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Visual Computing MAGAZiNE

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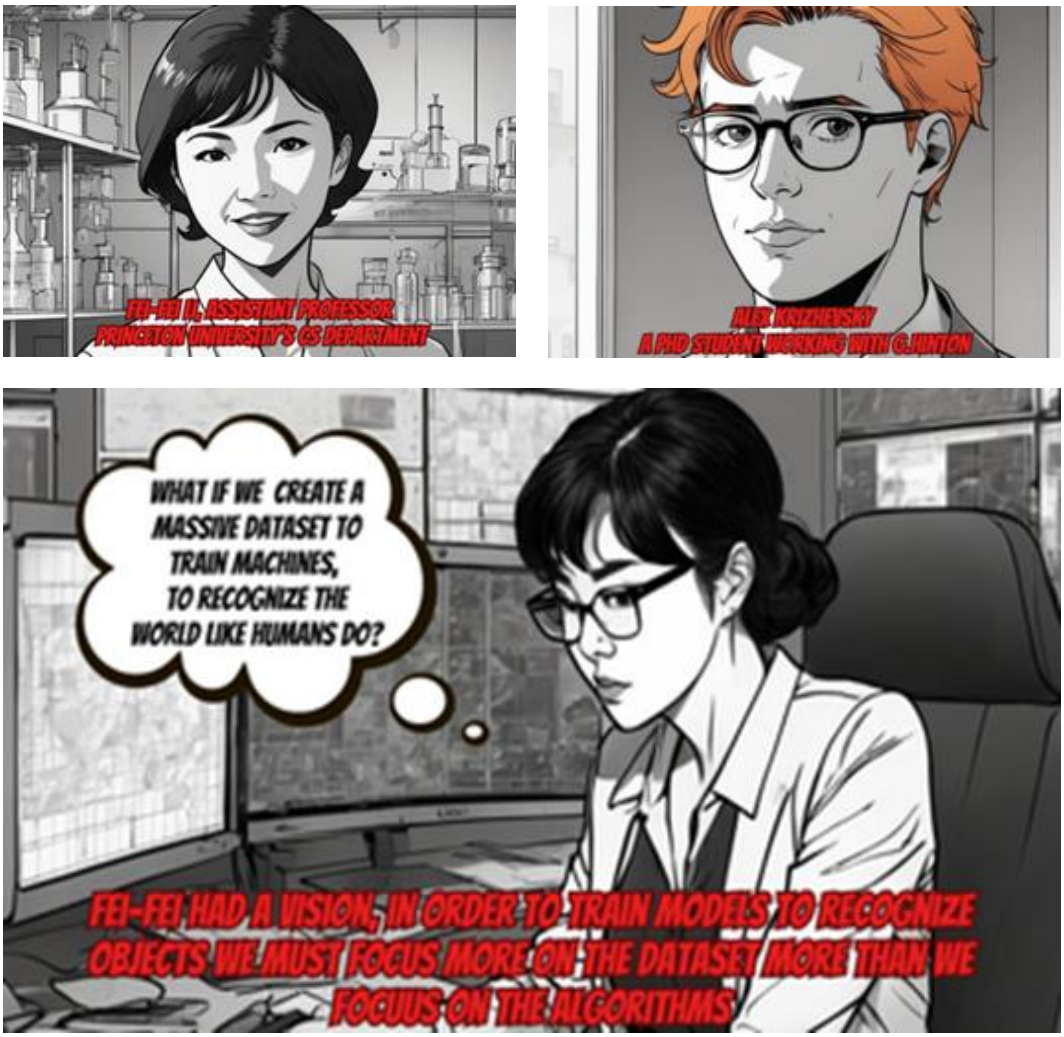
2025



CHRONICLE OF ARTIFICIAL INTELLIGENCE

PART (2)

The Preface

Welcome to this new issue the Visual Computing Magazine, where we present a chronicle of artificial intelligence (AI) through a selection of landmark developments from 2012 to 2021 **(part 2)**.
Some of the contributions in this issue are presented in a **comic style**. This creative format brings these stories to life in a visually dynamic way and provides an entertaining perspective on complex technological advancements.

We begin with AlexNet (**AlexNet wins IMAGENET, 2012**), the deep learning architecture that revolutionized image classification and won the ImageNet competition in 2012.
We present at the next event (**Google DeepMind's AlphaGo Research, 2016**), a project that attracted worldwide attention by beating world champions in the ancient Chinese game of Go. AlphaGo's success was a triumph deep reinforcement learning. Building on this success, **(AlphaGo Zero, 2017)** was able to eliminate human knowledge from the training process. AlphaGo Zero learned only by playing alone, achieving high performance, which contributed to the development of autonomous AI systems.
In 2019, OpenAI **(OpenAI Five, 2019)** demonstrated that AI could master complex multi-agent environments involving real-time strategy and cooperative play.
This issue concludes with **(GPT-3, Research OpenAI, 2020)**, the language model that is capable of generating coherent and contextual text in a variety of domains.

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Computer Science Faculty
USTHB University, Algeria

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CHRONICLE OF ARTIFICIAL INTELLIGENCE
Event: AlexNet wins IMAGENET, 2012

B. ABADLI, R. KEMMOUN, MASTER 2 VISUAL COMPUTING, USTHB

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Reference: Jia Deng, Wei Dong, Richard Socher, Li-Jia Li, Kai Li and Li Fei-Fei. ImageNet: A Large-Scale Hierarchical Image Database, CVPR, 2009

CHRONICLE OF ARTIFICIAL INTELLIGENCE
Event: AlexNet wins IMAGENET, 2012

B. ABADLI, R. KEMMOUN, MASTER 2 VISUAL COMPUTING, USTHB

Reference: G. Hinton, N. Srivastava, K. Swersky. ImageNet Classification with Deep Convolutional Neural Networks. Advances in Neural Information Processing Systems, NIPS 2012.

