1. Introduction

Most computer scientists believe that we are professionals, in the meaning that we are part of a profession\(^1\). There are many reasons why this claim is possible weak, but it is almost universally supported in the field.

Traditional professions like Medicine (human or veterinary) and law justify their professional status by having specific training, a professional society that accredits that training, board exams that certify that the candidate is ready to do independent work in their field, and professional rules of ethics which can lead to disbarment from the profession if they are broken. Computer Science does not do most of these. For example while we do have ABET accredited Computer Science degree programs, including at MSU, most Computer Science degree programs are still not accredited. Anyone, including high school kids, can do work as a programmer without breaking any laws. By comparison, someone who decided to work as a doctor just because they thought that they would be good at it would get into a lot of trouble if they didn’t bother to go to medical school first.

What Computer Science does have is a professional society (the Association for Computing Machinery or ACM) and a code of ethics which members of the society are expected to follow. There are actually two separate codes of ethics, the *ACM Code of Ethics and Professional Conduct* and the *Software Engineering Code of Ethics and Professional Conduct*, which was developed by a joint ACM and IEEE task force. In these notes I’ll mainly be looking at these two documents. Both of these documents emphasize that these are professional responsibilities, which implies that these organizations believe that we work in a profession.

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\(^1\) As compared to the other meaning of professional, which just means that we are paid for our work.
2. ACM Code of Ethics and Professional Conduct

The document can be found at [http://www.acm.org/constitution/code.html](http://www.acm.org/constitution/code.html). It is fairly large, so I won’t just cut and paste it here but will expect you to go to that link and read it.

The preamble to the ACM code states that “Commitment to ethical professional conduct is expected of every member (voting members, associate members, and student members) of the Association for Computing Machinery (ACM).” It also states that “The Code and its supplemented guidelines are intended to serve as a basis for ethical decision making in the conduct of professional work. Secondarily, they may serve as a basis for judging the merit of a formal complaint pertaining to violation of professional ethical standards.”

The first main section is entitled **General Moral Imperatives**, and has the headings:

1. Contribute to society and human well being
2. Avoid harm to others
3. Be honest and trustworthy
4. Be fair and take action not to discriminate
5. Honor property rights including copyrights and patents
6. Give proper credit for intellectual property
7. Respect the privacy of others
8. Honor confidentiality

The second section is entitled **More Specific Professional Responsibilities** and has the headings:

1. Strive to achieve the highest quality, effectiveness, and dignity in both process and products of professional work
2. Acquire and maintain professional competence
3. Know and respect existing laws pertaining to professional work
4. Accept and provide appropriate professional review
5. Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks
6. Honor contracts, agreements, and assigned responsibilities
7. Improve public understanding of computing and its consequences
8. Access computing and communication resources only when authorized to do so

The third section is entitled **Organizational Leadership Imperatives**, and has the headings:

As an ACM member and an organizational leader I will:

1. Articulate social responsibilities of members of an organizational unit and encourage full acceptance of those responsibilities
2. Manage personnel and resources to design and build information systems that enhance the quality of working life
3. Acknowledge and support proper and authorized uses of an organization’s computing and communication resources
4. Ensure that users and those who will be affected by a system have their needs clearly articulated during the assessment and design of requirements; later the system must be validated to meet these requirements
5. Articulate and support policies that protect the dignity of users and others affected by a computing system
6. Create opportunities for members of the organization to learn the principles and limitations of computer systems

Finally, there is a section on **compliance** with the preceding code which states:

1. Uphold and promote the principles of this code
2. Treat violations of this code as inconsistent with membership in the ACM

### 3. **Software Engineering Code of Ethics and Professional Conduct, Short Version**

Many computer professionals find that this is a more useful code. It begins with a useful “short version” which summarizes the main points of the code, and was clearly intended as a one-page summary that could be included in contracts, posted on cubicle walls, and be part of the stated operational procedures of software companies. In its entirety the short version states:

**PREAMBLE**

The short version of the code summarizes aspirations at a high level of abstraction. The clauses that are included in the full version give examples and details of how these aspirations change the way we act as software engineering professionals. Without the aspirations, the details can become legalistic and tedious; without the details, the aspirations can become high sounding but empty; together, the aspirations and the details form a cohesive code.

