BAHIR DAR UNIVERSITY IOT

SCHOOL OF COMPUTING AND ELECTRICAL ENGINEERING DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

 ARTIFICIAL NTELLIGENCE ASSIGNMENTS ONE

**SUBMITTED BY:**

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**Answer for Assignments one**

**1, Read and list out the contribution of various disciplines to the foundation of Artificial Intelligence (AI) to exist as a science?**

**Cognitive science**

* Cognitive science is the interdisciplinary scientific study of mind and its processes. It examines what [cognition](http://en.wikipedia.org/wiki/Cognition) is, what it does and how it works. It includes research on how information is processed (in faculties such as perception, language, memory, reasoning, and emotion), represented, and transformed in behavior, (human or other animal) nervous system or machine (e.g., computer).

Cognitive science consists of multiple research disciplines, including:-[psychology](http://en.wikipedia.org/wiki/Psychology), [artificial intelligence](http://en.wikipedia.org/wiki/Artificial_intelligence), [philosophy](http://en.wikipedia.org/wiki/Philosophy), [neuroscience](http://en.wikipedia.org/wiki/Neuroscience), [linguistics](http://en.wikipedia.org/wiki/Linguistics), [anthropology](http://en.wikipedia.org/wiki/Anthropology), [sociology](http://en.wikipedia.org/wiki/Sociology), and [education](http://en.wikipedia.org/wiki/Education). It spans many levels of analysis, from low-level learning and decision mechanisms to high-level logic and planning; from neural circuitry to modular brain organization.Which concerned the then-current state of [Artificial Intelligence](http://en.wikipedia.org/wiki/Artificial_Intelligence) research.

**Psychology**

* Psychology contributes for AI in the area of adaptation phenomena of perception and motor control experimental techniques.

**Philology**

* Philosophers have found that the concepts and technology of artificial intelligence provide useful ways to test theories of knowledge and reason. Conversely, researchers in artificial intelligence, noting that the productions of information-processing systems require a prior theory of rationality, have begun writing philosophy. Philosophy and AI presents invited contributions that focus on the different perspectives and techniques that philosophy and AI bring to the theory of rationality. The other contributions for logic, methods of reasoning mind as a physical system foundation of learning, language, and other.

**Linguistic**

* Contribute the area of knowledge representation grammar**.**

**Economic**

* The concept of Economics apply in the field of AI directly and indirectly different way like, first, the behavior of artificial intelligence agents that behave under the assumptions made in economic theory can be predicted by economic theory. Second, one can test how well artificial intelligence agents do the things economists assume people do. Thirdly, artificial intelligence agents that behave under the assumptions made in economic theory can be used to do calculations of math relating to economic theory.

**Biology**

**Mathematics**

* Contribute in field of formal representation and proof algorithms.

**Computer science and Engineering**

* Computer science is the combination of two disciplines that are computer science and computer engineering. So, both of them contribute for the existence of AI some things like that. Computer science, contribute in the fields of algorithms and data structures and other things, Methods for applying computers to problems, Study of the fundamental limits of computation and, the "technocratic paradigm" (which might be found in [engineering](http://en.wikipedia.org/wiki/Engineering) approaches, most prominently in software engineering)

**Neuroscience**

* Physical substrate for mental activity

**Control theory**

* Homeostatic systems, stability simple optimal agent designs

**2, what are the potted histories of AI? Read more about the technological evolution related to AI (state of the art)**

|  |  |
| --- | --- |
| year | Activity which is/are done |
| 1943 | McCulloch & Pitts: Boolean circuit model of brain |
| 1950 | Turing's “Computing Machinery and Intelligence" |
| 1952-69 | Look, Ma, no hands! |
| 1950s | Early AI programs, including Samuel's checkers program,Newell & Simon's Logic Theorist, Gelernter's Geometry Engine |
| 1956 | Dartmouth meeting: Artificial Intelligence adopted |
| 1965 | Robinson's complete algorithm for logical reasoning |
| 1966-74 | AI discovers computational complexityNeural network research almost disappears |
| 1969-79 | Early development of knowledge-based systems |
| 1980-88 | Expert systems industry booms |
| 1988-93 | Expert systems industry busts: \AI Winter" |
| 1985-95 | Neural networks return to popularity |
| 1988- | Resurgence of probabilistic and decision-theoretic methodsRapid increase in technical depth of mainstream AI\Nouvelle AI": ALife, GAs, soft computing |

**3 Read about the following topics and write a note about:-**

**Computer vision**

* Computer vision is the field concerned with automated computer based processing of images to extract and interpret information. It is the science and technology of machines that see. Here *see* means the machine is able to extract information from an image, to solve some task, or perhaps "understand" the scene in either a broad or limited sense.