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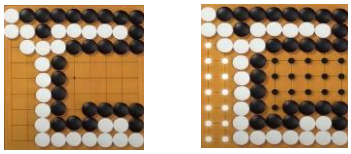
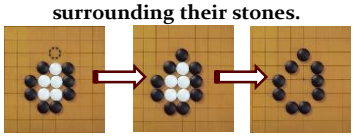
CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Google DeepMind's AlphaGo Research, 2016

H. KACIOUSSALEH, Z. BISKRI, MASTER 2 VISUAL COMPUTING, USTHB

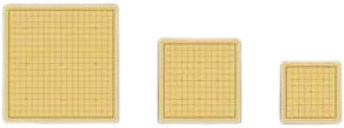
GO GAME

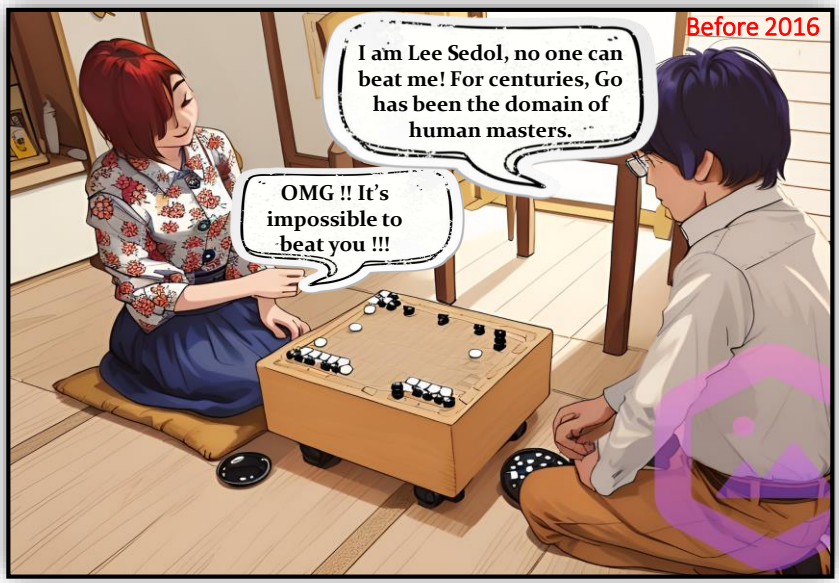


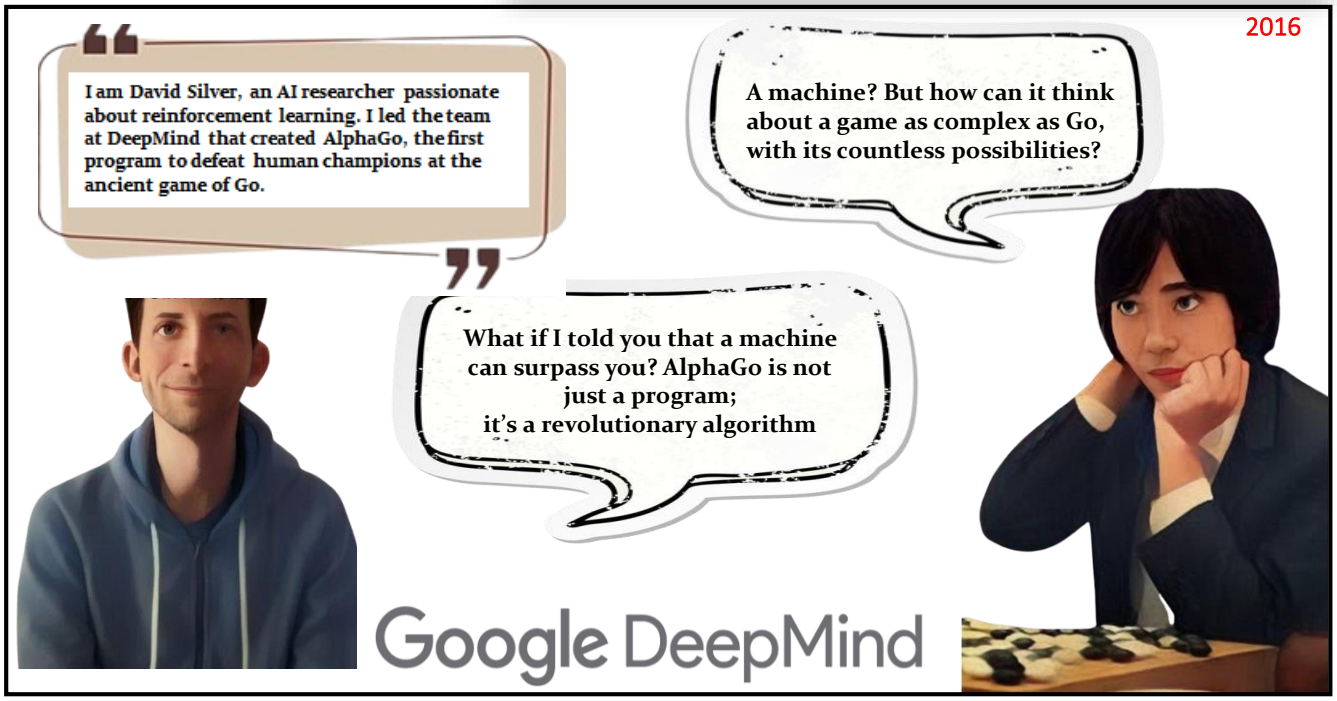
Control more space than the opponent by surrounding their stones.