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:

1. **PUBLIC** - Software engineers shall act consistently with the public interest.
2 **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.

3 **PRODUCT** - Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.

4 **JUDGMENT** - Software engineers shall maintain integrity and independence in their professional judgment.

5 **MANAGEMENT** - Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.

6 **PROFESSION** - Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.

7 **COLLEAGUES** - Software engineers shall be fair to and supportive of their colleagues.

8 **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.

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I am also including the complete text of the Software Engineering Code here, because it has become the code of choice for most computing professionals.

**PREAMBLE**

Computers have a central and growing role in commerce, industry, government, medicine, education, entertainment and society at large. Software engineers are those who contribute by direct participation or by teaching, to the analysis, specification, design, development, certification, maintenance and testing of software systems. Because of their roles in developing software systems, software engineers have significant opportunities to do good or cause harm, to enable others to do good or cause harm, or to influence others to do good or cause harm. To ensure, as much as possible, that their efforts will be used for good, software engineers must commit themselves to making software engineering a beneficial and respected profession. In accordance with that commitment, software engineers shall adhere to the following Code of Ethics and Professional Practice.

The Code contains eight Principles related to the behavior of and decisions made by professional software engineers, including practitioners, educators, managers, supervisors and policy makers, as well as trainees and students of the profession. The Principles
identify the ethically responsible relationships in which individuals, groups, and organizations participate and the primary obligations within these relationships. The Clauses of each Principle are illustrations of some of the obligations included in these relationships. These obligations are founded in the software engineer's humanity, in special care owed to people affected by the work of software engineers, and in the unique elements of the practice of software engineering. The Code prescribes these as obligations of anyone claiming to be or aspiring to be a software engineer.

It is not intended that the individual parts of the Code be used in isolation to justify errors of omission or commission. The list of Principles and Clauses is not exhaustive. The Clauses should not be read as separating the acceptable from the unacceptable in professional conduct in all practical situations. The Code is not a simple ethical algorithm that generates ethical decisions. In some situations, standards may be in tension with each other or with standards from other sources. These situations require the software engineer to use ethical judgment to act in a manner which is most consistent with the spirit of the Code of Ethics and Professional Practice, given the circumstances.

Ethical tensions can best be addressed by thoughtful consideration of fundamental principles, rather than blind reliance on detailed regulations. These Principles should influence software engineers to consider broadly who is affected by their work; to examine if they and their colleagues are treating other human beings with due respect; to consider how the public, if reasonably well informed, would view their decisions; to analyze how the least empowered will be affected by their decisions; and to consider whether their acts would be judged worthy of the ideal professional working as a software engineer. In all these judgments concern for the health, safety and welfare of the public is primary; that is, the "Public Interest" is central to this Code.

The dynamic and demanding context of software engineering requires a code that is adaptable and relevant to new situations as they occur. However, even in this generality, the Code provides support for software engineers and managers of software engineers who need to take positive action in a specific case by documenting the ethical stance of the profession. The Code provides an ethical foundation to which individuals within teams and the team as a whole can appeal. The Code helps to define those actions that are ethically improper to request of a software engineer or teams of software engineers.

The Code is not simply for adjudicating the nature of questionable acts; it also has an important educational function. As this Code expresses the consensus of the profession on ethical issues, it is a means to educate both the public and aspiring professionals about the ethical obligations of all software engineers.

PRINCIPLES

Principle 1 PUBLIC Software engineers shall act consistently with the public interest. In particular, software engineers shall, as appropriate:

1.01. Accept full responsibility for their own work.
1.02. Moderate the interests of the software engineer, the employer, the client and the users with the public good.

1.03. Approve software only if they have a well-founded belief that it is safe, meets specifications, passes appropriate tests, and does not diminish quality of life, diminish privacy or harm the environment. The ultimate effect of the work should be to the public good.

1.04. Disclose to appropriate persons or authorities any actual or potential danger to the user, the public, or the environment, that they reasonably believe to be associated with software or related documents.

