Ethics

What is Ethics?  
Ethics refers to the branch of philosophy that deals with moral principles and values that guide human behavior. It involves examining and understanding what is right or wrong, good or bad, and the reasons behind ethical judgments and decisions. Ethics provides a framework for individuals and societies to evaluate actions and determine their moral implications.

At its core, ethics seeks to answer questions about how we ought to live and what actions are morally permissible or impermissible. It explores various ethical theories and principles that help in understanding and resolving ethical dilemmas. These theories include consequentialism, deontology, virtue ethics, and ethical relativism, among others.

Consequentialism focuses on the outcomes or consequences of actions. It asserts that the morality of an action is determined by its consequences and aims to maximize overall happiness or utility while minimizing harm.

Deontology, on the other hand, emphasizes the inherent nature of actions rather than their consequences. It suggests that certain actions are inherently right or wrong, regardless of the outcomes they produce. Deontological ethics often involves adherence to moral rules or duties, such as telling the truth or respecting the autonomy of others.

Virtue ethics focuses on the development of virtuous character traits and emphasizes the importance of cultivating virtues like honesty, compassion, and fairness. It suggests that ethical decisions should be guided by individual character and moral virtues rather than following specific rules or calculating consequences.

Ethical relativism posits that moral principles are subjective and vary across different cultures, societies, or individuals. It suggests that morality is relative and depends on personal or cultural perspectives, rejecting the idea of universal moral truths.

Ethics also examines various ethical dilemmas and real-world issues, such as the ethics of technology, business ethics, medical ethics, environmental ethics, and bioethics. These fields explore the ethical implications of advances in science, technology, and society and provide guidelines for responsible decision-making in these areas.

Importance of Ethics

Ethics is critical for several reasons:

* It provides a foundation for making laws and rules to regulate behavior within societies, ensuring fairness, justice, and respect among individuals.
* In professional contexts, ethical behavior builds trust between individuals, businesses, and their stakeholders. For example, ethical practices in business attract customers and retain employees.
* It serves as a guide for individuals, helping them make choices that are not only legally right but also morally commendable.
* Ethical principles help resolve conflicts by providing frameworks that prioritize respect, fairness, and empathy.

**Ethical Challenges in Modern Society**

* **Technology and Privacy:** With the advent of digital technologies, ethical issues surrounding privacy, data protection, and surveillance have become increasingly significant.
* **Globalization:** The interconnectedness of the global economy raises ethical questions about labor rights, environmental standards, and economic inequality.
* **Medical Ethics:** Advances in medical science, such as genetic engineering and end-of-life care, present complex ethical dilemmas.
* **Environmental Ethics:** The environmental crisis has led to ethical debates about human responsibility towards non-human life and future generations.

For this course we will focus on the ethics of technology. No matter what a person particular specialism is, the person is expected to act ethically.

A professional can receive guidance on ethical behaviour by joining an appropriate professional organisation. Such an organisation will have a code of conduct that will include reference to ethical practice.

For example, the British Computer Society (BCS) has a code of conduct that gives guidance under four headings:

1. Public Interest
2. Professional Competence and Integrity
3. Duty to Relevant Authority
4. Duty to the Profession

The Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE) are both based in the USA but have a global perspective and global influence. The IEEE-CS/ACM Joint Task Force Software Engineering Code of Ethics defines eight principles defined as

follows.

1. PUBLIC: Software engineers shall act consistently with the public interest. This principle emphasizes the responsibility of software engineers to consider the broader impact of their work on society. They should prioritize public safety, health, and welfare and strive to create software that benefits the public.
2. CLIENT AND EMPLOYER: Software engineers shall act in a manner that is in the best interests of their clients and employers and shall be honest and trustworthy. This principle highlights the importance of maintaining professional integrity and loyalty to clients and employers. Software engineers should provide services that meet the needs of their clients while upholding ethical standards.
3. PRODUCT: Software engineers shall ensure that their products and related modifications meet the highest professional standards possible. This principle emphasizes the importance of quality and professionalism in software development. Software engineers should strive for excellence and deliver reliable, efficient, and maintainable software products.
4. JUDGMENT: Software engineers shall maintain integrity and independence in their professional judgment. This principle highlights the need for software engineers to make impartial and objective decisions. They should avoid conflicts of interest and not compromise their professional judgment due to personal gain or external pressures.
5. MANAGEMENT: Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance. This principle recognizes the influence of management in shaping ethical behavior within software development organizations. Managers should prioritize ethical considerations, create a supportive work environment, and promote ethical practices throughout the software development lifecycle.
6. PROFESSION: Software engineers shall advance the integrity and reputation of the profession consistent with the public interest. This principle emphasizes the responsibility of software engineers to uphold the reputation of the software engineering profession. They should actively contribute to the professional community, share knowledge, and promote ethical practices among their peers.
7. COLLEAGUES: Software engineers shall be fair to and supportive of their colleagues. This principle highlights the importance of fostering a respectful and inclusive work environment. Software engineers should treat their colleagues with respect, value their contributions, and support their professional development.
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. This principle emphasizes the importance of continuous learning and professional development. Software engineers should stay updated with advancements in their field, enhance their skills, and promote ethical conduct within the profession.