Applications range from tasks such as industrial [machine vision](http://en.wikipedia.org/wiki/Machine_vision) systems which, say, inspect bottles speeding by on a production line, to research into artificial intelligence and computers or robots that can comprehend the world around them. The computer vision and machine vision fields have significant overlap. Computer vision covers the core technology of automated image analysis which is used in many fields. Machine vision usually refers to a process of combining automated image analysis with other methods and technologies to provide automated inspection and robot guidance in industrial applications.

As a scientific discipline, computer vision is concerned with the theory behind artificial systems that extract information from images. The image data can take many forms, such as video sequences, views from multiple cameras, or multi-dimensional data from a medical scanner.

**Robotics**

* Robots based on sense-model-plan-act (SMPA) approach pioneered by Shakey, however, have been slow to appear. Despite operating in a simplified, custom-made experimental environment or microworld and reliance on the most powerful available off board computers, Shakey “operated excruciatingly slowly” (Brooks 1991b), as have other SMPA based robots. An ironic revelation of robotics research is that abilities such as object recognition and obstacle avoidance that humans share with “lower” animals often prove more difficult to implement than distinctively human “high level” mathematical and inferential abilities that come more naturally (so to speak) to computers. Rodney Brooks’ alternative behavior-based approach has had success imparting low-level behavioral aptitudes outside of custom designed microworlds, but it is hard to see how such an approach could ever “scale up” to enable high-level intelligent action (see Behaviorism: [Objections & Discussion](http://www.iep.utm.edu/behavior/#H2): [Methodological Complaints](http://www.iep.utm.edu/behavior/#SSH2a.iv)). Perhaps hybrid systems can overcome the limitations of both approaches. On the practical front, progress is being made: NASA’s Mars exploration rovers Spirit and Opportunity, for instance, featured autonomous navigation abilities. If space is the “final frontier” the final frontiersmen are apt to be robots. Meanwhile, Earth robots seem bound to become smarter and more pervasive.Knowledge based systems are artificial intelligent tools working in a narrow domain to provide intelligent decisions with justification. Knowledge is acquired and represented using various knowledge representation techniques rules, frames and scripts. The basic advantages offered by such system are documentation of knowledge, intelligent decision support, self learning, reasoning and explanation. Knowledge-based systemsare systems based on the methods and techniques of [Artificial Intelligence](http://en.wikipedia.org/wiki/Artificial_Intelligence). Their core components are:
* [knowledge base](http://en.wikipedia.org/wiki/Knowledge_base)
* acquisition mechanisms
* inference mechanisms

Knowledge Base Systems (KBS) goes beyond the decision support philosophy to indicate the expert system technology into the decision making framework. Expert Systems (ES) have been the tools and techniques perfected by artificial intelligence (AI) researchers to deduce decision influences based on codification of knowledge. The codification of knowledge uses the principles of knowledge representation (part of the large theoretical ideas of knowledge engineering). Typically such codification uses rules like IF-THEN rules to represent logical implications

#### Natural Language Processing (NLP)

* Natural language processing has proven more difficult than might have been anticipated. Languages are symbol systems and (serial architecture) computers are symbol crunching machines, each with its own proprietary instruction set (machine code) into which it translates or compiles instructions couched in high level programming languages like LISP and C. One of the principle challenges posed by natural languages is the proper assignment of meaning. High-level computer languages express imperatives which the machine “understands” procedurally by translation into its native (and similarly imperative) machine code: their constructions are basically instructions. Natural languages, on the other hand, have – perhaps principally – declarative functions: their constructions include descriptions whose understanding seems fundamentally to require rightly relating them to their referents in the world. Furthermore, high level computer language instructions have unique machine code compilations (for a given machine), whereas, the same natural language constructions may bear different meanings in different linguistic and extralinguistic contexts. Contrast “the child is in the pen” and “the ink is in the pen” where the first “pen” should be understood to mean a kind of enclosure and the second “pen” a kind of writing implement. Commonsense, in a word, is how we know this; but how would a machine know, unless we could somehow endow machines with commonsense? In more than a word it would require sophisticated and integrated syntactic, morphological, semantic, pragmatic, and discourse processing. While the holy grail of full natural language understanding remains a distant dream, here as elsewhere in AI, piecemeal progress is being made and finding application in grammar checkers; information retrieval and information extraction systems; natural language interfaces for games, search engines, and question-answering systems; and even limited machine translation (MT).