When a group of stones is completely surrounded, it is captured and removed.





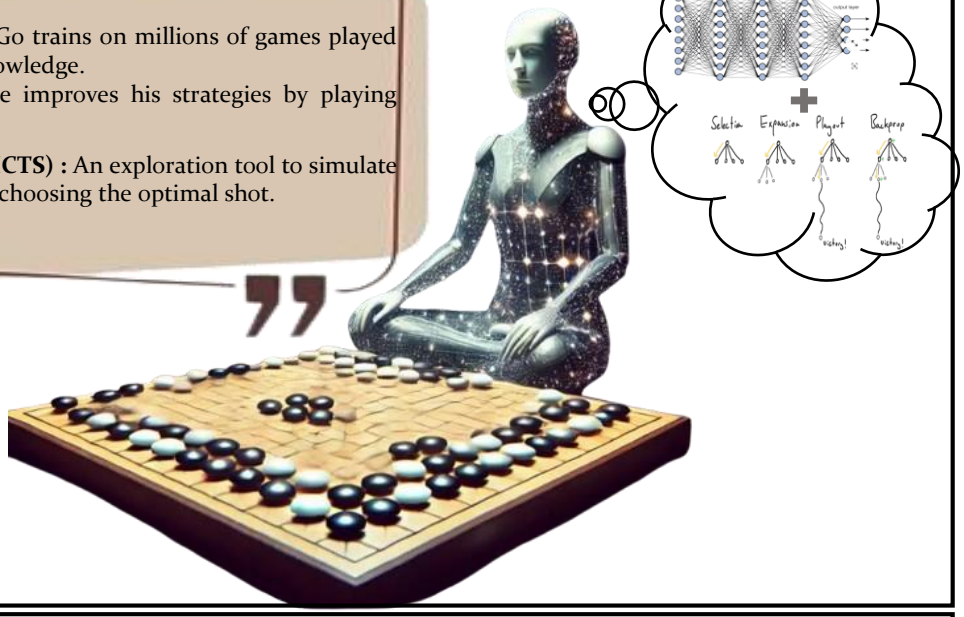


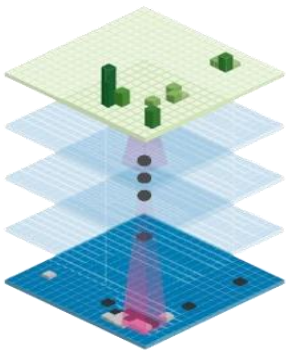
CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Google DeepMind's AlphaGo Research, 2016

H. KACIOUSSALEH, Z. BISKRI, MASTER 2 VISUAL COMPUTING, USTHB

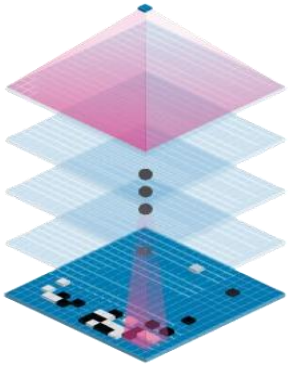
The priciples keys are:
Supervised Learning: AlphaGo trains on millions of games played by experts, absorbing their knowledge.
Reinforcement Learning: he improves his strategies by playing against himself.

Monte Carlo Tree Search (MCTS) : An exploration tool to simulate and evaluate future scenarios, choosing the optimal shot.





The Policy Network
it picks promising moves from millions of possibilities, like a sharp instinct.



The Value Network
He analyzes each position to assess the chances of victory, like a seasoned strategist.

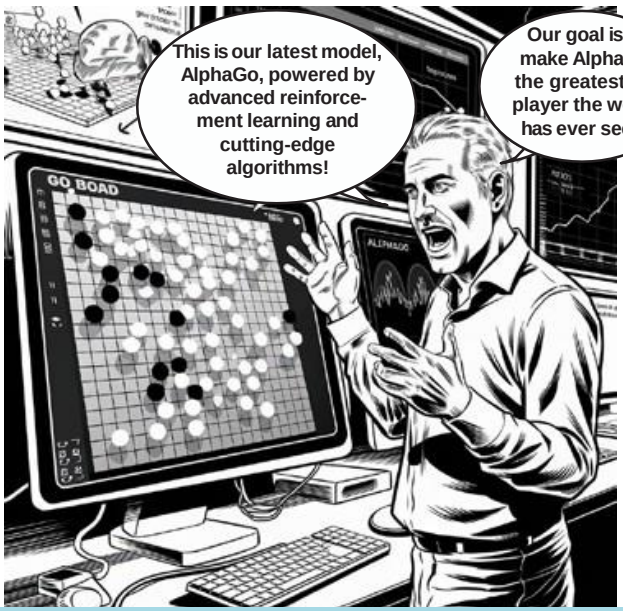
REFERENCE : David Silver et al. Mastering the game of Go with deep neural networks and tree search. Nature volume 529, pages484–489 (2016).

Visual Computing Magazine

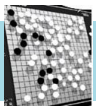
CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Google DeepMind's AlphaGo Research, 2016

R.Boussis, W.Fellah, Master 2 Visual Computing, USTHB

David Silver, a leading researcher at DeepMind, introduces the ambitious idea of creating AlphaGo—a model capable of mastering the ancient and highly complex game of Go. With a vision to push artificial intelligence beyond its traditional boundaries, he began collaborating closely with his team of researchers to tackle one of the most challenging games for machines to learn, laying the groundwork for a groundbreaking achievement in AI.



