



KENNESAW STATE
UNIVERSITY

Generalization & Democratization of Artificial Intelligence & Machine Learning



Democratization

“The process of making countries or organizations use democratic ways of making decisions” (DEMOCRATIZATION: definition in the Cambridge English Dictionary).



Introduction to Democratization

- Only **10,000 people** from seven different countries worldwide are trained enough to work in the development of Artificial Intelligence (AI) and Artificial General Intelligence (AGI) (Shen, 2017).
 - Additionally, this small group of people are heavily pursued by companies like: Google, Facebook, Twitter, etc.
- Democratization ensures that all people, regardless of nationality, race, sex, age, etc., hold stock in the benefits AI creates.

Democratization of Artificial Intelligence

- Mega-corporations such as Google and Facebook will undoubtedly implement more AI solutions and eventually reach a level of AGI, with their endless resources.
- The paper, “Distributed, Decentralized, and Democratized Artificial Intelligence,” illustrates a future where “the most potent set of technologies in the history of humankind is spoken for by a small biased minority” (Montes & Goertzel, 2019).



SingularityNET

- The authors of this paper present a solution to solving the issue of a lack of democratic cooperation in the development of AI:
 - **SingularityNET** is a decentralized self-organizing cooperative (DSOC) platform which allows for the buying and selling of AI services (Montes & Goertzel, 2019).
 - The transactions between buyers, sellers, and artificial agents, utilize a blockchain, or Distributed Ledger Technology (DLT), similar to popular cryptocurrencies.



A Decentralized Self-organizing Cooperative

- The SingularityNET platform was designed to allow contributions from individuals and communities anywhere in the world.
- The benefits to a DSOC platform include:
 - Diversity of thought: produces an array of different solutions
 - Incentive for good: profit won't be as big of a driving factor, since it's self-organizing
 - Community Cooperation: between developers, small businesses, and artificial agents alike



Intelligent Agent Cooperation

- In addition to humans, intelligent agents will be able to communicate within the community and to other AIs to find specific solutions and create further specialized AIs
 - Small businesses will be provided advanced AI solutions through the cooperation of intelligent agents that they would not likely receive elsewhere.
 - The authors state that this will increase “the likelihood that a decentralized AI network would have market demand, traction, and thus impact” (Montes & Goertzel, 2019).



Agent Cooperation Model

- This model illustrates a simple example of how a request for an agent's assistance is made and additional AI nodes are created in regards to that request.
- The ability of the network to replicate specialized nodes resulted in the creation of three new nodes: object, face, and event recognition.

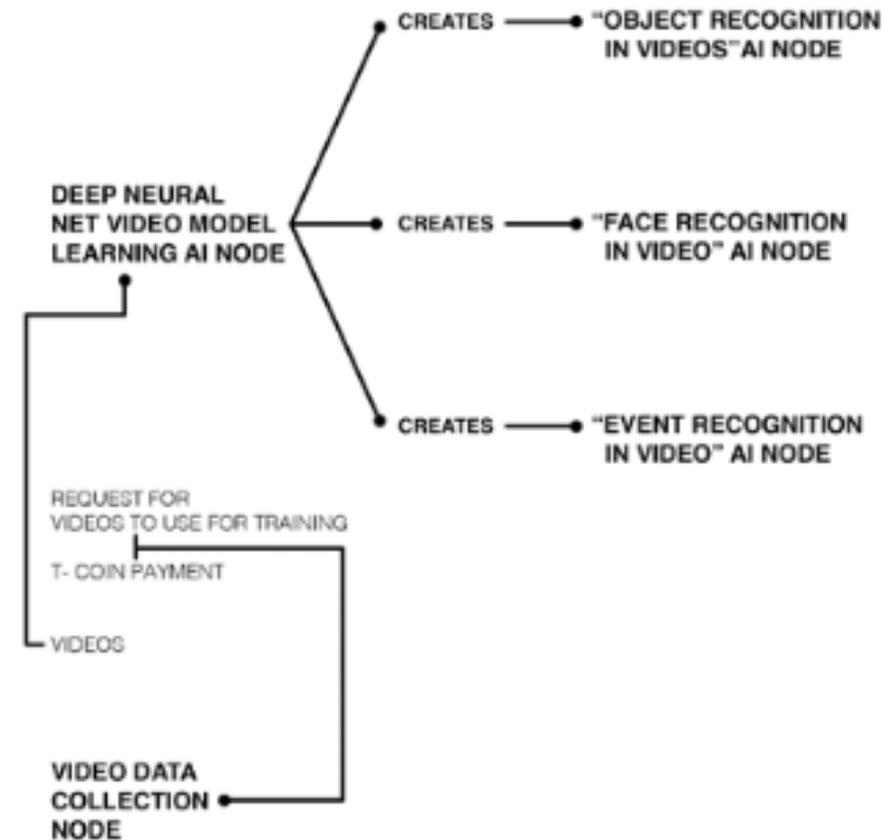


Figure 1.1: Agent Interaction (Montes & Goertzel, 2019).



