

IEEE CS/ACM Code of Ethics and Professional Practice

The Software Engineering Code of Ethics and Professional Practice, produced by the Institution of Electrical and Electronic Engineers Computer Society (IEEE CS) and the Association for Computing Machinery (ACM), acts as a professional standard for teaching and practicing software engineering. The code also tells the public what they should expect from software engineers.

Software engineers shall commit themselves to making the analysis, specification, design, development, testing and maintenance of software a beneficial and respected profession. In accordance with their commitment to the health, safety and welfare of the public, software engineers shall adhere to the following Eight Principles:

- i. **Public:** Software engineers shall act consistently with the public interest.*
- ii. **Client and Employer:** Software engineers shall act in a manner that is in the best interests of their client and employer, consistent with the public interest.*
- iii. **Product:** Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.*
- iv. **Judgement:** Software engineers shall maintain integrity and independence in their professional judgment.*
- v. **Management:** Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.*
- vi. **Profession:** Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.*
- vii. **Colleagues:** Software engineers shall be fair to and supportive of their colleagues.*
- viii. **Self:** Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.*

Code of Conduct

A Code of Conduct is not law, but it is a set of rules that apply when you are in an organization such as your college. Examples might include "Don't see movie at work". This would be legal at home, but if you did it at work you could be sacked. In addition, a code of conduct may contain laws such as "Don't install pirated software".

The British Computer Society has produced a list of standards for the training and development of Information Technology workers.

It covers the following issues:

- **The Public Interest** - safeguarding public health; respecting rights of 3rd parties, applying a knowledge of relevant regulation.
- **Duty to employers and clients** - carrying out work according to the requirements, and don't abuse employers' or clients' trust in any way.
- **Professional duty** - uphold the reputation of the profession through good practice, support fellow members in professional development.
- **Professional Integrity and Competence** - maintain standards of professional skill and practice, accepting responsibility for work done, avoiding conflicts of interest with clients.

An example of a code of conduct in use in an office is as follows:

- Don't play games.
- Don't look at pornography.
- Don't gamble.
- Don't plug your own peripherals into your computer.
- Don't install software on work machines without permission.

Each of these might be perfectly legal at home, but they might get you sacked at work



Codes of Conduct may also include laws, as a way of reminding employees what is legal and what isn't legal

Copyright: A formal recognition of ownership of a created and published work.

Copyright can apply to any of:

- a literary (written) work.
- a musical composition.
- a film.
- a music recording.
- a radio or TV broadcast
- a work of art.
- a computer program.

The justification for the existence of copyright has two components.

1. The first is that the creation takes time and effort and requires original thinking, so the copyright holder should have the opportunity to earn money for it.
2. The second is that it is unfair for some other individual or organization to reproduce the work and to make money from it without any payment to the original creator.

Different countries have different details in their laws but there is an international agreement that copyright laws cannot be avoided, for example by someone publishing the work in another country without the original copyright holder's permission.

Typical copyright laws will include:

- a requirement for registration recording the date of creation of the work.
- a defined period when copyright will apply.
- a policy to be applied if an individual holding copyright die.
- an agreed method for indicating the copyright, for example the use of the © symbol.

Software Licensing

Commercial Software: It is created and made available for sale by a company that is aiming to make a profit. It is normal that the software license has to be paid for but there are a number of different options that might be available:

- A fee is paid for each individual copy of the software.
- A company might have the option of buying a site license which allows a define number of copies to be running at any one time.
- Special rates might be available for educational use.

Shareware software: Provided free of charge for a limited period but no source code provided.

It might be the full package available at the time or a limited version of it. A beta test version of new software might be considered to come in the shareware category.

Freeware: might be a limited version of a full package or possibly an earlier version. The difference is that there is no time limit for the license.

Examples of when using commercial software can be justified include:

- The software is available for immediate use and provides the functionality required.
- The software has been created to be used in conjunction with already installed software.
- There will be continuous maintenance and support provided.
- Taking advantage of a shareware offer might allow suggestions to be made as to how the software could be improved.
- Freeware can often offer sufficient functionality to serve a user's limited needs.

Open Source Software: Software provided with the source code.

