COSC130
Fundamentals of Cybersecurity and Privacy

LECTURE 3: COMPUTER ETHICS AND CODE OF CONDUCT

Introduction to Ethics and Ethical Theories

1. Origin of Computer Ethics

2. Ethical issues in IT and cybersecurity

3. Code of Conduct

Much of this lecture is based on

Terrell Ward Bynum. "The Foundation of Computer Ethics", *Computers and Society*, June 2000.

In-text references to this source are typically omitted for readability.

Aristotle's Animal Behaviour
[Bynum, 2000]

Before we look at Computer Ethics, we will revisit the Greek philosopher Aristotle.

We already know that Aristotle equated virtue with the proper functioning (or flourishing) of an object. Here "object" includes animals and human beings.

Aristotle argued that the main difference between animals and plants was in the animals' ability to 'perceive' – to use their senses to gather information from the outside world. Animals then process this information according to their physiology, which results in their subsequent behaviour.

Aristotle's Animal Behaviour

[Bynum, 2000]

In simplest animals, the information is not stored but rather triggers immediate reactions (reflexes).

In more complex animals, information is retained and affects future behaviours. Animals 'learn', which allows them to adapt to the changing environment.

In more sophisticated animals, this translates into memories, recognition and processing of complex patterns and situations and decision-making.

Humans, as the most sophisticated animals, are capable of theoretical and practical reasoning, which allows them to evaluate different possibilities and make choices.

Aristotle's model of animal behaviour is suggestive of automata theory and AI.

Wiener's Ethics

Computer ethics goes back to 1950s and MIT professor of mathematics Norbert Weiner.

- Prof Weiner argued that computing is fundamentally different from other technologies.

- He anticipated that the time would come when we would be surrounded by computers that will constantly collect and provide data.

Wiener's model of animal behaviour is strikingly similar to that of Aristotle. He also argues that an animal's purpose is determined by its physiological structure.

Wiener's Ethics

"While it is impossible to make any universal statements concerning life-imitating automata in a field which is growing as rapidly as that of automatization, there are some general features of these machines that I should like to emphasize.

One is that they are machines to perform some definite task or tasks, and therefore must possess effector organs (analogous to arms and legs in human beings) with which such tasks can be performed.

The second point is that they must be a rapport with the outer world by sense organs, such a photoelectric cells and thermometers, which not only tell them what the existing circumstances are but enable them to record the performance or nonperformance of their own tasks.

This last function, as we have seen, is called feedback, the property of being able to adjust future conduct by past performance ….

For all these forms of behavior, and particularly for the more complicated ones, we must have central decision organs which determine what the machine is to do next on the basis of information fed back to it, which is stored by means analogous to the memory of a living organism."

[Wiener, 1950]

Wiener's Ethics

"Cybernetics takes the view that the structure of the machine or of the organism is an index of the performance that may be expected from it.

The fact that the mechanical rigidity of the insect is such as to limit its intelligence while the mechanical fluidity of the human being provides for his almost indefinite intellectual expansion is highly relevant to the point of view of this book.

Man thus spends what may amount to forty percent of his normal life as a learner, again for reasons that have to do with his physical structure.

It is as completely natural for a human society to be based on learning as for an ant society to be based on an inherited pattern .... man's advantage over the rest of nature is that he has the physiological and hence the intellectual equipment to adapt himself to radical changes in his environment.

The human species is strong only insofar as it takes advantage of the innate, adaptive, learning faculties that its physiological structure makes possible."

[Wiener, 1950]

Human Nature and Purpose of Life

Aristotle and Wiener have remarkably similar views of what constitutes human nature and the purpose of life.

For Aristotle, the purpose of human life is to flourish and excel in being human, which is characterised by theoretical and practical thinking, both on individual and community levels, as humans are social beings.

That, in turn, determines what is ethical: to excel in acquiring knowledge via theoretical reasoning and to do what humans do excellently via practical reasoning.

Human Nature and Purpose of Life

Wiener expresses fundamentally the same views, but he sees humans as information-processing entities.

"I wish to show that the human individual, capable of vast learning and study, which may occupy almost half of his life, is physically equipped, as the ant is not, for this capacity. Variety and possibility are inherent in the human sensorium -- and are indeed the key to man's most noble flights -- because variety and possibility belong to the very structure of the human organism.

While it is possible to throw away this enormous advantage that we have over the ants [and the rest of the animal kingdom], and to organize . . . [an] ant-state with human material, I certainly believe this is a degradation of man's very nature, and.., a waste of the great human values which man possesses .... if the human being is condemned and restricted to perform the same functions over and over again, he will not even be a good ant, not to mention a good human being."