Despite the differences in the detail the codes are consistent with regard to the following:

* the public interest or public good is a key concern
* the codes present fundamental principles
* the professional is expected to exercise their own judgement
* the professional should seek advice if unsure.

Ownership/Intellectual Property and Copyright

Intellectual property (IP) refers to creations of the mind, such as

* inventions
* literary and artistic works
* designs
* symbols, names, and images used in commerce.

Intellectual property is a critical concept in law, enabling individuals or companies to earn recognition or financial benefit from what they invent or create. By striking the right balance between the interests of innovators and the wider public interest, the IP system aims to foster an environment in which creativity and innovation can flourish.

Types of Intellectual Property

Intellectual property is typically divided into several categories:

* Patents: Protect inventions and give the patent holder exclusive rights to use, make, sell, or distribute the invention for a certain period, typically 20 years.
* Trademarks: Protect symbols, names, and slogans used to identify goods or services. Trademarks can last indefinitely, as long as they are in use and their renewal fees are paid.
* Copyrights: Protect the expression of ideas, such as writings, music, and artwork. Copyright typically lasts for the lifetime of the creator plus 70 years after their death.
* Trade Secrets: Protect confidential business information that provides a competitive edge, such as recipes, formulas, and manufacturing processes. Trade secrets can be protected indefinitely, as long as the information remains secret.
* Industrial Designs: Protect the visual design of objects that are not purely utilitarian, including the shape, surface, or ornamentation of an item.

Copyright is a formal acknowledgement of ownership. It is a subset of intellectual property. When an individual creates and publishes a work that demonstrates originality, they become the rightful owner and can claim copyright. However, if the work is created by an individual working for an organization, the organization can claim the copyright for the published work. *It's important to note that copyright cannot be applied to ideas, and no claim can be made on any part of a published work that was previously published by another individual or organization.*

Copyright can be applicable to various forms of creative expression, including

* literary (written) works
* musical compositions
* films
* music recordings
* radio or TV broadcasts
* works of art
* computer programs.

The justification for copyright has two main aspects.

* Firstly, the creation of a work requires time, effort, and original thinking, and the copyright holder should have the opportunity to earn financial benefits from their creation.
* Secondly, it would be unfair for someone else to reproduce the work and profit from it without providing any compensation to the original creator.

Software Licencing

Software licensing refers to the legal framework that governs the authorized use, distribution, and modification of computer software. It outlines the rights and restrictions imposed on the users or purchasers of the software. A software license is a legal agreement between the software developer or copyright holder (licensor) and the end-user or organization (licensee).

* It layout the terms and conditions under which the software can be used, such as Permitted Use: The license specifies the scope of authorized use, such as the number of installations, the number of users, or the permitted usage scenarios (e.g., personal, commercial, educational).
* Redistribution: Some licenses allow the licensee to distribute the software to others, while others restrict redistribution or require separate agreements for redistribution.
* Modification: The license may grant permission to modify the software's source code or restrict modification entirely.
* Intellectual Property Rights: The license clarifies the ownership and protection of intellectual property rights associated with the software. It defines the extent to which the licensee can copy, modify, or derive new works from the software.
* Support and Maintenance: Commercial licenses may include provisions for technical support, updates, and maintenance services, while open source licenses typically do not.
* Termination and Revocation: The license outlines the conditions under which the license can be terminated or revoked, such as non-compliance with the license terms.

Common types of software licenses

**Free Software Foundation (FSF) Licensing**

The FSF is a nonprofit with a worldwide mission to promote computer user freedom. It advocates for the use of free software, which is not necessarily about the price but about freedom. The FSF promotes licenses that allow users the freedom to run, copy, distribute, study, change, and improve the software more freely

The most common FSF license is the GNU General Public License (GPL). Other licenses include the GNU Lesser General Public License (LGPL) and the GNU Affero General Public License (AGPL).