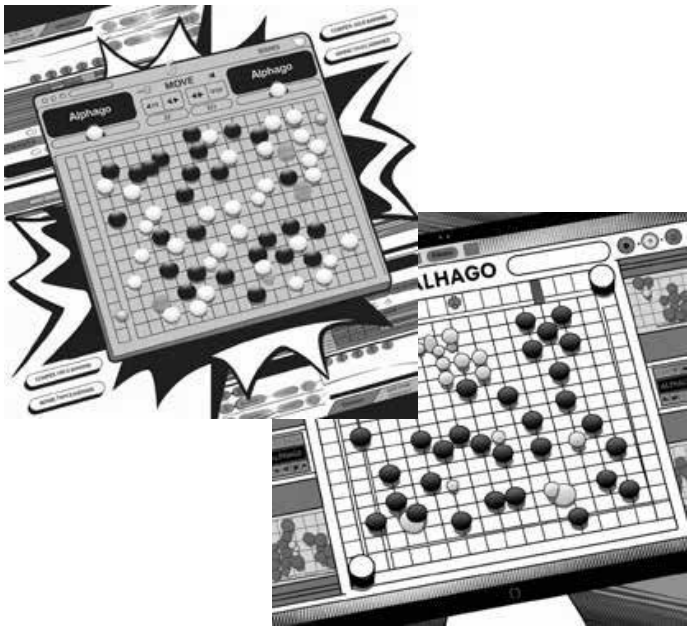
David Silver explains AlphaGo's architecture, which combines deep neural networks with Monte Carlo Tree Search (MCTS). The policy network predicts optimal moves, while the value network evaluates board positions to estimate the likelihood of winning. Through self-play reinforcement learning, AlphaGo improves by playing millions of games against itself, refining its strategies to master the complexity of Go.

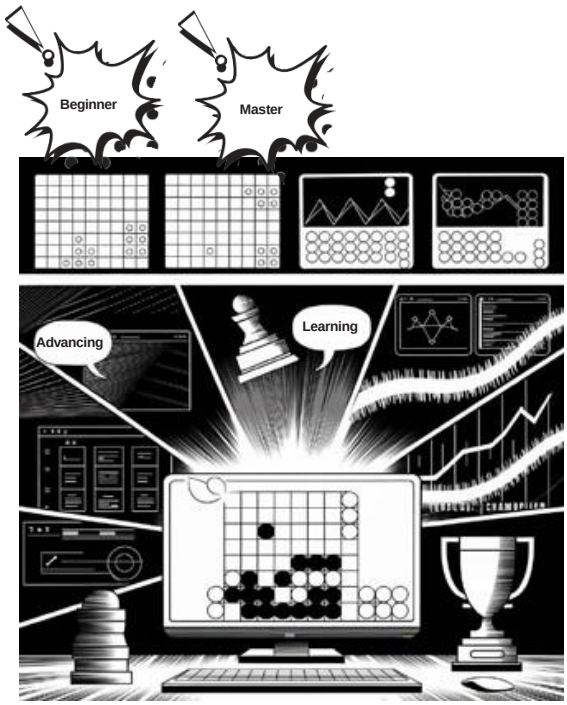


CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Google DeepMind's AlphaGo Research, 2016

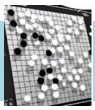
R.Boussis, W.Fellah, Master 2 Visual Computing, USTHB

AlphaGo begins to teach itself by playing millions of games against itself. This self-learning process allows the model to analyze positions, evaluate out- comes, and refine its strategies, demonstrating the power of reinforcement learning in AI development.





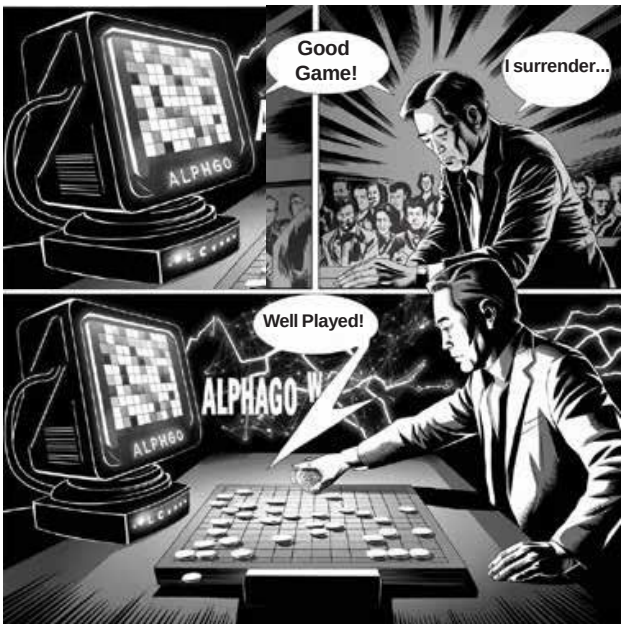
As AlphaGo progresses through countless self-play matches, it evolves from a beginner to a world-champion, mastering complex strategies along the way. Its autonomous learning, driven by reinforcement learn- ing and self-analysis, showcases the remarkable potential of AI to achieve human-level and beyond capabilities.

