and the privacy of intimate decision. Repose means peace, quiet, and calm for the	Privacy is a multidimensional concept wherein features of behavior regulation relating to choice, control, and access, such as "having choice, protecting personal information, having control over one's information. Other features referenced what is commonly described as the

			system as it processes PII" (NISTIR 8062 2017, iv)	individual protected. Sanctuary means prohibiting other persons from seeing, hearing, and knowing (1456). The zone of intimate decision is an area within which the personal calculus used by an individual to make fundamental decisions must be allowed to operate without the injection of disruptive factors by the state. This privacy is less "freedom from" and more "freedom to" (1466)" (Bostwick 1976). The OECD Privacy Framework Privacy Principles include: collection limitation, data quality, purpose specification, use limitation, security safeguards, openness, individual participation, and accountability	content of privacy, for example, attending to bodily functions, personal information, medical information. The functions of privacy were expressed through features such as safety, security, independence, allows one to self-reflect, helps avoid scrutiny, or judgment. Features indicative of the psychological processes motivating behaviors of control, or following loss of control were mentioned, for example, a human need, concealing emotions, concealing embarrassing details, fear of adverse outcomes. Threats to privacy also emerged, for example, subject to violation, threatened

					on the Internet. Moreover, utterances included the states or conditions that allow privacy to be achieved, for example, being alone/without company, with people you feel close to, anonymity, not being disturbed, intimacy, personal space" are prized (Vasalau, Joinson and Houghton 2015).
PROPRIETARY	Owned as property	"A protocol confined to a particular proprietary set of software or hardware. This is in contrast to Internet protocols which are completely open" (Ince 2013).	**We welcome recommendations!**	"Proprietary capacity means the capacity or interest of a producer or handler that, either directly or through one or more intermediaries, is a property owner together with all the appurtenant rights of an owner including the right to vote the interest in that capacity as an individual, a shareholder, member of a cooperative,	"Pertaining to the ownership of and benefits derived from property, including intellectual property and a commercial or industrial enterprise" (Last 2007). "Defined and enforced in employment contracts rather than

				partner, trustee or in any other capacity with respect to any other business unit" (&CFR983.27)	by substantive law, proprietary information encompasses both trade secrets as well as knowledge not eligible for trade secret protection" (Montville 2007, 1162).
RESEARCH	Systematic inquiry into real phenomena	"Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view" (OECD Glossary of Statistical Terms 2013).	**We welcome recommendations!**	"Research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy, whether or not they are conducted or supported under a program which is considered research for other purposes" (45CFR46.102(d)).	Emancipatory research is defined as "Politically engaged research aimed at the empowerment of oppressed people by revealing the social relations of knowledge production in which oppression is maintained. Contrary to the positivist tradition, claims to objectivity in knowledge production are interrogated and accountability to the subjects is emphasized. The method devolves control of the research agenda to

					the subjects at all stages: the planning, design, fieldwork, and analysis challenge hierarchical relations between researchers and researched. The research process is seen as a transformative experience for both researchers and subjects" (Elliot et al 2016).
RESPONSIBILITY	Capability of fulfilling an obligation or duty; The quality of being reliable or trustworthy; The state or fact of being accountable for actions Liability for some action	**We welcome recommendations!**	National Society of Professional Engineers, Fundamental Canon #6 "6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession." Specific responsibilities include: "responsibility for coordination of an	"A government that is responsive to public opinion, that pursues policies that are prudent and mutually consistent, and that is accountable to the representatives of the electors" (Grant 2016).	"To be morally responsible for something, say an action, is to be worthy of a particular kind of reaction—praise, blame, or something akin to these—for having performed it" (Eshleman 2016).

			entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment" (II, 2, c); ". Engineers shall accept personal responsibility for their professional activities, provided, however, that engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer's interests cannot otherwise be protected." (III, 8).		
RIGHTS	That which is considered proper, correct, or consonant with justice, and related uses;	**We welcome recommendations!**	**We welcome recommendations!**	"Legal or moral recognition of choices or interests to which particular weight is attached. Very often, statements about rights draw on more	"Rights are entitlements (not) to perform certain actions, or (not) to be in certain states; or entitlements that others (not) perform

	The standard of permitted and forbidden action within a particular sphere			than one of the four relations identified: 1. A right is a liberty: a person has a liberty to X means that he has no obligation not to X. 2. A right is a right 'strictly speaking' or a claim right: a person has a right to X means others have a duty to him in respect of X. 3. A right is a power, that is, the capacity to change legal relations (and others are liable to have their position altered). 4. A right is an immunity, that is the absence of the liability to have the legal position altered (Reeve 2016).	certain actions or (not) be in certain states… Rights-assertions can be categorized, for example, according to: Who is alleged to have the right: Children's rights, animal rights, workers' rights, states' rights, the rights of peoples. What actions or states or objects the asserted right pertains to: Rights of free expression, to pass judgment; rights of privacy, to remain silent; property rights, bodily rights. Why the rightholder (allegedly) has the right: Moral rights are grounded in moral reasons, legal rights derive from the laws of the society, customary

					rights exist by local convention. How the asserted right can be affected by the rightholder's actions: The inalienable right to life, the forfeitable right to liberty, and the waivable right that a promise be kept" (Wenar 2015). "
RISK	Possible loss or harm	"Risk exposure is [equal to] the probability of an unsatisfactory outcome and the loss to the parties affected if the outcome is unsatisfactory" (Boehm 1991, 33).	"The probability that a substance or situation will produce harm under specified conditions. Risk is a combination of two factors: The probability that an adverse event will occur (such as a specific disease or type of injury) and the consequences of the adverse event. Risk encompasses impacts on public health and on the environment, and arises from exposure and hazard. Risk does not exist if	Risk = Probability X Consequence	"1. risk = an unwanted event which may or may not occur. 2. risk = the cause of an unwanted event which may or may not occur. 3. risk = the probability of an unwanted event which may or may not occur. 4. risk = the statistical expectation value of an unwanted event which may or may not occur. 5. risk = the fact that a decision is made under conditions of known probabilities

			exposure to a harmful substance or situation does not or will not occur. Hazard is determined by whether a particular substance or situation has the potential to cause harmful effects" (Presidential Commission on Risk Assessment and Risk Management 1997).		("decision under risk" as opposed to "decision under uncertainty")" (Hansson 2014).
SAFETY	Prevention of accidents	AI safety is described as mitigating accident risks from machine learning. "The problem of accidents in machine learning systems. We define accidents as unintended and harmful behavior that may emerge from machine learning systems when we specify the wrong objective function, are not careful about the learning process, or commit other	The state of Michigan has defined a safety engineer as "Safety Engineers make sure workplaces are safe. They monitor the general work environment, inspect buildings and machines for hazards and safety violations, and recommend safety features in new processes and products. Safety Engineers evaluate plans for new equipment to assure	**We welcome recommendations!**	**We welcome recommendations!**

		machine learning-related implementation errors" (Amodei et al 2016, 1-2)	that it is safe to operate and investigate accidents to determine the cause and how to keep them from happening again. Safety Engineers also design special safety clothing and safety devices to protect workers from injury when operating machines. They may educate workers through safety campaigns or classes. Some Safety Engineers specialize in fire prevention They analyze the design of buildings and the items in them to determine the best place to put fire extinguishers, sprinklers and emergency exits. Others specialize in product safety. They conduct research to make sure products are safe and recommend how a company can change		

			its product design to make it safe" (Michigan.gov).		
SOCIAL NORMS	Formal and informal rules defined by a social group	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**	"Rules indicating what is considered to be acceptable or appropriate behavior for the members of some group. Social norms can be either formal and explicit (e.g., traffic regulations) or informal and implicit (e.g., unspoken rules governing how close we stand to others while engaging in conversation" (Baron and Byrne 1981, 268; quoted in Shaffer 1983).
SOCIOTECHNICAL SYSTEM	"a social system operating on a technical base" (?)	Integration of community and personal systems with informational and mechanical systems (the-encyclopedia-of-human-computer-interaction-2nd-ed)	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**