FSF licenses are great for projects that want to make sure any work based on them stays free for everyone to use, share, and change. They're especially good for creating basic tools and resources that other software projects can build on. This way, everything stays open and easy for people to access and improve, keeping a strong community of sharing alive.

Examples

* GNU General Public License (GPL): Perhaps the most well-known FSF license, it requires that any modified versions of a GPL-licensed program must also be free and open-source. This "copyleft" license is used in many projects, including the Linux kernel.   
  The GNU General Public License (GPL), created by Richard Stallman for the GNU Project, is the most famous example of a copyleft license. It was designed to ensure that software remains free and that any derivative works or software that incorporates GPL-licensed components also become free software under the GPL. Copyleft licenses can apply to software as well as to other types of creative works, such as documentation, art, and music, provided these works are subject to copyright.  
  What is copy left?  
  "Copy left" is a rule for sharing software or creative work. It says you can use, change, and share the work as much as you want, but there's one important rule: if you share the work or anything you've made from it, you have to use the same sharing rule. This makes sure that everyone can use, change, and share the work now and in the future. It keeps the work free for everyone, instead of letting someone make it their own private property. The GNU General Public License (GPL) is a famous example of this rule. It makes sure that software stays free for everyone to use and share, even if someone else changes it or adds to it. This rule can be used for software, but also for writing, art, and music.
* GNU Lesser General Public License (LGPL): Similar to the GPL but less strict. It allows non-free programs to use LGPL-licensed libraries without being required to release the source code of the non-free program. It's commonly used for software libraries.such as the LibreOffice suite's
* GNU Affero General Public License (AGPL): Designed for server-side applications, the AGPL requires that the source code be made available to any network user of the AGPL-licensed work, thus closing the "Application Service Provider loophole" in the GPL. Example is Nextcloud.   
  Nextcloud is an open-source software suite for storing and sharing files, similar to services like Dropbox, but with an emphasis on privacy and security. It enables individuals and organizations to host their own cloud storage service, manage files, contacts, calendars, and to communicate through chat and video calls.
* GNU Free Documentation License (FDL): Aimed at free documentation, this license allows users to copy, modify, and distribute documentation, ensuring that all versions of the document remain free. Example is Wikipedia   
  Wikipedia, the free encyclopedia that anyone can edit, utilizes the GFDL for much of its content to ensure that it remains freely distributable, modifiable, and usable by anyone.

**The Open Source Initiative (OSI) Licensing**

The OSI promotes and protects open-source software by certifying licenses that comply with the Open Source Definition (OSD), ensuring that software can be freely used, modified, and shared. It allows software with these licenses to be freely accessible, modifiable, and distributable. Examples include the Apache License, MIT License, and BSD licenses. It is used for software that wants to encourage collaboration, innovation, and the wide distribution of software without restricting the commercialization of derived products. OSI-approved licenses are beneficial when the focus is on fostering collaboration, encouraging contributions, and leveraging a larger community of developers for software improvement. They are commonly used in projects where openness, transparency, and community engagement are valued.

Shareware  
Shareware is a distribution model rather than a specific license type. It allows users to try software for a limited period/trail basis before buying. After the trial period, users must pay to continue using the software or to unlock additional functionality. It is effective for consumer software where the goal is to maximize adoption and allow users to evaluate the product before making a financial commitment. It's suitable for applications with broad consumer appeal or specialized software where the value can be clearly demonstrated through a trial period. Example is WinZip and WinRAR

**Commercial Software Licenses**

Commercial software is proprietary software that is developed and sold by companies. The license restricts users' rights to modify or distribute the software and usually require the purchase of a license for usage. Commercial software licenses are suitable when the focus is on protecting intellectual property, maintaining control over the software, and generating revenue through sales or licensing fees. They are commonly used when proprietary technologies, unique features, or specialized support and services are involved. Commercial licenses provide companies with the ability to monetize their software and invest in further development and support.

What is proprietary software?

Proprietary software refers to computer software that is owned and controlled by an individual, company, or organization. It is also commonly known as **closed-source or commercial software.** Proprietary software is developed and distributed under a license that restricts certain rights and privileges to the end-users.