1.05. Cooperate in efforts to address matters of grave public concern caused by software, its installation, maintenance, support or documentation.

1.06. Be fair and avoid deception in all statements, particularly public ones, concerning software or related documents, methods and tools.

1.07. Consider issues of physical disabilities, allocation of resources, economic disadvantage and other factors that can diminish access to the benefits of software.

1.08. Be encouraged to volunteer professional skills to good causes and to contribute to public education concerning the discipline.

Principle 2 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. In particular, software engineers shall, as appropriate:

2.01. Provide service in their areas of competence, being honest and forthright about any limitations of their experience and education.

2.02. Not knowingly use software that is obtained or retained either illegally or unethically.

2.03. Use the property of a client or employer only in ways properly authorized, and with the client's or employer's knowledge and consent.

2.04. Ensure that any document upon which they rely has been approved, when required, by someone authorized to approve it.

2.05. Keep private any confidential information gained in their professional work, where such confidentiality is consistent with the public interest and consistent with the law.

2.06. Identify, document, collect evidence and report to the client or the employer promptly if, in their opinion, a project is likely to fail, to prove too expensive, to violate intellectual property law, or otherwise to be problematic.

2.07. Identify, document, and report significant issues of social concern, of which they are aware, in software or related documents, to the employer or the client.

2.08. Accept no outside work detrimental to the work they perform for their primary employer.

2.09. Promote no interest adverse to their employer or client, unless a higher ethical concern is being compromised; in that case, inform the employer or another appropriate authority of the ethical concern.
Principle 3  PRODUCT Software engineers shall ensure that their products and related modifications meet the highest professional standards possible. In particular, software engineers shall, as appropriate:

3.01. Strive for high quality, acceptable cost, and a reasonable schedule, ensuring significant tradeoffs are clear to and accepted by the employer and the client, and are available for consideration by the user and the public.
3.02. Ensure proper and achievable goals and objectives for any project on which they work or propose.
3.03. Identify, define and address ethical, economic, cultural, legal and environmental issues related to work projects.
3.04. Ensure that they are qualified for any project on which they work or propose to work, by an appropriate combination of education, training, and experience.
3.05. Ensure that an appropriate method is used for any project on which they work or propose to work.
3.06. Work to follow professional standards, when available, that are most appropriate for the task at hand, departing from these only when ethically or technically justified.
3.07. Strive to fully understand the specifications for software on which they work.
3.08. Ensure that specifications for software on which they work have been well documented, satisfy the users' requirements and have the appropriate approvals.
3.09. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes on any project on which they work or propose to work and provide an uncertainty assessment of these estimates.
3.10. Ensure adequate testing, debugging, and review of software and related documents on which they work.
3.11. Ensure adequate documentation, including significant problems discovered and solutions adopted, for any project on which they work.
3.12. Work to develop software and related documents that respect the privacy of those who will be affected by that software.
3.13. Be careful to use only accurate data derived by ethical and lawful means, and use it only in ways properly authorized.
3.14. Maintain the integrity of data, being sensitive to outdated or flawed occurrences.
3.15 Treat all forms of software maintenance with the same professionalism as new development.

Principle 4  JUDGMENT Software engineers shall maintain integrity and independence in their professional judgment. In particular, software engineers shall, as appropriate:

4.01. Temper all technical judgments by the need to support and maintain human values.
4.02 Only endorse documents either prepared under their supervision or within their areas of competence and with which they are in agreement.
4.03. Maintain professional objectivity with respect to any software or related documents they are asked to evaluate.
4.04. Not engage in deceptive financial practices such as bribery, double billing, or other improper financial practices.
4.05. Disclose to all concerned parties those conflicts of interest that cannot reasonably be avoided or escaped.

4.06. Refuse to participate, as members or advisors, in a private, governmental or professional body concerned with software related issues, in which they, their employers or their clients have undisclosed potential conflicts of interest.

Principle 5 MANAGEMENT Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance. In particular, those managing or leading software engineers shall, as appropriate:

5.01 Ensure good management for any project on which they work, including effective procedures for promotion of quality and reduction of risk.