Free Software: Software provided free of charge with no time limit for its use but no source code provided.

Artificial intelligence (AI)

It uses of a computer or computer-controlled device to perform tasks normally associated with intelligent behavior by humans.

There are five aspects of intelligent human behavior and let's discuss some applications of AI that mimic this human behavior.

Problem Solving

One example is the development of a system that can play chess. This can be considered as displaying artificial intelligence but this is only demonstrated because the rules of chess are limited. A computer with sufficient storage capacity and processing power can investigate so many options for a possible sequence of moves that a human cannot compete.

A second example is the traditional form of expert system that, for example, has been developed to aid medical diagnosis. This is supplied with data and rules from living medical experts. The expert system contains more knowledge than is possible for an individual doctor to have. However, if the expert system is given a new situation that is not covered by the data and rules it has been given, it cannot attempt a new or creative approach – unlike a human.

Linguistics

Voice recognition and voice synthesis techniques are already developed and in use. One example is if you phone a help line where you might be answered by a computer. Provided that you answer questions clearly the computer might be able to identify your needs and pass you on to an appropriate human who can help. However, this is a long way away from the computer itself creating new questions based on your answers and providing the help you need.

Perception

Traditionally robots have been used in manufacturing processes. Here the robot is programmed to perform repetitive tasks. The action of the robot each time is triggered by some mechanism. However, if anything unexpected happens the robot continues to operate as normal, regardless of any damage being caused. There is now much research focused on the development of autonomous robots. These have to be fitted with sensors to enable the robot to take appropriate action depending on the information received from the sensors. This is an example of perception in AI. A development of this concept is the driverless car. There are several examples available or in development but so far, they have only been able to perform limited tasks. An example is the capability for a car to park itself in a vacant parking space.

Reasoning

There are examples of the application of AI where a program has been able to draw inferences (reach conclusions based on evidence) which is a requirement for reasoning. The best examples concern the proving of mathematical theorems. Attempts have also been made to develop techniques that can verify that software that has been created does indeed correctly and fully match the documented specification.

Learning

This is currently a very active area for the application of AI techniques. Machine learning is said to take place if a system that has a task to perform is seen to improve its performance as it gains experience. The AI system has access to 'experience' in the form of a massive set of data. By the use of appropriate statistical algorithms, the system learns from this data. One example is when the actions of users visiting websites to buy products are stored. The AI system then attempts to identify appropriate products to be advertised when a user returns to the website. If sales progressively increase there is evidence that learning is taking place. Another example is the program that investigates incoming emails and makes decisions as to whether these can be classified as spam and therefore should be refused entry to the user inbox.

The impact of AI

1. The use of the Internet dominates the lives of a large proportion of the world's population. Global organizations that provide the systems underpinning this user activity are collecting and storing massive amounts of data concerning how the Internet is being used. If this data is only being used to enable the organization to increase its profits, this could be seen as normal business practice. However, if the data is not being securely stored it could get into the wrong hands and be used for criminal or subversive activity.
2. There are different concerns with respect to the introduction of autonomous mechanical products such as robots, robotic devices and driverless vehicles into our daily lives. There are arguments that technological developments lead to employment of more people to manufacture, service and install the new products. There is a further argument that more technology leads to less manual labor and therefore to increased leisure time. One counter argument is that more technology leads to fewer jobs because machines are doing the work.
3. Such developments simply make the rich richer and the poor poorer. Some people are excited by the introduction of driverless vehicles, but other people believe that the potential for accidents will be increased and that there are not enough measures to prevent accidents.
4. Robots can be used in environments that would be dangerous for humans to enter. Giving the robot the capability to act autonomously would make it more useful in such environments.

5. The environmental impact of robot manufacture and disposal is probably the most significant issue. Robots are manufactured and require materials for their construction. There is only a limited supply of the raw materials needed. Also, all mechanical and electronic devices eventually end up on the scrap heap contributing to the already serious problem of waste products harming the environment and creatures living in this environment.

6. The use of improved expert systems to aid practicing doctors and nurses is clearly a benefit. However, if these systems came to replace doctors and nurses the social consequences are difficult to predict.