1 General Questions

1. Can you list some current applications of AI? Have you used any of them?

2. Which disciplines (other than Computer Science) are related to AI and how?

3. What are the pros and cons of AI?

Solution:

1. Some of the applications of AI are medical diagnosis, image recognition, intelligent conversational interfaces, game playing, cybersecurity defense etc.

2. AI is not confined to Computer Science, rather it is related to many other disciplines like:
   a. Psychology: It can suggest cognitive, perceptual, emotional mechanisms for use in AI systems.
   b. Physiology: Results from the study of the nature and working of biological bodies and especially of brains are helpful in the development of computational infrastructures for AI (e.g.: artificial neural networks) and robotic hardware and body control systems.
   c. Philosophy: The fundamental nature of thought, consciousness, mind/body relationship, morality, free will, aesthetic qualities, value, time, etc., and more specialized philosophical issues such as the fundamental nature of language, representation, information, logic, computation, rule-following, symbols and causation.
   d. Law: The increase over time of the level of intelligence and degree of embeddedness in society of AI agents will lead to new challenges for Law, on matters such as responsibility, intention, evidence, ownership (notably of intellectual property, of web-crawling software agents, especially if they can collaborate to create other such agents), punishment, and the fundamental nature of legal processes themselves.
3. **Pros**: Good performing algorithms (e.g. image recognition, speech processing, regression, ...), implementation in risky situations like studying ocean floor, machines can work continuously.

**Cons**: It can displace jobs for humans, may be ethically questionable (e.g. for weapons), may not always take the right action, actions might be hard to understand.

## 2 Applications of Artificial Intelligence

Discuss if the following tasks can be solved by a computer system. Identify the problems of the individual tasks

1. Playing a decent soccer game against a human team.
2. Prove a mathematical theorem.
3. Write a funny story.
4. Give correct advice on legal problems in a specialized field.

### Solution:

1. Due to the conceptual and physical complexity of a soccer game, a human team could not be beaten by a robot team so far. The current state of the art is displayed at the Robot-World-Cup [http://www.robocup.org](http://www.robocup.org).

2. The first applications of AI were to prove mathematical theorems. Single proves for mathematical theorems that were more elegant than the existing ones were found by programs, due to simplicity-constraints within the program. Yet it is not clear whether all valid proves could be found by a program or not.

3. Till today, no program exists that can write reliably funny stories because the concept of humor is subjective and there are no strict rules for it. Individual examples of jokes that are written by a program might coincidentally be funny, but there exists no algorithm that has the general ability to write funny stories.

4. So called *expert systems* can be used to answer questions on specific problems. However, when the problem is not limited to certain topics general question answering is still subject of current research. In case of legal advise on a specialized field, artificial intelligent techniques for knowledge representation and logical reasoning can be applied.
3 Turing Test

What is the Turing Test and how does it work? Which abilities can be assessed using the Turing Test?

**Solution:**

"The Turing Test, proposed by Alan Turing (1950), was designed to provide a satisfactory operational definition of intelligence. A computer passes the test if a human interrogator, after posing some written questions, cannot tell whether the written responses come from a person or from a computer." (Russel, Norvig: Artificial Intelligence A Modern Approach, Third Edition)

4 Rational Agents

Draw the basic schematic of a rational agent and its interaction with the environment covering the following aspects: Agent, Environment, Sensors, Actuators, Percepts, Actions.

**Solution:**

![Rational Agent Diagram]

[Diagram showing Agent, Environment, Sensors, Actuators, Percepts, Actions]