

Artificial Intelligence and Machine Learning Applications

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Outline

- Introduction to Artificial Intelligence and Machine Learning
- Achievements of Contemporary Artificial Intelligence
- Limitations of Contemporary Artificial Intelligence
- AI Future

Introduction

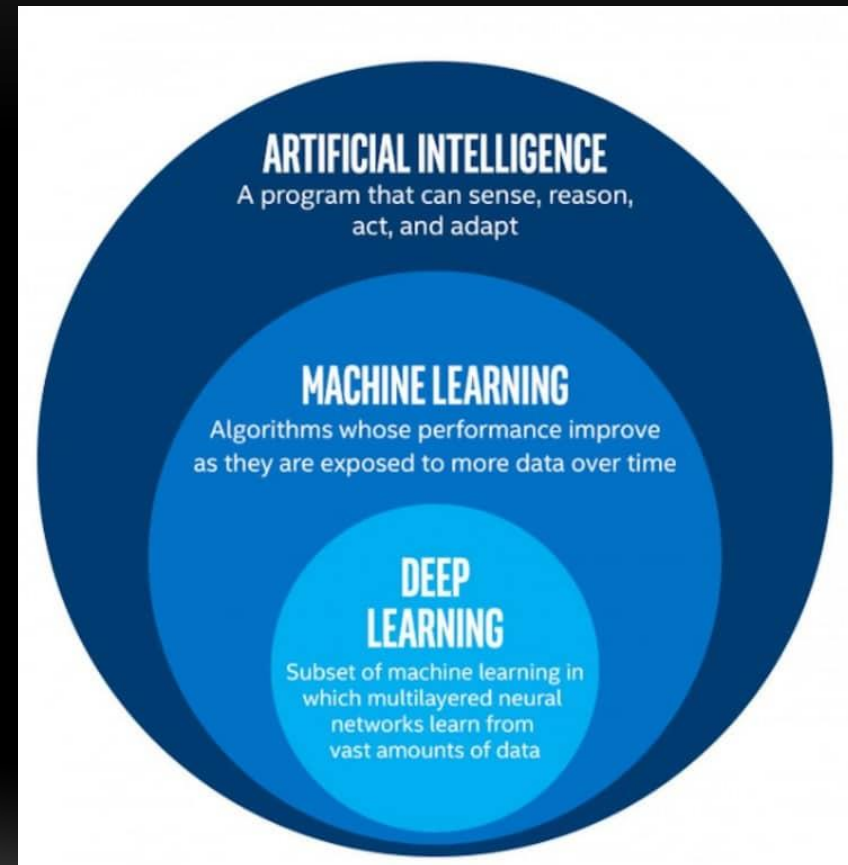
- **Intelligence** Ability to accomplish complex goals
- **Artificial Intelligence (AI)** Non-biological intelligence
- **Narrow Intelligence** Ability to accomplish a narrow set of goals, e.g., play chess or drive a car

Introduction

- **General Intelligence** Ability to accomplish virtually any goal, including learning
- Many large companies and researchers are currently investigating developing General AI
- **Artificial Super Intelligence (ASI)** General Intelligence far beyond human level

Introduction

- **Machine Learning (ML)**
Algorithms whose performance improve as they are exposed to more data
- **Deep Learning (DL)**
Subset of ML using multi-layer neural networks that learn from huge data



Introduction

- **Machine Learning Types**
 - 1. Supervised Learning**
 - 2. Unsupervised Learning**
 - 3. Reinforcement Learning**