SUPERINTELLIGENCE	The capacity to apprehend what is beyond the normal range of human intelligence or understanding; spiritual or paranormal insight or awareness, spiritualism. (OED)	Bostrom defines superintelligence as "an intellect that is much smarter than the best human brains in practically every field, including scientific creativity, general wisdom and social skills" (2006,11)	**We welcome recommendations!**	**We welcome recommendations!**	Marcus, Hibbard, and Yudkowsky debated the possibility of a "Friendly superintelligence" as imbued with a "motivation of benevolence towards humanity" but whose superintelligent maximization might go awry leading based upon faults in conceptualizations of AI motivation, leading to the "Smiley Tiling Berserker" scenario, faltering on the "Do what I mean" vs "Do what I said" problem, or becoming a "maverick nanny with a dopamine drip" (see Loosemore 2014).
SUSTAINABILITY	The Brundtland Report defines sustainable development as "Sustainable development is	**We welcome recommendations!**	"The Natural Step" perspective on sustainability suggests four "system conditions" amenable to	A sustainable system is one which survives or persists (Costanza and Patten 1995, p. 193)	"Sustainability is the continued use of program components and activities for the continued

	development that meets the needs of the present without compromising the ability of future generations to meet their own needs"		engineering design and control: Condition 1: Finite materials (including fossil fuels) should not be extracted at a faster rate than they can be redeposited in the Earth's crust. Condition 2: Artificial materials (including plastics) should not be produced at a faster rate than they can be broken down by natural processes. Condition 3: The biodiversity of ecosystems should be maintained, whilst renewable resources should only be consumed at a slower rate than they can be naturally replenished. Condition 4: Basic human needs must be met in an equitable and efficient manner" (Hammond 2004, 616)		achievement of desirable program and population outcomes" (Scheirer and Dearing 2011, 2060).

SYSTEM	Integration of individual units into a purposive whole	"A stat of a system may be defined as an undisturbed motion that is restricted by as many conditions or data as are theoretically possible without mutual interference or contradiction" (Dirac 1981, 11)	"A system is a complete set of components which interact or are interdependent from one stage to another" (Blanchard and Fabrycky, 2011 chapter 1).	"Socio-technical systems [are] arrangements of multiple purposive actors and material artifacts interacting in ways that require analyzing the total system and not just the constituent subsystems. (Rophol 1999, quoted in Bauer and Herder 2004).	Systems philosophy is one component of van Bertalanffy's systems' theory. Systems philosophy includes: systems ontology, systems paradigms, systems axiology, applied systems philosophy. Laszlo describes "philosophical value theory can be reconstructed in the framework of systems philosophy by conceiving of values as expressions of various states of adaptation of the individual to his biological and sociocultural environment" (1973, 250).
TECHNICAL NORMS	Parameters of action which a professional community has determined confer some benefit based upon their uses	**We welcome recommendations!**	**We welcome recommendations!**	**We welcome recommendations!**	"A technical norm is a factual statement about the relationship between means and ends…. More generally, a technical norm is a statement of the form: If you want A,