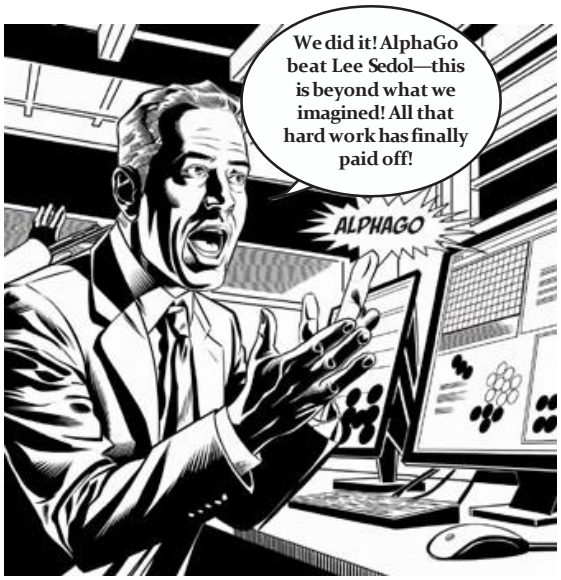


CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Google DeepMind's AlphaGo Research, 2016

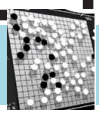
R.Boussis, W.Fellah, Master 2 Visual Computing, USTHB

After extensive training, AlphaGo was ready to take a monumental leap—facing Lee Sedol, the legendary South Korean Go master. The match was intense, with high stakes and brilliant moves on both sides. In the end, AlphaGo emerged victorious, claiming the title of world champion and setting a groundbreaking milestone in the evolution of AI models in the game of Go.





David Silver felt immense pride and fulfillment as he saw AlphaGo achieve his vision of mastering the complex game of Go. The model not only defeated human champions like Lee Sedol but also demonstrated superhuman performance, surpassing expectations. For Silver, this moment validated years of hard work and innovation alongside his team. It was proof that AI could rival and exceed human expertise, marking a significant milestone and paving the way for even greater advancements in artificial intelligence.



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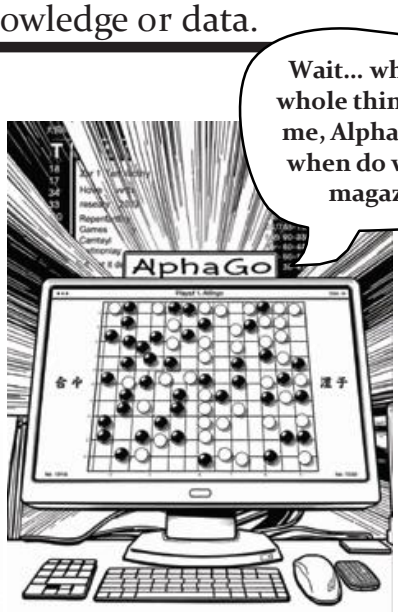
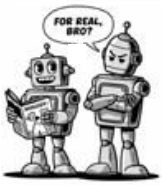
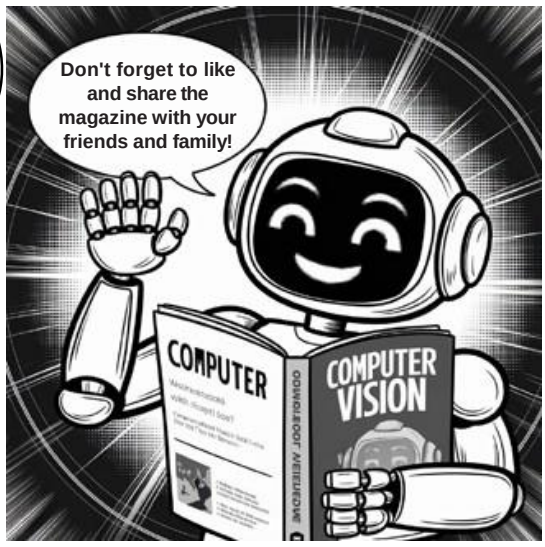
CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: Google DeepMind's AlphaGo Research, 2016

R.Boussis, W.Fellah, Master 2 Visual Computing, USTHB

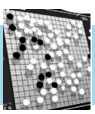
"Ladies and gentlemen, we did it!" With these words, David Silver and his team of researchers celebrated their success in creating an AI model that not only mastered the game of Go but surpassed human champions. The AlphaGo series continued to evolve, with the groundbreaking AlphaGo Zero pushing the boundaries even further, achieving superhuman performance without any prior human knowledge or data.







REFERENCE : David Silver et al. Mastering the game of Go with deep neural networks and tree search. Nature volume 529, pages484–489 (2016).



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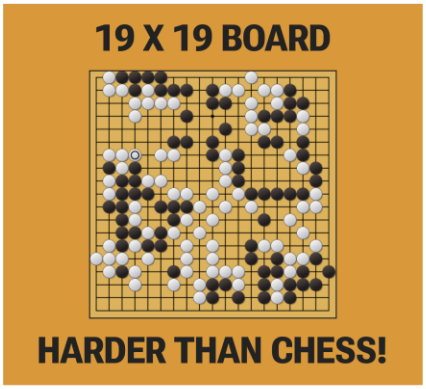
CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: ALPHAGO ZERO RESEARCH, 2017

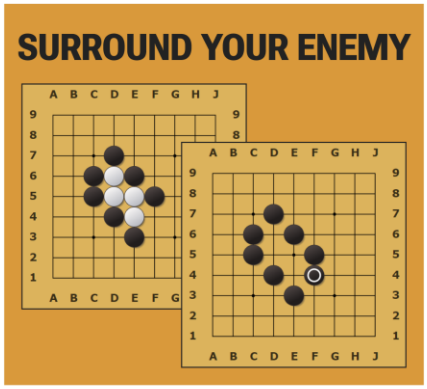
I. TIMSILINE, A. ABDENNOUZ, MASTER 2 VISUAL COMPUTING, USTHB

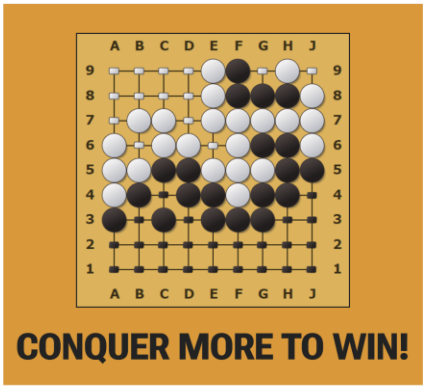
AlphaGo Zero Redefines Strategy: Outperforming Human Perception in Go!