Characteristics of proprietary software include:

1. Intellectual Property Protection: Proprietary software is protected by copyright, trade secrets, and other intellectual property laws. The source code is typically kept confidential and is not freely available to the users.
2. Limited Usage Rights: The license agreement for proprietary software grants specific rights to the users, typically allowing them to use the software on a limited number of devices or for a specific period. Any usage beyond the terms of the license may be considered a violation of the agreement.
3. Restricted Modification and Distribution: Proprietary software licenses usually prohibit users from modifying, reverse-engineering, or distributing the software without explicit permission from the copyright holder. These restrictions aim to maintain control over the software and protect the developer's intellectual property.
4. Commercially Driven: Proprietary software is often developed and distributed as a commercial product for profit. The software is typically sold under a pricing model that involves one-time purchases, subscriptions, or licensing fees.
5. Vendor Support and Updates: Proprietary software vendors typically provide customer support, regular updates, and bug fixes. Users may have access to technical assistance, documentation, and additional services as part of the software package.

Examples of commercial software

* Microsoft Windows operating system
* Microsoft 365 Office Suite
* Adobe Creative Cloud is a collection of software applications widely used for graphic design, video editing, web development, and digital media creation. Applications like Adobe Photoshop, Illustrator, Premiere Pro, and InDesign are part of this suite.
* AutoCAD is a computer-aided design (CAD) software used by architects, engineers, and designers for creating 2D and 3D models, drafting, and documentation in various industries.
* Oracle Database: Oracle Database is a commercial relational database management system (RDBMS) used for storing, managing, and retrieving structured data.

The impact of Artificial Intelligence (AI)

The impact of Artificial Intelligence (AI) and its applications requires a multifaceted approach, considering its profound influence on society, economy, environment, and various sectors where AI technologies are applied.

**Social Issues**

* **Job Displacement and Creation:** AI can automate routine and repetitive tasks, leading to displacement of jobs in sectors like manufacturing, customer service, and data entry. However, it also creates new jobs in AI development, data analysis, and cybersecurity, necessitating workforce reskilling and upskilling.
* **Ethical and Privacy Concerns:** AI systems raise ethical questions regarding privacy, surveillance, bias, and decision-making. For example, facial recognition technology can enhance security but also raises privacy invasion concerns.
* **Digital Divide:** The rapid advancement in AI technology could widen the gap between those with access to digital technologies and those without, exacerbating social inequalities.

**Economic Issues**

* **Productivity and Efficiency:** AI significantly boosts productivity and operational efficiencies across various industries by optimizing processes, reducing downtime, and enhancing product and service quality.
* **Innovation and New Markets:** AI drives innovation, leading to the creation of new markets and industries. However, it also disrupts existing markets, challenging businesses to adapt quickly.
* **Impact on Global Economy:** AI's contribution to the global economy is significant, with projections suggesting it could add trillions to global GDP by automating tasks and creating new wealth. However, this also poses challenges regarding wealth distribution and economic inequality.

**Environmental Issues**

* **Resource Efficiency:** AI can optimize energy use in industries and homes, contribute to efficient waste management, and enhance agricultural practices, reducing environmental footprints.
* **Climate Change:** AI technologies assist in climate modeling, monitoring deforestation, and managing renewable energy sources, offering tools to combat climate change.
* **Electronic Waste:** The rapid development of AI technologies contributes to the generation of electronic waste, posing disposal and recycling challenges.

Applications of AI

AI's versatility allows its application across numerous fields, significantly transforming them:

Healthcare

* Disease Diagnosis and Treatment: AI algorithms can analyze medical images and data to diagnose diseases early and recommend treatments, improving patient outcomes.
* Personalized Medicine: AI helps in developing personalized treatment plans based on the individual's genetic makeup, lifestyle, and environmental factors.

Finance

* Fraud Detection: AI systems analyze transaction patterns to identify and prevent fraudulent activities in real-time.
* Robo-Advisors: AI-powered robo-advisors provide personalized investment advice and portfolio management services at a lower cost than human financial advisors.

Transportation

* Autonomous Vehicles: AI enables self-driving cars, reducing accidents caused by human error and potentially transforming urban mobility.
* Traffic Management: AI optimizes traffic flow, reducing congestion and emissions through smart traffic management systems.

Manufacturing

* Predictive Maintenance: AI predicts equipment failures before they occur, reducing downtime and maintenance costs.
* Supply Chain Optimization: AI enhances supply chain efficiency by predicting demand, optimizing inventory, and streamlining logistics.

Environment and Climate Change

* Wildlife Conservation: AI tools analyze data from various sources to track endangered species and combat poaching.
* Energy Management: AI optimizes energy consumption in buildings and integrates renewable energy sources into the grid more efficiently.

Entertainment

* Content Recommendation: AI curates personalized content for users on streaming platforms, improving user experience.
* Game Development: AI enhances gaming experiences by powering non-player characters and generating dynamic content.