					and you believe that you are in a situation B, then you ought to do X" (Niiniluoto 1993, 11-12).
TECHNOLOGY	The branch of knowledge dealing with the mechanical arts and applied sciences; the study of this; The application of such knowledge for practical purposes, esp. in industry, manufacturing, etc.; the sphere of activity concerned with this; the mechanical arts and applied sciences collectively (OED); Application of scientific, mathematical, design, or engineering practices to creation of artifacts (SM-J)	"Technology is the application of science, engineering and industrial organization to create a human-build world" (Rhodes 1999, p. 19)	"technology is constituted by the systematic study and practice of the making and using of artifacts and to some extent by the physical artifacts themselves" (Mitcham 2004, 328)	NIST defines information technology as, "Any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency. For purposes of the preceding sentence, equipment is used by an executive agency if the equipment is used by the executive agency directly or is used by a contractor under a contract with the executive agency which—	In philosophy of technology, techne is referred to as related to the concept of technology. Feenberg describes it as "the word techne in ancient Greed signifies the knowledge or the discipline associated with a form of poiesis (the practical activity of human production). Each techne includes a purpose and meaning for its artifacts (2006, 2). Techne, is variously defined as a type of productive knowledge, whether technical knowledge, theoretical knowledge, or moral

				1) requires the use of such equipment; or 2) requires the use, to a significant extent, of such equipment in the performance of a service or the furnishing of a product. The term information technology includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources" (NIST 2013).	knowledge (Roochnik 1986).
TEST	Testing is defined as assessment of the fitness of a product to achieve its stated goals	Models of software testing emphasize different testing goals. "Demonstration phase models test to make sure that the software satisfies its specification, while destruction phase models test to detect implementation faults. Life Cycle Evaluation models test to detect requirements, design	In software engineering, "Segment testing requires each statement in the program to be executed by at least one test case. Branch testing asks that each transfer of control (branch) in the program is exercised by at least one test case and is usually considered to be a minimal testing	**We welcome recommendations!**	**We welcome recommendations!**

		and implementation faults while Life Cycle Prevention models test to prevent requirements, design and implementation faults" (Gelperin and Hetzel 1988, 688). Test data is a data set used at the end of the model building process to determine how well the model might fit the full data.	requirement. Path testing requires that all execution parts in a program are tested but is impractical since even small programs can have a huge (possibly infinite) number of paths (Ntafos 1988, 868).		
TRAINING	Goal oriented teaching, particularly to develop a skill	Training data is a portion of data used to fit a model	**We welcome recommendations!**	"A training program is the method through which the State agency carries out a plan of educational and training activities to improve the operation of its programs. (a)Initial in-service training means a period of intensive, task-oriented training to prepare new employees to assume job responsibilities. (b)Continuing training means an on-going	"Ethical training in a company is directed to the company employees and aims to enable each organisation member to apply moral reasoning tools to discuss and tackle ethical questions connected with corporate activities…Ethical training in a company is directed to the company

				program of training planned to enable employees to: (1) Reinforce their basic knowledge and develop the required skills for the performance of specific functions, and (2) acquire additional knowledge and skill to meet changes such as enactment of new legislation, development of new policies, or shifts in program emphasis. (c)Full-time training means training that requires employees to be relieved of all responsibility for performance of current work to participate in a training program. (d)Part-time training means training that allows employees to continue full time in their jobs or requires only partial reduction of work activities to participate in a training program	employees and aims to enable each organisation member to apply moral reasoning tools to discuss and tackle ethical questions connected with corporate activities ethical training can help the organisation to: Build understanding around the reason why certain organisational principles and rules can be shared as the result of a fair agreement; Provide an opportunity for a real dialog between the company and its employees, in order to reach an agreement supporting compliance with principles, values and rules of conduct. The purpose of ethical training is to enable employee to identify

				outside of the State or local agency. (e)Long-term training means training for eight consecutive work weeks or longer. (f)Short-term training means training for less than eight consecutive work weeks" (45CFR 235.61).	and deal with ethical problems, developing their moral intuitions, which are implicit in choices and actions. Ethical training help each member of the organisation to judge the moral legitimacy of her/his decisions, enabling them to apply moral principles and values in business decision-making (De Colle, Sacconi and Baldin 2003).
TRANSPARENCY	Easily seen through, recognized, understood, or detected (OED); Sufficient illumination to confer comprehension	**We welcome recommendations!**	**We welcome recommendations!**	Transparency is a characteristic which describes a process whereby information is requested and then disclosed completely within the limits of public law, without distortion, and with respect to the computational and cognitive capacities of the information recipient in order to enable those recipients to interpret the information so	"Information transparency is not an ethical principle per se, seeing that it can be ethically neutral, but it can easily become an ethically 'enabling'' or "impairing'' factor, that is a proethical condition, when the disclosed information has an impact on ethical principles. Such an impact depends on at least two types of