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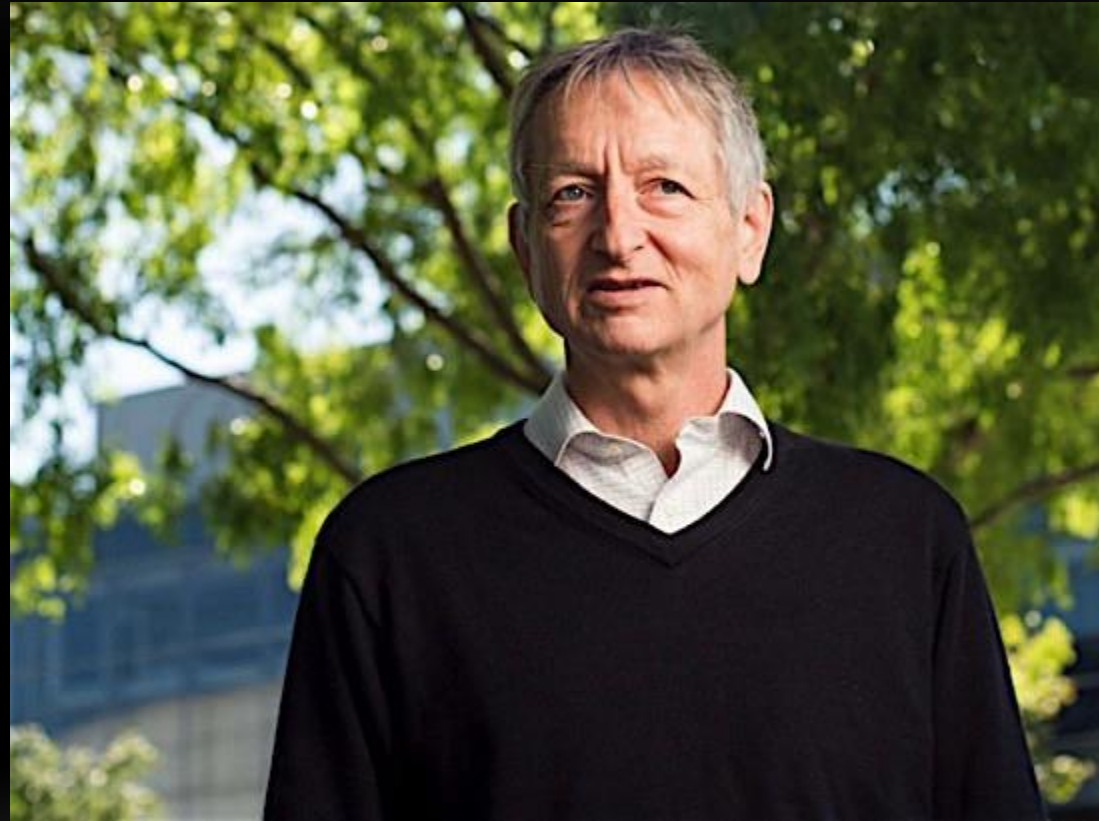
Achievements of Contemporary AI

