

A Brief Introduction to Artificial Intelligence

Sibghat Ullah

PhD Candidate/Early Stage Researcher, Leiden Institute of Advanced Computer Sciences (LIACS), Leiden University, The Netherlands

Email: s.ullah@liacs.leidenuniv.nl

GitHub: <https://github.com/SibghatUllah13>

Contents

- What is Artificial Intelligence ?
- Timeline of Artificial Intelligence
- Modern Artificial Intelligence
- Challenges
- Summary

What is Artificial Intelligence ?

- “Artificial” means “Unnatural”, i.e., “Machines” or “Computers”.
- “Intelligence” means the ability to extract and utilize knowledge, i.e., learning something new and using it to solve new problems.
- “Artificial Intelligence” refers to the “Intelligence” depicted by machines, e.g., Robots, Smart TV, Computers and Smart Phones.

Goal: Create technology that enables machines to behave “intelligently”.

Timeline of Artificial Intelligence

- 1950, Alan Turing proposes “Imitation Game” also known as “Turing Test” to measure the “Intelligence” of a machine ^[1].
- 1951, First “Artificial Neural Networks” (ANN) ^[2] were created.
- 1952, First machine learning ^[3] computer program was written.
- 1955, The term “Artificial Intelligence” was used for the first time.
- 1957, “Perceptron” algorithm was developed.
- 1969, Backpropagation was introduced.
- 1989, First Convolutional Neural Networks were created, especially used for image processing.
- 1992, (nonlinear) Support Vector Machines (SVMs) ^[4] were invented.

Modern Artificial Intelligence

Is inspired from Soft Computing and can be divided in at least five major branches

- Machine Learning ^[3], e.g., Neural Networks and Support Vector Machines
- Fuzzy Systems, i.e., based on fuzzy logic
- Evolutionary Computation ^[5] e.g., genetic algorithms and evolution strategies
- Metaheuristic and Swarm Intelligence e.g., Ant Colony Optimization
- Probabilistic Methods ^[3] e.g., Bayesian Networks, Hidden Markov Models

Challenges

Issues include

- How to measure the quality of intelligence ?
- Transparency & Interpretability^[6]
- Generalized Artificial Intelligence
- Ethical/Legal Issues in Artificial Intelligence

Summary

- Artificial Intelligence (AI) refers to the intelligent behavior demonstrated by machines, e.g., Computer and Smart TVs.
- Modern AI systems are based on Fuzzy logic, Machine Learning, Evolutionary Computation, Metaheuristics and Probabilistic Models.
- AI applications include gaming, sports and betting, Facebook Friends recommendations.
- AI systems face the challenges of ethical/legal issues, transparency and interpretability and generalization.

References

- [1] Turing, Alan M. "Computing machinery and intelligence." *Parsing the turing test*. Springer, Dordrecht, 2009. 23-65.
- [2] Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. *Deep learning*. MIT press, 2016
- [3] Bishop, Christopher M. *Pattern recognition and machine learning*. springer, 2006.
- [4] Vapnik, Vladimir. *The nature of statistical learning theory*. Springer science & business media, 2013.
- [5] Bäck, Thomas, David B. Fogel, and Zbigniew Michalewicz, eds. *Evolutionary computation 1: Basic algorithms and operators*. CRC press, 2018.
- [6] Molnar, Christoph. *Interpretable machine learning*. Lulu. com, 2019.

Thank You