[Wiener, 1950]

Where Aristotle and Wiener differ is in the fact that Aristotle thinks in terms of virtue and good character, while Wiener thinks in terms of "Great Principles of Justice".

Wiener's "Great Principles of Justice"

In order to capture conditions for human beings to flourish and fulfill their purpose, Wiener defines three "Great Principles of Justice" and an additional principle to limit the negative influence of government and society.

Bynum [Bynum, 2000] terms these principles
- The Principle of Freedom
- The Principle of Equality
- The Principle of Benevolence
- The Principle of Minimum Infringement of Freedom.

Wiener's "Great Principles of Justice"

The Principle of Freedom refers to "the liberty of each human being to develop in his freedom the full measure of the human possibilities embodied in him".

The Principle of Equality states that "what is just for A and B remains just when the positions of A and B are interchanged".

The Principle of Benevolence refers to "a good will between man and man that knows no limits short of those of humanity itself".

The Principle of Minimum Infringement of Freedom states that "what compulsion the very existence of the community and the state may demand must be exercised in such a way as to produce no unnecessary infringement of freedom".

Origins of Computer Ethics

Wiener [Wiener, 1948] argues that the invention of computing machines in 1940s introduced new ethical challenges:

"It has long been clear to me that the modern ultra-rapid computing machine was in principle an ideal central nervous system to an apparatus for automatic control; and that its input and output need not be in the form of numbers or diagrams but might very well be, respectively, the readings of artificial sense organs, such as photoelectric cells or thermometers, and the performance of motors or solenoids .... we are already in a position to construct artificial machines of almost any degree of elaborateness of performance. Long before Nagasaki and the public awareness of the atomic bomb, it had occurred to me that we were here in the presence of another social potentiality of unheard importance for good and for evil."

[Wiener, 1948]

Origins of Computer Ethics

Wiener [Wiener, 1950] argues that in order to understand human society, one needs to understand its internal messages and communication; computing machines with the ability to fundamentally change internal messages and communication can also profoundly transform society.

"It is the thesis of this book that society can only be understood through a study of the messages and the communication facilities which belong to it; and that in the future development of these messages and communication facilities, messages between man and machines, between machines and man, and between machine and machine, are destined to play an ever-increasing part."

[Wiener, 1950]

Origins of Computer Ethics

The rise of computer technology and what we today refer to as AI could devalue human physical and intellectual labour on the job market.

"Theoretically, if we could build a machine whose mechanical structure duplicated human physiology, we could have a machine whose intellectual capacities would duplicate those of human beings."

[Wiener, 1950]

"Perhaps I may clarify the historical background of the present situation if I say that the first industrial revolution, the revolution of the 'dark satanic mills,' was the devaluation of the human arm by the competition of machinery. There is no rate of pay at which a... pick-and-shovel laborer can live which is low enough to compete with the work of a steam shovel as an excavator. The modern industrial revolution (i.e., the computer revolution) is similarly bound to devalue the human brain, at least in its simpler and more routine decisions.... The answer, of course, is to have a society based on human values other than buying and selling. To arrive at this society, we need a good deal of planning and a good deal of struggle.... "

[Wiener, 1948]

AI Ethics Questions

Based on Wiener's ethical considerations and principles of justice, Bynum [Bynum, 2000] asked the following questions in relation to 'intelligent' computing machines:

1. "If we build machines 'whose intellectual capacities duplicate those of human beings', what will be the social and ethical consequences?"

2. "Will such machines have a purpose of their own that rivals that of humans?"

3. "Will they have the right to "flourish" and have "principles of justice" like humans?"

4. "Will machines whose intellectual capacities even exceed those of human beings have rights that thereby override human rights?"

AI Ethics Questions

Bynum [Bynum, 2000] argues that Wiener would not consider differentiation between living and non-living entities as a satisfactory answer to these questions:

"Such words as life, purpose and soul are grossly inadequate to precise scientific thinking. These terms have gained their significance through our recognition of the unity of a certain group of phenomena, and do not in fact furnish us with any adequate basis to characterize this unity. Whenever we find a new phenomenon which partakes to some degree of the nature of those which we have already termed 'living phenomena,' but does not conform to all the associated aspects which define the term 'life,' we are faced with the problem of whether to enlarge the word 'life' so as to include them, or to define it in a more restrictive way so as to exclude them... Now that certain analogies of behavior are being observed between the machine and the living organism, the problem as to whether the machine is alive or not is, for our purposes, semantic and we are at liberty to answer it one way or the other as best suits our convenience."