AlphaGo Zero is an advanced AI developed by DeepMind that mastered the game of Go with reinforcement learning.

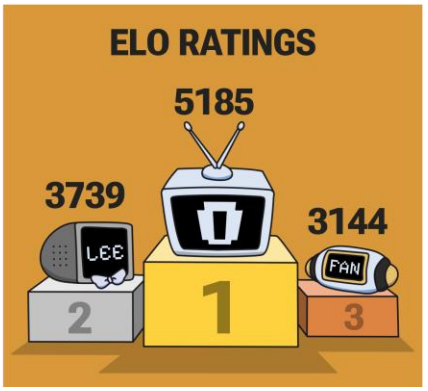
How to play Go?







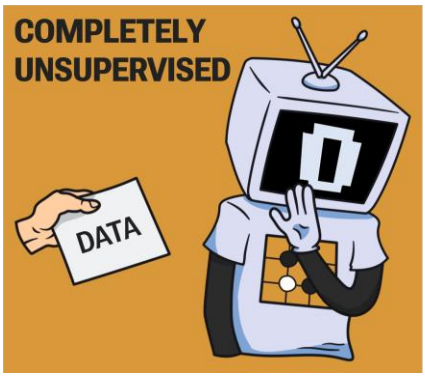
Previous AlphaGo Models

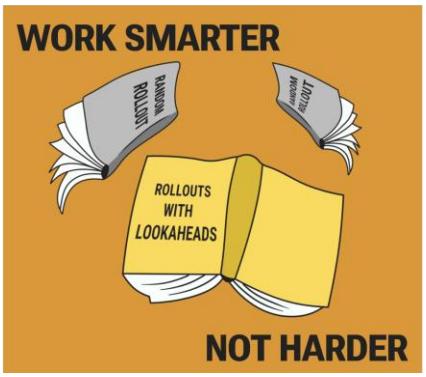


CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: ALPHAGO ZERO RESEARCH, 2017

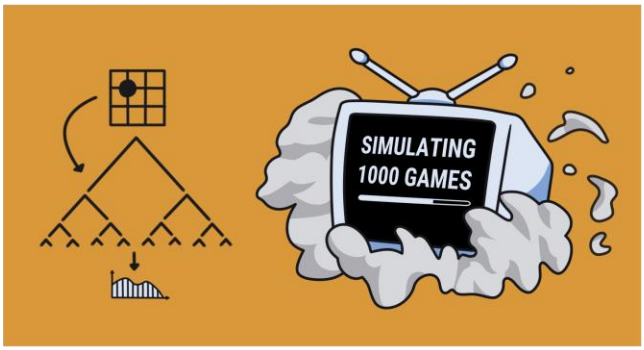
I. TIMSILINE, A. ABDENNOUZ, MASTER 2 VISUAL COMPUTING, USTHB

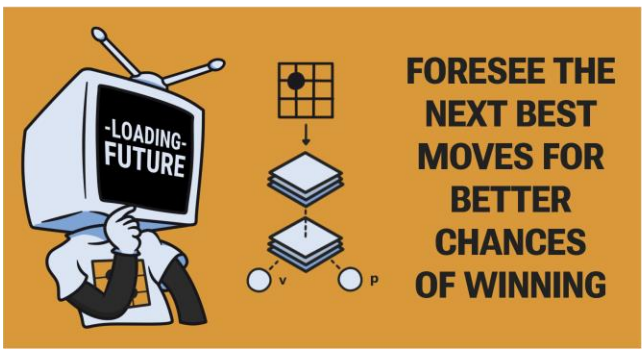
Properties



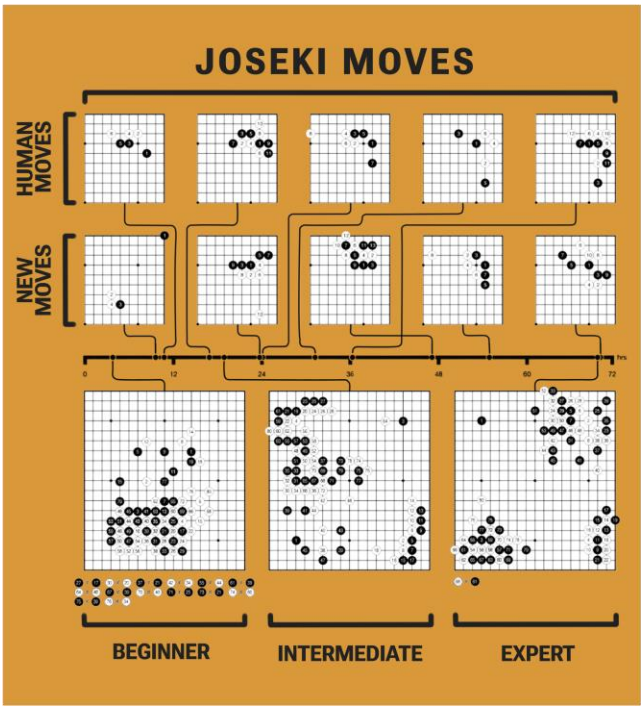


Architecture





Game Knowledge



Reference: David Silver et al. Mastering the game of Go without human knowledge. doi:10.1038/nature2427.

CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: OpenAI 5, 2019

W. KESBI, M. SAADI, MASTER 2 VISUAL COMPUTING, USTHB

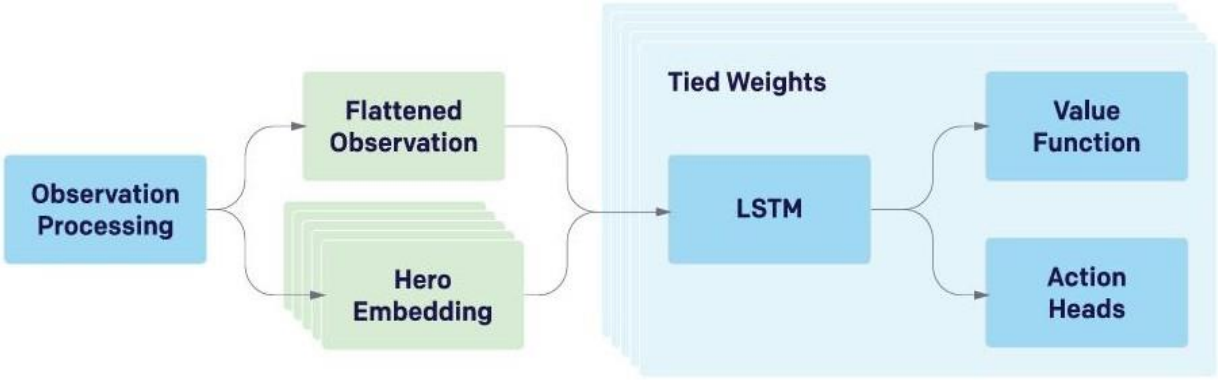
HISTORIC VICTORY

VALVE

OpenAI Five became the first AI to defeat Dota 2 world champions, beating the team OG in two consecutive games.

MASSIVE SCALE TRAINING

TRAINING TOOK AROUND 10 MONTHS, WITH POTENTIAL SETBACKS FROM BUGS OR MISSING DATA, REQUIRING MODEL ADJUSTMENTS AND RETRAINING.



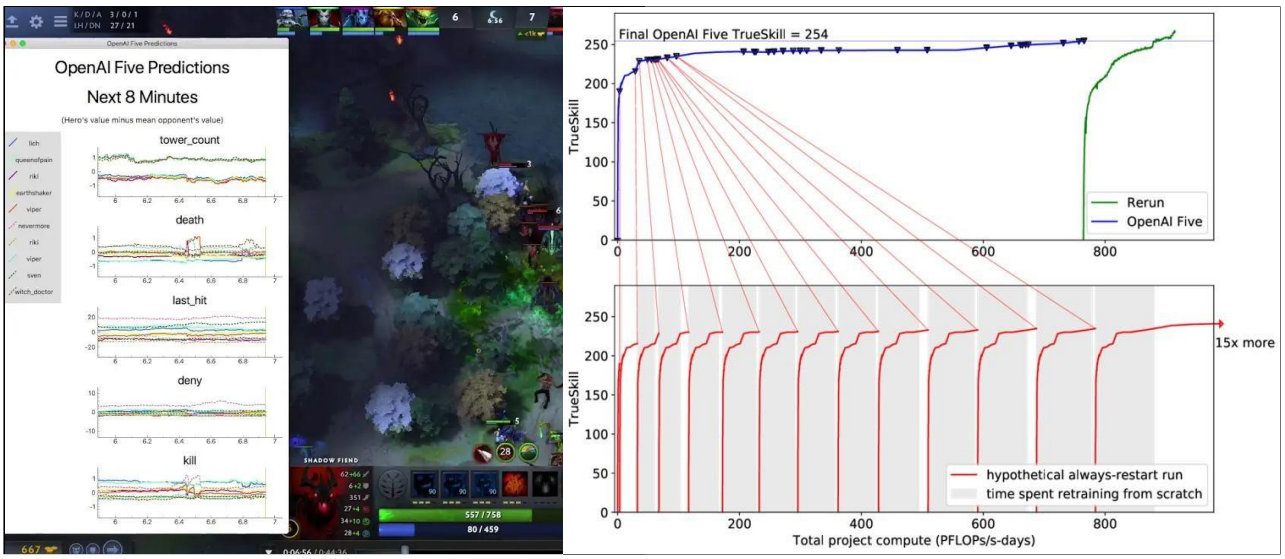
CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: OpenAI 5, 2019

W. KESBI, M. SAADI, MASTER 2 VISUAL COMPUTING, USTHB

This model processes game observations into flattened and embedded features, which are then analyzed by an LSTM. The LSTM output guides value assessment and action decisions.

SURGERY TECHNIQUE

THE TRAINING PROCESS OF OPEN AI 5 INVOLVES TRAINING THE NEURAL NETWORK OVER A PERIOD OF 10 MONTHS. HOWEVER, THE SURGERIES PERFORMED DURING THIS TIME ALLOW FOR CONTINUOUS IMPROVEMENTS WITHOUT INTERRUPTING THE TRAINING.



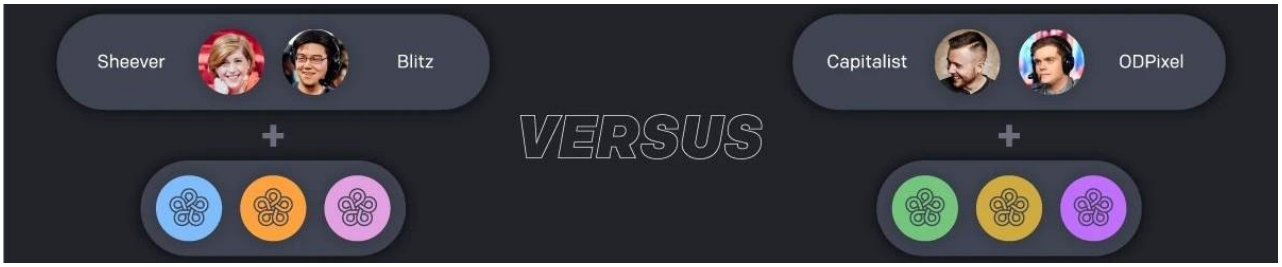
OpenAI 5 program, by design, selects an action every fourth frame which means, it observes the game's state, makes a decision, and executes the action around 7 times per second.