- Important AI Milestones

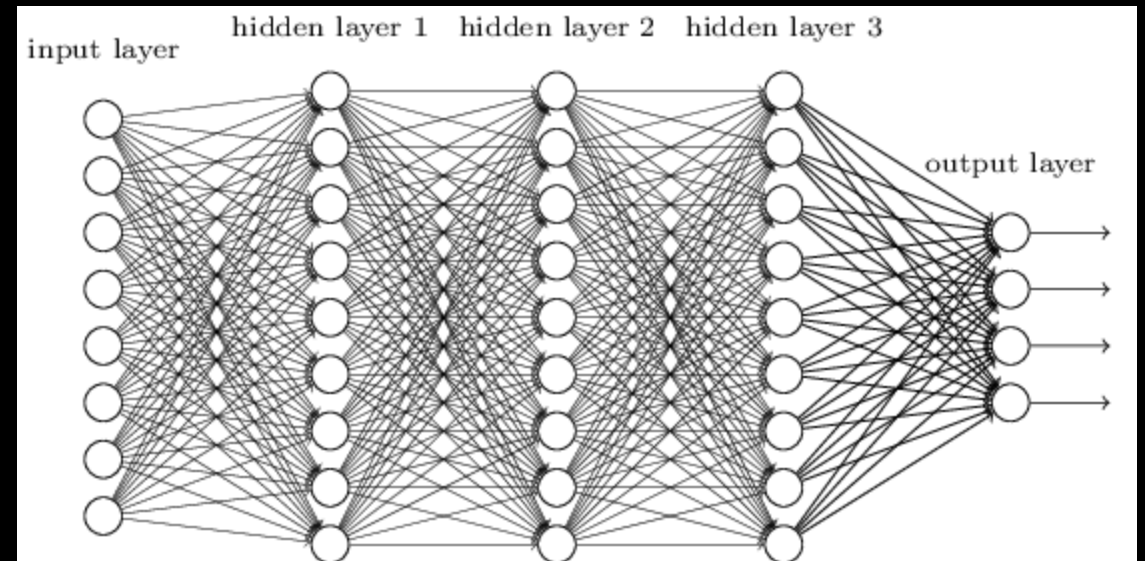
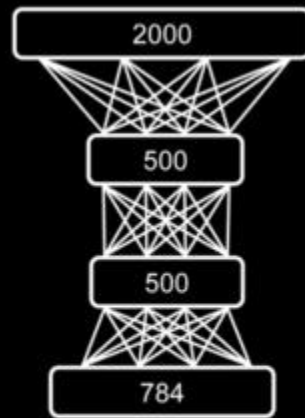
1997: IBM Deep Blue Beets Kasparov



2006: Hinton et al. Train a Deep Neural Network



2006: Hinton et al. Train a Deep Neural Network

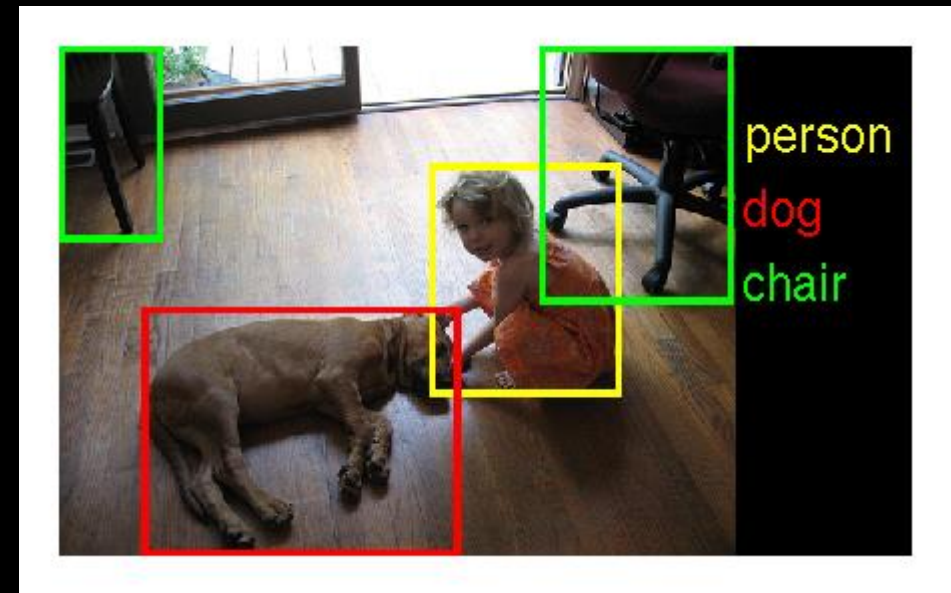


2011: IBM Watson Wins Jeopardy!