				that they are able to make rational, informed, decisions.	relationship that occur between disclosed information and ethical principles. One is dependence: some amount of information is required in order to endorse ethical principles. The other is regulation: ethical principles regulate information flow by constraining its access, usage, dissemination and storage. Information transparency is ethically enabling when it provides the information necessary for the endorsement of ethical principles (dependence) or (and this might be an inclusive or) when it provides details on how information is constrained (regulation). Conversely, ethical principles can be

					impaired if false details (misinformation) or inadequate or excessive amounts of information are disclosed. Accountability, safety, welfare and informed consent are examples of ethical principles that depend on the disclosure of some information in order to be endorsed" (Turilli and Floridi 2009, 107)
TRIPLE BOTTOM LINE	"People, Planet, Profit"	**We welcome recommendations!**	**We welcome recommendations!**	"3BL (triple bottom line) advocates believe that social (and environmental) performance can be measured in fairly objective ways, and that firms should use these results in order to improve their social (and environmental) performance. Moreover, they should report these results as a matter of principle, and in using and	"The Triple Bottom Line is based on the idea that a firm should measure its performance in relation to stakeholders including local communities and governments, not just those stakeholders with whom it has direct, transactional relationships (such as employees,

				reporting on these additional "bottom lines' firms can expect to do better by their financial bottom line in the long run" (Norman and MacDonald 246)	suppliers and customers). … The TBL adds social and environmental measures of performance to the economic measures typically used in most organizations. Environmental performance generally refers to the amount of resources a firm uses in its operations (e.g. energy, land, water) and the by-products its activities create (e.g. waste, air emissions, chemical residues etc.). Social performance generally refers to the impact a firm (and its suppliers) has on the communities in which it works" (Hubbard 2006, 180).

TRUST	Firm belief in the reliability, truth, or ability of someone or something; To believe or accept a statement, story, etc., without seeking verification or evidence for it (OED)	Trust models are developed for multi-agent communication: "A reputation-based trust model collects, distributes, and aggregates feedback about participants' past behavior. These models help agents decide whom to trust, encourage trustworthy behavior, and discourage participation by agents who are dishonest. Reputation-based trust models are basically divided into two categories based on the way information is aggregated from an evaluator's perspective. They are "Direct/ Local experience model" and "Indirect/Global reputation model" where direct experience is derived	**We welcome recommendations!**	Legal definitions of trust include: 1. An equitable or beneficial right or title to land or other property, held for the beneficiary but another person, in whom resides the legal tile or ownership, recognized and enforced by courts of chancery. 2. An obligation arising out of a confidence reposed in the trustee or representative, who has the legal title to property conveyed to him, that he will faithfully apply the property according to the confidence reposed or, in	"Trust is generally a three-part relation: A trusts B to do X. First, I trust someone if I have reason to believe it will be in that person's interest to be trustworthy in the relevant way at the relevant time. My trust turned, however, not directly on the Trusted's interests per se, but on whether my own interest are encapsulated in the interests of the trusted, that is, on whether the Trusted counts my interests as partly his or her own interests just because they are my interests" (Hardin 2006, 19).