CHRONICLE OF ARTIFICIAL INTELLIGENCE EVENT: OpenAI 5, 2019

W. KESBI, M. SAADI, MASTER 2 VISUAL COMPUTING, USTHB

COOPERATIVE MODE

OPENAI FIVE'S ABILITY TO PLAY WITH HUMANS PRESENTS A COMPELLING VISION FOR THE FUTURE OF HUMAN-AI INTERACTION, ONE WHERE AI SYSTEMS COLLABORATE AND ENHANCE THE HUMAN EXPERIENCE.



OpenAI 5 program, by design, selects an action every fourth frame which means, it observes the game's state, makes a decision, and executes the action around 7 times per second.

DOTA 2

OpenAI

Reference: OpenAI, *, Dota 2 with Large Scale Deep Reinforcement Learning, Artificial Intelligence, 13 December 2019.

VALVE

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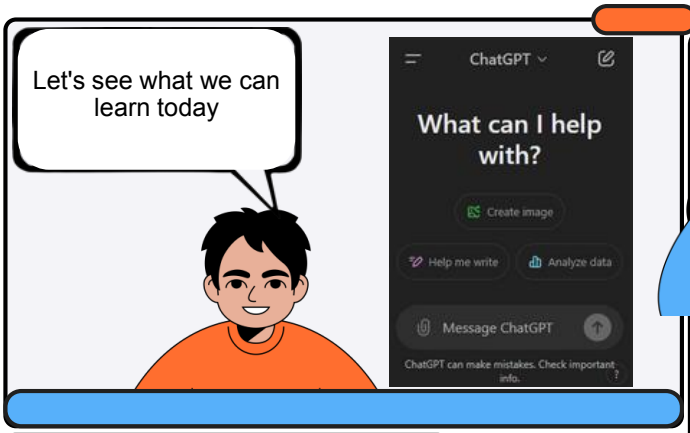
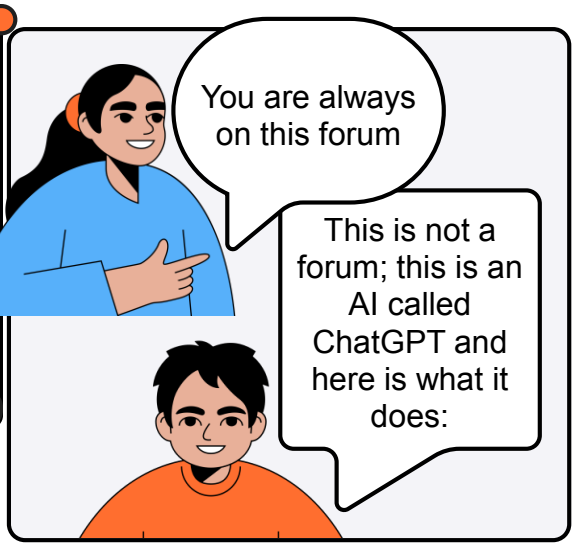
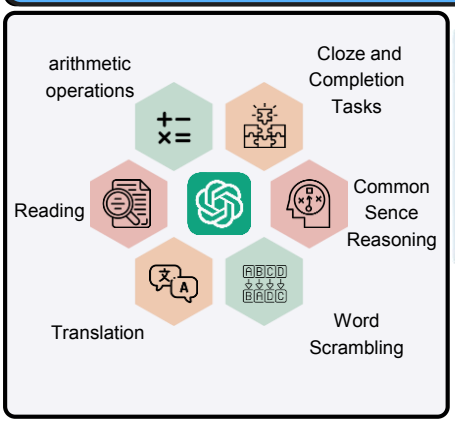
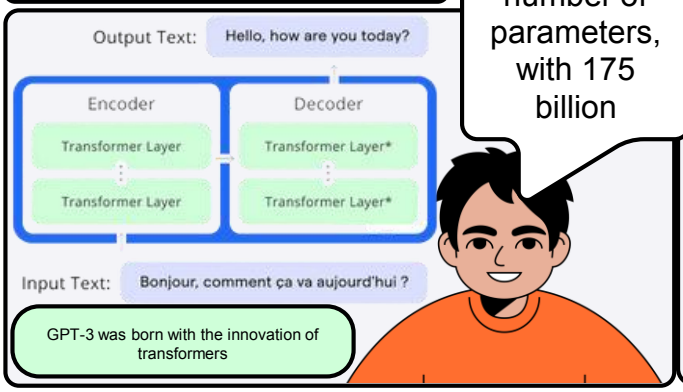
CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: GPT-3 Research OpenAI, 2020

A. BOUCENNA, A. OUHIB, Master 2 Visual Computing, USTHB









Model Name	Number of params	Number of layers	Learning Rate
GPT-3 Small	125M	12	6×10^{-4}
GPT-3 XL	1.3B	24	2×10^{-4}
GPT-3 13B	13B	40	1×10^{-4}
GPT-3	175B	96	0.6×10^{-4}

Reference :
2020 - GPT-3 Research by OpenAI
OpenAI releases GPT-3

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CHRONICLE OF ARTIFICIAL INTELLIGENCE
EVENT: GPT-3 Research OpenAI, 2020

A. BOUCENNA, A. OUHIB, Master 2 Visual Computing, USTHB

Reference: Tom B. Brown et al. Language Models are Few-Shot Learners. Cs.arXiv:2005.14165, 2020

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Content

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