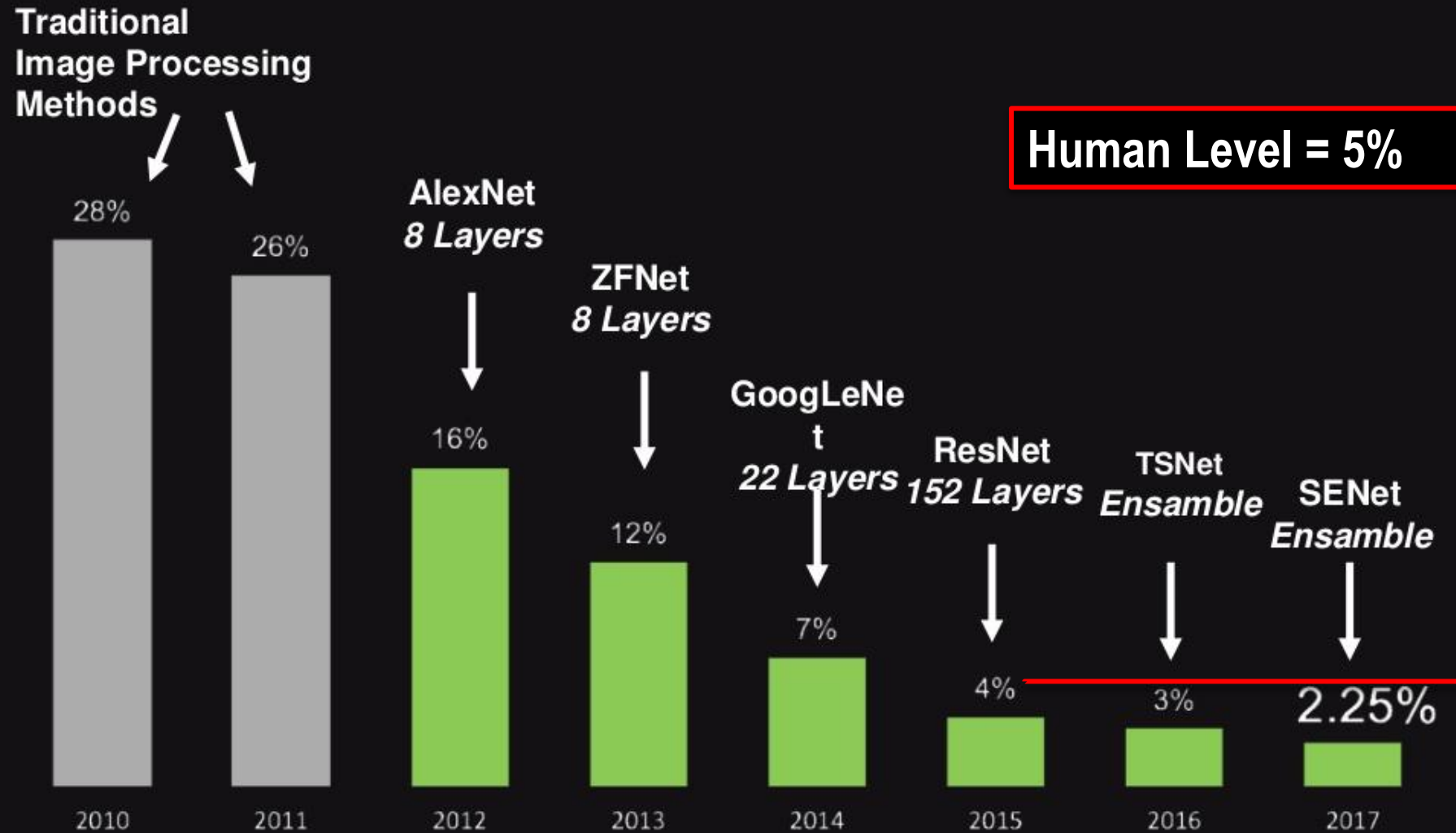


2015: DL Beats Humans in ImageNet

- Large scale visual recognition challenge
 - 1000 classes
 - 1.2 million images



ImageNet Top 5 Error Rate