[Wiener, 1950]

Computer Ethics Questions

Bynum [Bynum, 2000] argues that the computer ethics questions that Wiener raised are as relevant today as they were in the 1950s. Three basic Wiener questions are summarized in the table below.

Wiener's Question	Bynum's modern ICT ethics equivalen
What will be the social and ethical consequences of introducing ultra-rapid computing machines into society?	What are the social and ethical implications of creating and using ICT?
How can human beings anticipate and cope with the social and ethical consequences of automatization in ways that serve and preserve human values?	How can we ethically integrate ICT into society?
What are the special obligations and responsibilities of people who are engaged in automatization and the creation of computerized automata?	What are the specific social and ethical responsibilities of ICT professionals?

Computer Ethics Questions

Some of the more specific ethical questions posed by Wiener relate to the following [Bynum, 2000]:

- computers replacing humans in the workplace;

- encryption and government secrecy;

- computerized weapons of war;

- access to computing for persons with disabilities;

- intellectual property;

- computers as decision-makers.

Methodology for Applying Computer Ethics in Practice

Bynum proposed a methodology for applying computer ethics based on Wiener principles [Bynum 2000]. The methodology includes the following guidelines:

- **Human Purpose.** Ethical judgments and practices must be grounded in the overall purpose of human life: society and the rules which govern its members must make it possible for people to flourish -- to reach their full potential in variety and possibility of action.

- **Principles of Justice.** The Principle of Freedom, the Principle of Equality and the Principle of Benevolence should govern every person's judgments and practices; and society must neither permit nor impose unnecessary limitations upon individual freedom.

- **Unambiguity.** The meanings of ethical concepts and rules, in a given situation, should be clear and unambiguous. If they are not, one must undertake to clarify their meanings to the extent possible.

- **Precedent and Tradition.** New ethical judgments and cases should be assimilated into the existing body of cases, rules, laws, policies and practices.

Methodology for Applying Computer Ethics in Practice

Based on those guidelines, Bynum [Bynum, 2000] proposed the following steps for solving issues in computer ethics based on Wiener's principles.

❑ <u>Step One:</u> Identify an ethical question or case regarding the integration of ICT into society.

❑ <u>Step Two:</u> Clarify any ambiguous concepts or rules that may apply to the case in question.

❑ <u>Step Three:</u> Apply existing principles, laws, rules, policies and practices which govern human behavior in the given society. Use precedent and traditional interpretation in such a way as to assimilate the new case or policy into the existing set of social policies and practices. If a given case or question does not fit easily into the existing set of rules and policies, then one must either (1) make adjustments in the old policies and rules to accommodate the new case, or else (2) introduce a totally new policy to cover the new kind of case.

Methodology for Applying Computer Ethics in Practice

One of the early papers on computer ethics was entitled "What is Computer Ethics" and was written by James H. Moor in 1985.

Moor argues that the proliferation of computers creates new capabilities and therefore new choices for action, which in turn creates a policy vacuum as such capabilities had not been previously considered.

Step 3 in Bynum's methodology where new policies need to be introduced is an example of James Moor's "policy vacuum" where it is justified to introduce new policies.

Computer Ethics

In 1976, Walter Maner argued that the widespread use of computing technologies in medicine introduced new ethical issues.

Unlike Wiener and Maner, Deborah Johnson [Johnson, 2004] argued they computing technologies only introduced a new twist to existing ethical issues.

She asked the following questions:

◦ Should employers monitor employees to the extent possible with computer software?

◦ Should doctors perform surgery remotely?

◦ Should I make copies of proprietary software?

◦ Is there any harm in me taking on a pseudo-identity in an online chat room?

◦ Should companies doing business online be allowed to sell the transaction-generated information they collect?

These are examples of policy vacuums created by computer technology.

What is Computer Ethics?

In 1976, Joseph Weiznbaum, a computer scientist at MIT, wrote a book entitled "Computer Power and Human Reason", where he described his experience with a chatbot named ELIZA that he created at MIT in the late 1960s.

When used with a "DOCTOR" script, ELIZA imitates a Rogerian psychiatrist in a simulated initial interview with a patient.

(In Rogerian school, the psychiatrist typically askes open-ended questions reflecting the patient's own words back to the patient.)

Weizenbaum was unpleasantly surprised to see a tendency of people who interacted with ELIZA to become emotionally attached to the program and share some of their innermost thoughts with it.

Computer Ethics and Code of Conduct

In terms of virtue ethics, the most important question of computer ethics is the following:

"What constitutes ethical behaviour for those who work with or have access to information systems?" [Stallings, 2017]

Computer Ethics and Code of Conduct

While the answer to this question is not unique to the context of computer ethics, there are some consideration that are specific to computer technology [Stallings, 2017].

