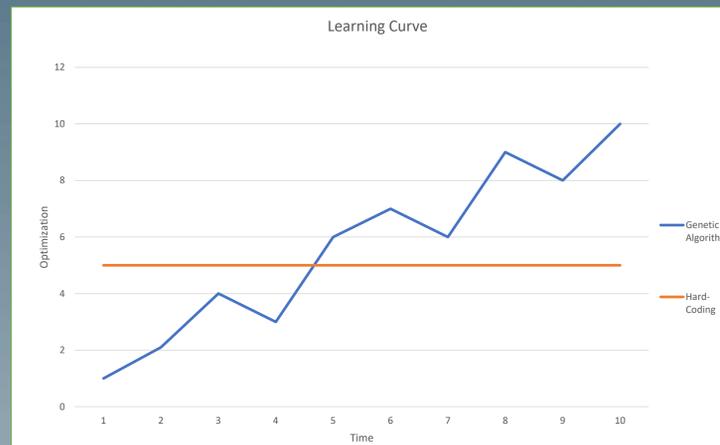




# GENETIC ALGORITHMS AND THEIR APPLICATIONS IN NAVIGATION SYSTEMS OF AUTONOMOUS DRONE TECHNOLOGY

## What is a Genetic Algorithm?

- Genetic algorithms are a subset of machine-learning code that allows the programmer to teach code to optimize itself through trial and error.
- Genetic algorithms combine computer science and biology in a “survival of the fittest” manner to optimize solutions.

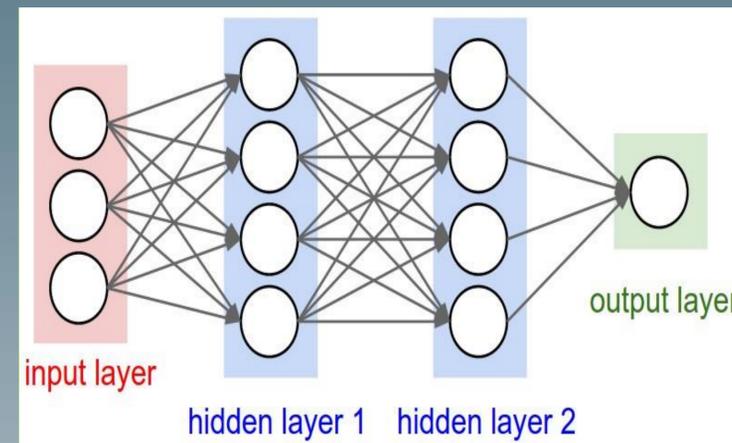


## How Does this Relate to Drone Navigation?

- Companies like Uber, Amazon, and Tesla can use genetic algorithms to optimize their drone navigation systems to their most **sustainable** state.
- This will save both consumers and producers money: optimizing statistics like fuel efficiency, time to destination, and workflow.

## How a Genetic Algorithm Works to Help Navigation Systems

- The trial and error process of a genetic algorithm involves the use of a neural network (pictured below).
- The network acts as the code’s “brain” as it balances what it “sees” with the input node and counteracts the information with how it will react through it’s output node.



## Benefits and Drawbacks of Genetic Algorithms

- Using a genetic algorithm will inevitably bring the optimized solution.
- Two things limit genetic algorithm’s availability to companies: time and finances.
- Genetic algorithms must fail to succeed: if failure is not an option the optimal solution cannot be reached.

## Are Genetic Algorithms Sustainable?

- An important emphasis of not only this conference, but for companies in general is the idea of creating sustainable products.
- Genetics algorithms are built for sustainability.
- Although there is a learning curve (graph to the left): genetic algorithms work towards optimization with each evolution while hard-coding stays at a constant average.
- Genetic algorithms save the man-power needed for code creation, leaving room to eventually save both time and money for consumers and producers.
- The environmental, logistical, and possible financial impacts point toward genetic algorithms being the **future** of drone navigation software.

Hard-Coding (Conventional)	Genetic Algorithm
Requires precisely stated analytical model and excess computation time.	Tolerant of imprecision, uncertainty, and approximation.
Based on binary (true-false) logic, numerical analysis, and crisp software.	Based on fuzzy (many-valued) logic, neural networks, and probabilistic reasoning.
Requires entire programs to be physically written.	Evolves its own programs.
Deterministic.	Incorporates a “randomness” factor to look for new solutions.
Strictly Sequential.	Allows parallel computations.