Platform Currency

- The transactions between buyers/sellers on the distributed ledger technology (DLT) will be completed using a common currency unique to the platform.
 - This ensures that the economy on the platform: isn't affected by external markets, won't fall victim to exploitation of native currency, and won't be affected by the manipulation of elites (Montes & Goertzel, 2019).
- Currency will be rewarded to users on the basis of a unique rating system which incentivizes good behavior and benevolent solutions.



Generalization

The ability of a model or neural net to react to new data; a balance between underfitting and overfitting data



Generalization of Artificial Intelligence

- General AI or AGI are defined as systems that can engage in general reasoning (Gobble, 2019).
- AGI is an end goal for many organizations and researchers.
- AGI does not exist currently and is not expected to at all in the near future. Predictions range from 2030 to 2300 if it happens at all (de Berruti, F., Nel, P., & Whiteman, R., 2020).



Generalization of Artificial Intelligence

- Advancements in Narrow AI that encourage AGI:
 - Speech recognition agents
 - Facial Recognition
 - Optical Character Recognition (OCR)
 - Game AI that can beat world class individuals
 - Watson
 - Deep Blue
 - AlphaGo
 - OpenAI Five



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 - Speech recognition agents
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 - Game AI that can beat world class individuals
 - Watson - won Jeopardy! championship in 2011
 - Deep Blue - won against chess world champion Garry Kasparov in May 1997
 - AlphaGo - won against Go 9-dan professional Lee Sedol in March 2016
 - OpenAI Five - won against Dota 2 champion team OG in April 2019