		from direct encounters or observations (firsthand experience) and indirect reputation is derived from inferences based on information gathered indirectly (secondhand evidence such as by word of mouth)" (Das and Islam 2012).		other words, according to the wishes of the grantor of trust. 3. An equitable obligation, either express or Implied, resting upon a person by reason of a confidence reposed in him, to apply or deal with the property for the benefit of some other person, or for the benefit of himself and another or others, according to such confidence (Black's Law Dictionary Online).	
TRUSTWORTHINESS	Worthy of trust or confidence; reliable, dependable (OED)	"In both socially oriented and service-oriented trust computing, we can define trust in terms	Microsoft proposes that, "Trustworthy Computing has four pillars: reliability, security, privacy and	"If the individuals trust one another, then they each believe the other is trustworthy enough to	Trust is an attitude that we have towards people whom we hope will be trustworthy,

		of trust belief and trust behavior.1 Trust belief between two parties is the extent to which one party believes that the other is trustworthy in a given situation. Trustworthy means one party is willing and able to act in the other's interest. Trust between two parties is the extent to which a party depends on the other in a given situation with a feeling of relative assurance, even though negative consequences are possible. If a trust belief means "A believes that B is trustworthy," it will lead to a trust behavior, such as "A trusts B" (Wang and Lin 2008).	business integrity. "Reliability" means that a computer system is dependable, is available when needed, and performs as expected and at appropriate levels. "Security" means that a system is resilient to attack, and that the confidentiality, integrity and availability of both the system and its data are protected. "Privacy" means that individuals have the ability to control data about themselves and that those using such data faithfully adhere to fair information principles. "Business Integrity" is about companies in our industry being responsible to customers and helping them find	perform a certain type of task in a competent way. Trustworthiness is a characteristic or property of an individual; trust is an attitude or belief we have about those who are trustworthy (Chesire 2011, 51-52)	where trustworthiness is a property [of a trusted person], not an attitude [towards trust as such]. Trust and trustworthiness are therefore distinct although ideally those whom we trust will be trustworthy and those who are trustworthy will be trusted. (McLeod 2015)

			appropriate solutions for their business issues, addressing problems with products or services, and being open in interactions with customers" (Gates 2002).		
VALUES	Worth or quality as measured by a standard of equivalence; The relative worth, usefulness, or importance of a thing or (occas.) a person; the estimation in which a thing is held according to its real or supposed desirability or utility (OED)	**We welcome recommendations!**	**We welcome recommendations!**	"Value consists in the relation of harmony or fitness. It finds its point of contact with common sense in the popular expression "good for"… or "good of its kind" and the relationship is that of the particular to its universal… "value consists in the fulfillment of interest as such" (Perry 1914).	""Value theory" is roughly synonymous with "axiology". Axiology can be thought of as primarily concerned with classifying what things are good, and how good they are. "value theory" designates the area of moral philosophy that is concerned with theoretical questions about value and goodness of all varieties — the theory of value." (Schroeder 2016). "There is a difference between values and norms… values are individual, or commonly shared

					conceptions of the desirable, ie. what I and/or others feel we justifiably want—what it is felt proper to want.. On the other hand, norms are generally accepted, sanctioned prescriptions for, or prohibitions against, others behavior, belief or feeling, i.e., what others ought to do, believe, feel—or else. Values can be held by a single individual, norms cannot. Norms must be shared prescriptions and apply to others, by definition" (Morris 1956, 610).
VALIDATION	A check for accuracy of relationships between claims and data supporting or refuting those claims.	Validation is "the process of building an acceptable level of confidence that an inference about a simulated process is a correct or valid inference for the actual process" (Van Horn quoted in	"Validation is the assessment of the accuracy of a computational simulation by comparison with experimental data. In validation, the relationship between computation and the	"Validation means establishing by objective evidence that the particular requirements for a specific intended use can be consistently fulfilled. Process validation means establishing by	"Construct validity is the approximate truth of the conclusion that your operationalization accurately reflects its construct" (Trochim 2006. Types of construct validity include: face

