ASSIGNMENT 1

The Foundations of Artificial Intelligence

CO541 – Artificial Intelligence

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E/15/366
SEMESTER 6
10/05/2020

TABLE OF CONTENTS

TABLE OF CONTENTS *2*
CONTRIBUTIONS TO AI *3*

APPROACHES & TECHNIQUES USED IN ARTIFICIAL INTELLIGENCE *4*
BUSINESS IMPLICATIONS *4*
SOCIETAL IMPLICATIONS *4*
EXPERT SYSTEMS *5*
COMPUTER VISION *5*
NATURAL LANGUAGE PROCESSING *5*
ROBOTICS *5*

REFERENCES *6*

Introduction

Artificial Intelligence is the automation of activities that are normally attributed to human thinking and rationality, such as problem-solving, decision-making, and learning**.** AI lives within the intersection of many classic disciplines, including philosophy, neuroscience, behavioral economics, computer science, and mechanical engineering. These interdisciplinary roots help to explain why AI has captured our imagination: this burgeoning research field offers a little something for people of all interests and backgrounds.

Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing and machine vision.

AI programming focuses on three cognitive skills: learning, reasoning and self-correction.

Contributions to AI

Artificial intelligence is a science and technology based on disciplines such as Computer Science, Biology, Psychology, Linguistics, Mathematics, and Engineering. A major thrust of AI is in the development of computer functions associated with human intelligence, such as reasoning, learning, and problem solving. Out of the above mentioned areas, one or multiple areas can contribute to build an intelligent system.

APPROACHES & TECHNIQUES USED IN ARTIFICIAL INTELLIGENCE

Business Implications

AI certainly impact your career path over the next decade. Though most industries are still in the early stages of proof-of-concept (POC) development, many early adopters are already starting to enjoy the fruits of their labor. In one study, researchers found that 500 companies that proactively adopted AI technology have 3–15% higher self-reported margins than their competitors. These early success signals have triggered a wave of investment, motivating VCs and Corp. Dev. departments alike to spend tens of billions of dollars each year to develop and scale new AI capabilities. This funding has substantially increased the demand for data scientists and ML engineers, giving rise to new educational models (e.g., MOOCs, bootcamps) which support this virtuous cycle by accelerating the pace of AI adoption.
It's always wise to approach funding statistics with a healthy dose of skepticism, and it's unclear whether these same trends will continue in a bear market. Still, the momentum behind these trends suggests that AI will have a long-lasting impact on the business community.

Societal Implications

Outside of the office, AI will also have a far-reaching impact on our society. Though AI has the potential to expedite and improve our daily lives in ways that we haven't yet discovered, it could just as easily be misused and abused.
The concept of "Artificial Superintelligence" (known in research communities as artificial general intelligence, or AGI) is particularly divisive. Though we're decades away from developing an autonomous agent à la *Terminator* or *Ex Machina*, many thought leaders have already started to debate the existential threat posed by superhuman AI.

In their 1995 classic Artificial Intelligence: A Modern Approach, Berkeley's Stuart J. Russell and Google's Peter Norvig broke AI into five distinct research areas originating from the Total Turing test:

- Machine Learning
- Expert Systems
- Computer Vision
- Natural Language Processing
- Robotics

Machine Learning

Artificial intelligence (AI), machine learning and deep learning are three terms often used interchangeably to describe software that behaves intelligently. However, it is useful to understand the key distinctions among them.

You can think of deep learning, machine learning and artificial intelligence as a set of Russian dolls nested within each other, beginning with the smallest and working out. Deep learning is a subset of machine learning, and machine learning is a subset of AI, which is an umbrella term for any computer program which does something smart. In other words, all machine learning is AI, but not all AI is machine learning, and so forth.

Expert Systems

An expert system (ES) is an artificial agent which leverages pre-programmed knowledge to offer advice or make decisions. In its simplest form, we can think of an ES as a complicated decision tree or nested if-then logic: if *x*, *y*, and *w* happen, we instruct the computer to do *z*. Though expert systems don't enjoy the same hype as machine learning, there are many reasons why we might prefer an ES over ML:

- An expert system can take advantage of human insights discovered through trial and error
- Expert systems are more predictable and are less likely to make extreme errors when faced with previously-unseen inputs
- Expert systems have historically been faster and easier to implement, though ML has become much more accessible in recent years

Computer Vision

Computer vision (CV) is the automatic extraction, analysis, and interpretation of images or videos**.** CV converts photos and videos into numerical arrays, enabling ML algorithms to draw inferences, make predictions, and even generate new images based on user-defined inputs.

Natural Language Processing

Natural language processing (NLP) is the automatic extraction, analysis, and generation of human language**.** NLP algorithms parse sentences in various ways (e.g., splitting by word, splitting by letter, reading both left-to-right and right-to-left, etc.) to automatically draw inferences about the writer's meaning and intent.

Robotics

Robotics is the science of designing, constructing, operating, and applying robots to solve human problems. Robots come in thousands of shapes and sizes, making it difficult to nail down the precise meaning of the term. Joseph Engelberger, a pioneer in industrial robotics, said it best:

“I can’t define a robot, but I know one when I see one.”
- Joseph Engelberger
The field of robotics research has evolved at breakneck speed over the past decade, enabling new designs and use cases that seem to have come straight out of a science fiction novel.

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