1. Computer technology amplifies both the volume of data/activities and opportunities for misuse:

    ◦ record-keeping on an unprecedented scale, particularly regarding information about individuals

    ◦ the ability to collect and organise fine-grained personal information

    ◦ the ability to conduct data mining and machine learning, as well as data matching

    ◦ empowers individuals to do harm

2. New technologies and concepts are emerging that did not exist before and for which no ethical rules already exist, such as databases containing personal information, Web browsers, chat rooms, cookies, AI, cloud computing, etc.

3. Individuals with computer knowledge and skills bear extra ethical responsibilities and obligations.

Computer Ethics and Code of Conduct

Gotterbarn [Gotterbarn, 1999] proposed a hierarchy of professional obligation adapted and summarized in the table below.

Level 1	Humanity	Integrity Freedom Justice Fairness ...
Level 2	Professionalism	Higher order of care Societal wellbeing ...
Level 3	Each Profession	Profession-specific standards and professionalism Standards in profession's code of ethics

Some ethical dilemmas that an IT professional may face [Stallings, 2017]

Loyalty to the employer vs moral duty/loyalty to the profession.

Example: A software developer is aware that inadequate testing was done in order to meet deadlines.

Solution?

1. Raise the issue in-house
   Cons: May get penalised

2. Resign
   Cons: Loss of job

3. Going public about it (whistle-blowing)
   Cons: This can harm not only the employer but also the customer, and the public in general

4. Getting advice from the professional society
   Cons: May not help

Some ethical dilemmas that an IT professional may face
[Stallings, 2017]

Potential conflict of interest.

Example: A consultant has a financial interest in a certain vendor. Should the consultant reveal this to a client they are recommending the vendor to?

Code of Conduct Functions

Many professional societies have their own Code of Conduct. According to Gotterbarn [Gotterbarn, 1999], a software engineering code of conduct serves the following functions.

1. **Inspiration**

   "It might be designed to be inspirational - either for 'positive stimulus for ethical conduct by the practitioner' or to inspire confidence of the customer or user in the computing artifact and confidence in its creator. Unfortunately, inspirational language tends to be vague, limiting the code's ability to help guide professional behavior."

2. **Guidance**

   "Historically, there has been a transition away from regulatory codes, designed to penalize divergent behavior and internal dissent, toward more normative codes, which give general guidance. Although a professional can use a normative Code to examine alternative actions, such codes are only a partial representation of a profession's ethical standards. Because the use of normative codes requires moral judgment on the part of the professional, they should not be considered a complete procedure for deciding what is right or wrong"

Code of Conduct Functions

3. **Education**

"Codes also serve to educate both prospective and existing software engineers about their shared commitment to undertake a certain level of quality in their work and their responsibility for the well-being of the customer and user of the developed product. Codes also serve to educate managers of software engineers, and to educate those who make rules and laws related to the profession, about expected behavior. Managers' and legislators' expectations will affect what is asked of software engineers and what laws are passed relating to software engineering, respectively. Directly and indirectly, codes also educate management about their responsibility for the effects and impacts of the products developed. Codes also indirectly educate the public at large about what professionals consider to be a minimally acceptable ethical practice in that field, even as practiced by nonprofessionals."

Code of Conduct Functions

4. **Support**
"Codes provide a level of support for the professional who decides to take positive action. An appeal to the imperatives of a code can be used as counterpressure against others' urging to act in ways inconsistent with the Code."

5. **Deterrence/discipline**
"Codes can be a means of deterrence and discipline. They can serve as a formal basis for action against a professional; for example, some organizations use codes to revoke membership or suspend licenses to practice. Because codes usually define in detail the minimal behavior for all practitioners, the failure to meet this expectation can be used as a reasonable foundation for litigation."

6. **Public image**

"Codes have been used to enhance a profession's public image. They prohibit public criticism of fellow professionals, even if they violate some ethical standard."

Code of Conduct

1. ACM (Association for Computing Machinery) Code of Ethics and Professional Conduct
    [Code of Ethics (acm.org)](#)

2. IEEE (Institute of Electrical and Electronics Engineers) Code of Ethics
    [IEEE - IEEE Code of Ethics](#)

Both Codes of Conduct place emphasis on responsibility to other people and have some common themes [Stallings, 2017]:

a. dignity and worth of other people

b. personal integrity and honesty

c. responsibility for work

d. confidentiality of information

e. public safety, health, and welfare

f. participation in professional societies to improve standards of the profession

g. the notion that public knowledge and access to technology is equivalent to social power

References

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