		Jagdev et al 1995, 333).	real world, i.e., experimental data, is the issue ” (Roache 1998, 2)	objective evidence that a process consistently produces a result or product meeting its predetermined specifications. Design validation means establishing by objective evidence that device specifications conform with user needs and intended uses” (CFR 21 Part 820.3(z)(1,2)).	validity, content validity, predictive validity, concurrent validity, convergent validity, and discriminant validity. See also Campbell and Stanley 2015.
VERIFICATION	A check for accuracy of a proposed solution.	Verification is “the process of confirming that the conceptual model has been correctly translated into an operational computer programme and that the calculations made with this programme utilize the correct input data” (Schlesinger et al 1974).	“Verification is the assessment of the accuracy of the solution to a computational model. In verification, the relationship of the simulation to the real world is not an issue” (Roache 1998, 2)	“Verification means confirmation by examination and provision of objective evidence that specified requirements have been fulfilled” (CFR 21 Part 820.3(aa)).	Within philosophy of language and philosophy of science, verificationism is allied with the logical positivist school of thought. A.J. Ayer and Rudolph Carnap both describe verification as relating to the method of determining the meaning of sentences.

		Approaches to verification include: numerical test cases, animation observation, and programme tracing (Jagdev et al 1995, 332, 333).			For Ayer, "Strong verification required that the truth of a proposition be conclusively ascertainable; weak verification required only that an observation statement be deducible from the proposition together with other, auxiliary, propositions, provided that the observation statement was not deducible from these auxiliaries alone… if weak, verifiability merely demarcated sense from nonsense, whilst the strong version meant that the method of verification provided the meaning of the sentence" (Macdonald 2017).

VIRTUAL REALITY	"A "virtual reality" is defined as a real or simulated environment in which a perceiver experiences telepresence" (Steuer 1992, 6)	"Virtual Reality is an alternate world filled with computer-generated images that respond to human movements. These simulated environments are usually visited with the aid of an expensive data suit which features stereophonic video goggles and fiber-optic data gloves" (Greenbaum, 1992; quoted in Steuer 1992, 5)	**We welcome recommendations!**	**We welcome recommendations!**	"A virtual reality is defined as a three dimensional interactive computer-generated environment that incorporates a first-person perspective. This means, first of all, that the attribute of full immersion is not taken to be an essential property for systems to qualify as virtual reality systems. Likewise, interaction through data gloves is not held to be essential, as interaction may also take place through a mouse or joystick. Stereo vision is likewise not held to be essential. Essential features of virtual reality, as defined here, are interactivity, the use of three dimensional graphics, and a first-person

					perspective" (Brey 1999, 6).
WEAPON SYSTEM	"A weapon system consists of a weapon and the items associated with its employment" (Schmitt 2013, 3)	**We welcome recommendations!**	**We welcome recommendations!**	An autonomous weapon system is: "a weapon system that, once activated, can select and engage targets without further intervention by a human operator. This includes human-supervised autonomous weapon systems that are designed to allow human operators to override operation of the weapon system, but can select and engage targets without further human input after activation" (Department of Defense 2012, Directive 3000.09, quoted in Schmitt 2013, 5).	**We welcome recommendations!**
WELLBEING	With reference to a person or community: the state of being healthy, happy, or prosperous;	**We welcome recommendations!**	**We welcome recommendations!**	The OECD recommends two areas of individual wellbeing dimensions that can be broken into eleven dimensions:	"Wellbeing [is] the balance point between an individual's resource pool and the challenges faced… In essence, stable wellbeing is when

	Physical, psychological, or moral welfare; (OED)			"Material Living Conditions include income and wealth, jobs and earnings, and housing. Quality of Life: health status, work and life balance, education and skills, social connections, civic engagement and governance, environmental quality, personal security, and subjective well-being". The OECD suggests that these wellbeing domains are sustained over time by natural capital, economic capital, human capital, and social capital (OECD 2011, 6).	individuals have the psychological, social and physical resources they need to meet a particular psychological, social and/or physical challenge. When individuals have more challenges than resources, the see-saw dips, along with their wellbeing, and vice-versa" (Dodge, Daly, Huyton, and Sanders 2012, 229-230).

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