5.02. Ensure that software engineers are informed of standards before being held to them.

5.03. Ensure that software engineers know the employer's policies and procedures for protecting passwords, files and information that is confidential to the employer or confidential to others.

5.04. Assign work only after taking into account appropriate contributions of education and experience tempered with a desire to further that education and experience.

5.05. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes on any project on which they work or propose to work, and provide an uncertainty assessment of these estimates.

5.06. Attract potential software engineers only by full and accurate description of the conditions of employment.

5.07. Offer fair and just remuneration.

5.08. Not unjustly prevent someone from taking a position for which that person is suitably qualified.

5.09. Ensure that there is a fair agreement concerning ownership of any software, processes, research, writing, or other intellectual property to which a software engineer has contributed.

5.10. Provide for due process in hearing charges of violation of an employer's policy or of this Code.

5.11. Not ask a software engineer to do anything inconsistent with this Code.

5.12. Not punish anyone for expressing ethical concerns about a project.

Principle 6 PROFESSION Software engineers shall advance the integrity and reputation of the profession consistent with the public interest. In particular, software engineers shall, as appropriate:

6.01. Help develop an organizational environment favorable to acting ethically.

6.02. Promote public knowledge of software engineering.

6.03. Extend software engineering knowledge by appropriate participation in professional organizations, meetings and publications.

6.04. Support, as members of a profession, other software engineers striving to follow this Code.

6.05. Not promote their own interest at the expense of the profession, client or employer.
6.06. Obey all laws governing their work, unless, in exceptional circumstances, such compliance is inconsistent with the public interest.
6.07. Be accurate in stating the characteristics of software on which they work, avoiding not only false claims but also claims that might reasonably be supposed to be speculative, vacuous, deceptive, misleading, or doubtful.
6.08. Take responsibility for detecting, correcting, and reporting errors in software and associated documents on which they work.
6.09. Ensure that clients, employers, and supervisors know of the software engineer's commitment to this Code of ethics, and the subsequent ramifications of such commitment.
6.10. Avoid associations with businesses and organizations which are in conflict with this code.
6.11. Recognize that violations of this Code are inconsistent with being a professional software engineer.
6.12. Express concerns to the people involved when significant violations of this Code are detected unless this is impossible, counter-productive, or dangerous.
6.13. Report significant violations of this Code to appropriate authorities when it is clear that consultation with people involved in these significant violations is impossible, counter-productive or dangerous.

Principle 7 COLLEAGUES Software engineers shall be fair to and supportive of their colleagues. In particular, software engineers shall, as appropriate:

7.01. Encourage colleagues to adhere to this Code.
7.02. Assist colleagues in professional development.
7.03. Credit fully the work of others and refrain from taking undue credit.
7.04. Review the work of others in an objective, candid, and properly-documented way.
7.05. Give a fair hearing to the opinions, concerns, or complaints of a colleague.
7.06. Assist colleagues in being fully aware of current standard work practices including policies and procedures for protecting passwords, files and other confidential information, and security measures in general.
7.07. Not unfairly intervene in the career of any colleague; however, concern for the employer, the client or public interest may compel software engineers, in good faith, to question the competence of a colleague.
7.08. In situations outside of their own areas of competence, call upon the opinions of other professionals who have competence in that area.

Principle 8 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. In particular, software engineers shall continually endeavor to:

8.01. Further their knowledge of developments in the analysis, specification, design, development, maintenance and testing of software and related documents, together with the management of the development process.
8.02. Improve their ability to create safe, reliable, and useful quality software at reasonable cost and within a reasonable time.
8.03. Improve their ability to produce accurate, informative, and well-written documentation.
8.04. Improve their understanding of the software and related documents on which they work and of the environment in which they will be used.
8.05. Improve their knowledge of relevant standards and the law governing the software and related documents on which they work.
8.06. Improve their knowledge of this Code, its interpretation, and its application to their work.
8.07. Not give unfair treatment to anyone because of any irrelevant prejudices.
8.08. Not influence others to undertake any action that involves a breach of this Code.
8.09. Recognize that personal violations of this Code are inconsistent with being a professional software engineer.