#### Knowledge Representation (KR)

* Knowledge representation embodies concepts and information in computationally accessible and inferentially tractable forms. Besides the STRIPS formalism mentioned above, other important knowledge representation formalisms include AI programming languages such as PROLOG, and LISP; data structures such as frames, scripts, and ontology, and. The “frame problem” is the problem of reliably updating dynamic systems’ parameters in response to changes in other parameters so as to capture commonsense generalizations: that the colors of things remain unchanged by their being moved, that their positions remain unchanged by their being painted, and so forth. More adequate representation of commonsense knowledge is widely thought to be a major hurdle to development of the sort of interconnected planning and thought processes typical of high-level human or “general” intelligence.

**Machine Learning (ML)**

* Learning – performance improvement, concept formation, or information acquisition due to experience – underwrites human common sense, and one may doubt whether any preformed ontology could ever impart common sense in full human measure. Besides, whatever the other intellectual abilities a thing might manifest (or seem to), at however high a level, without learning capacity, it would still seem to be sadly lacking something crucial to human-level intelligence and perhaps intelligence of any sort. The possibility of machine learning is implicit in computer programs’ abilities to self-modify and various means of realizing that ability continue to be developed. Types of machine learning techniques include decision tree learning, ensemble learning, current-best-hypothesis learning, explanation-based learning, Inductive Logic Programming (ILP), Bayesian statistical learning, instance-based learning, reinforcement learning, and neural networks. Such techniques have found a number of applications from game programs whose play improves with experience to data mining (discovering patterns and regularities in bodies of information).

#### Neural Networks

* Neural or [connectionist networks](http://www.iep.utm.edu/connect/) – composed of simple processors or nodes acting in parallel – are designed to more closely approximate the architecture of the brain than traditional serial symbol-processing systems. Presumed brain-computations would seem to be performed in parallel by the activities of myriad brain cells or neurons. Much as their parallel processing is spread over various, perhaps widely distributed, nodes, the representation of data in such connectionist systems is similarly distributed and sub-symbolic (not being couched in formalisms such as traditional systems’ machine codes and ASCII). Adept at pattern recognition, such networks seem notably capable of forming concepts on their own based on feedback from experience and exhibit several other humanoid cognitive characteristics besides. Whether neural networks are capable of implementing high-level symbol processing such as that involved in the generation and comprehension of natural language has been hotly disputed. Critics (for example, Fodor and Pylyshyn 1988) argue that neural networks are incapable, in principle, of implementing syntactic structures adequate for compositional semantics – wherein the meaning of larger expressions (for example, sentences) are built up from the meanings of constituents (for example, words) – such as those natural language comprehension features. On the other hand, Fodor (1975) has argued that symbol-processing systems are incapable of concept acquisition: here the pattern recognition capabilities of networks seem to be just the ticket. Here, as with robots, perhaps hybrid systems can overcome the limitations of both the parallel distributed and symbol-processing approaches.

#### 4, What an AI system can and cannot do?

* **Artificial intelligence** (**AI**) is the [intelligence](http://en.wikipedia.org/wiki/Intelligence) of machines and the branch of [computer science](http://en.wikipedia.org/wiki/Computer_science) that aims to create it. AI textbooks define the field as "the study and design of intelligent agents where an [intelligent agent](http://en.wikipedia.org/wiki/Intelligent_agent) is a system that **perceives its environment and takes actions that maximize its chances of success**. Artificial, an **expert system** is a computer system that emulates the decision-making ability of a human expert. Expert systems are designed to solve complex problems by **reasoning about knowledge, like an expert**, and not by following the [procedure](http://en.wikipedia.org/wiki/Procedural_programming) of a [developer](http://en.wikipedia.org/wiki/Developer_%28software%29) as is the case in conventional programming.

**AI system may not do**

* Human intelligence and expertise depend primarily on unconscious instincts rather than conscious [symbolic](http://en.wikipedia.org/wiki/Physical_symbol_system) manipulation, and that these unconscious skills could never be captured in formal rules. So, difficult performed by AI.