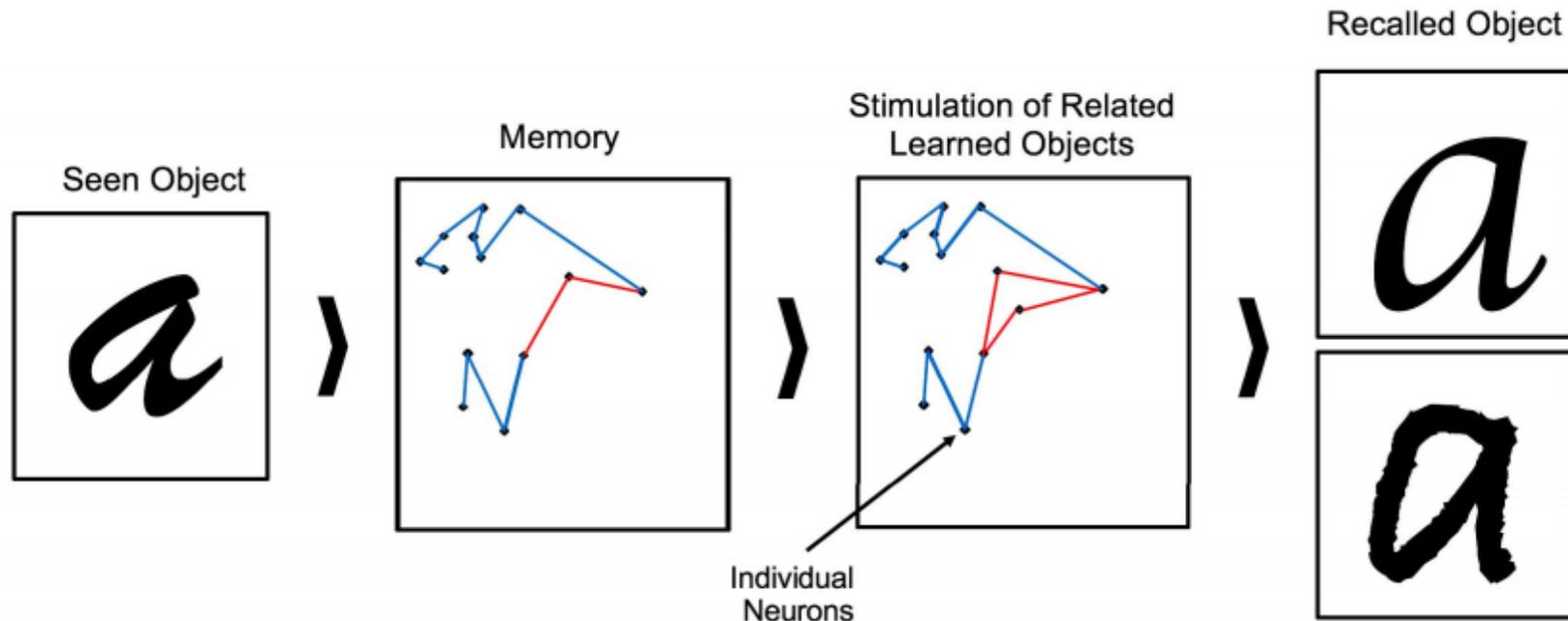


Generalization of Artificial Intelligence

- Areas of potential advancement to lead to AGI (de Berruti, F., Nel, P., & Whiteman, R., 2020):
 - Research toward improved or new algorithms to simulate human cognition
 - Quantum computing
 - New and larger sets of data in areas of human speech, computer vision, and spatial movement
 - Direct simulation of human brain through hardware and software (Nadji-Tehrani, M., & Eslami, A., 2020).

Conceptual Model for Simulated Recall

Fig 1.3 Conceptual Model For Simulated Recall (Nadji-Tehrani, M., & Eslami, A., 2020).





Machine Learning Background

- Machine learning, a subset of artificial intelligence, is the ability of a computer program to learn and adjust itself based on data that it interprets
- No human intervention is needed due to neural networks
 - Neural networks contain a series of algorithms that attempt to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates (Chen, 2020)



Examples of Machine Learning Generalization

- Tesla's autopilot technology uses machine learning to consistently and automatically improve its abilities
- Each Tesla vehicle is equipped with cameras and computer chips that run neural networks



Fig. 1.5: Front-facing Portion of Tesla Autopilot System
(Tesla, 2020))



Examples of Machine Learning Generalization

- The ability of the machine learning software in Tesla's vehicles to generalize itself is key to improving the reliability and safety of the cars
 - Each Tesla vehicle is connected to a network that compiles all the data and images collected by the cars
 - The "fleet" of Tesla vehicles can obtain data from each other to better improve the overall machine learning system

APA References

- Chen, James. (2020). Neural Network. Investopedia. <https://www.investopedia.com/terms/n/neuralnetwork.asp>
- DEMOCRATIZATION: Definition in the Cambridge English Dictionary. (n.d.). Retrieved November 10, 2020, from <https://dictionary.cambridge.org/us/dictionary/english/democratization>
- de Berruti, F., Nel, P., & Whiteman, R. (2020). An executive primer on artificial general intelligence. McKinsey Insights, N.PAG.
- Gobble, M. M. (2019). The Road to Artificial General Intelligence. *Research Technology Management*, 62(3), 55–59. doi.org:10.1080/08956308.2019.1587336
- Montes, G. A., & Goertzel, B. (2019). Distributed, decentralized, and democratized artificial intelligence. *Technological Forecasting and Social Change*, 141, 354-358. doi:10.1016/j.techfore.2018.11.010.
- Nadji-Tehrani, M., & Eslami, A. (2020). A Brain-Inspired Framework for Evolutionary Artificial General Intelligence. *IEEE Transactions on Neural Networks and Learning Systems*, PP. <https://doi.org/10.1109/TNNLS.2020.2965567>
- Shen, L., (2017). Former U.S. CTO: The “Robot Apocalypse” Could Happen. Here’s How You Stop It. Retrieved September 10, 2020, from <https://fortune.com/2017/11/14/megan-smith-cto-robot-apocalypse-elon-musk/>

Extended Resources

1. Fig. 1.1: Agent Interaction. Montes, G. A., & Goertzel, B. (2019). Retrieved October 7, 2020.
2. Fig 1.3: Conceptual Model For Simulated Recall. Nadji-Tehrani, M., & Eslami, A. (2020). Retrieved October 15, 2020.
3. Fig. 1.5: Front-facing Portion of Tesla Autopilot System. Tesla (2020). Retrieved October 15, 2020