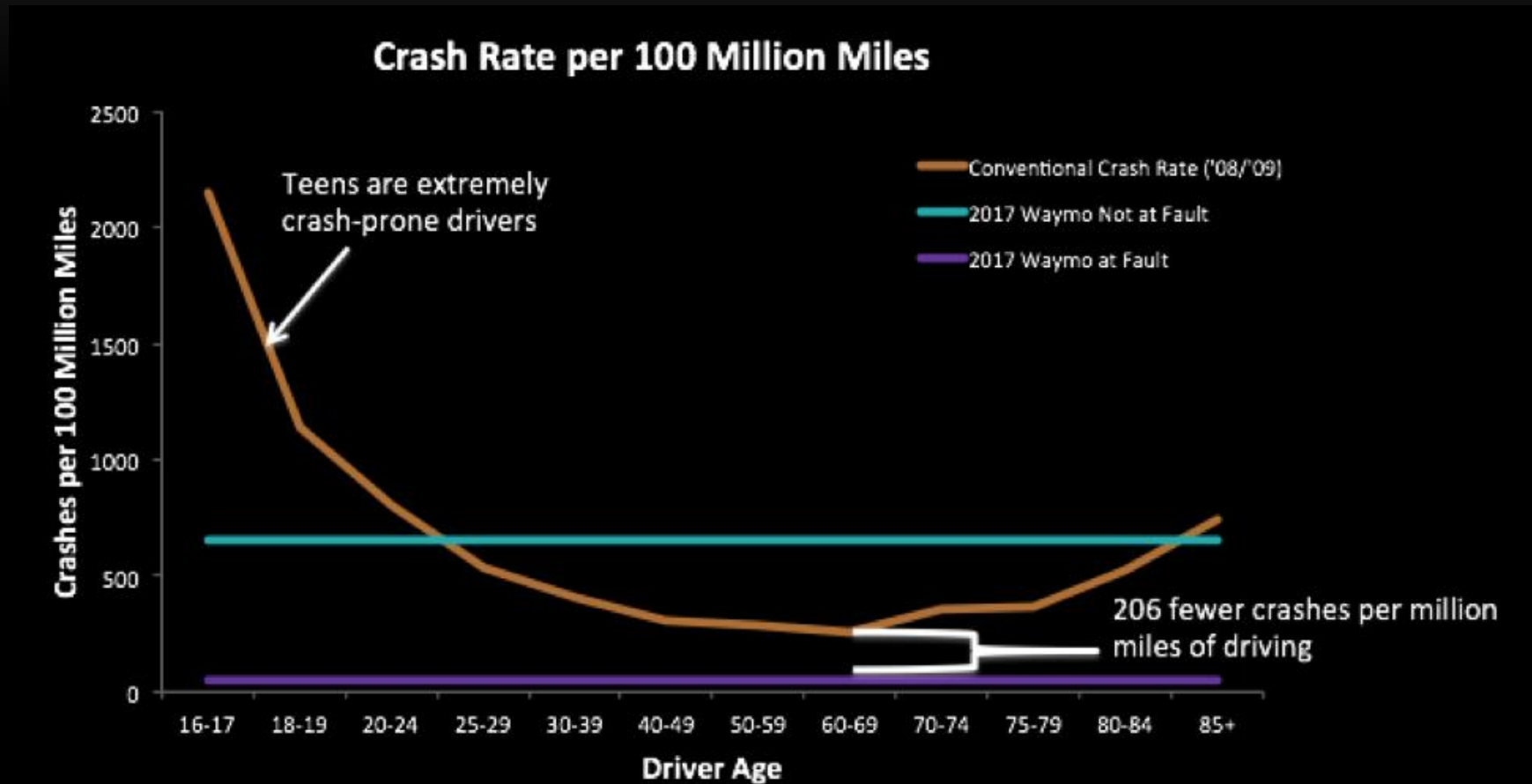
2016: DeepMind AlphaGo Beats Sedol



2017: Google Waymo Reaches Full Self-Driving Capability



Autonomous Vehicles are Saver

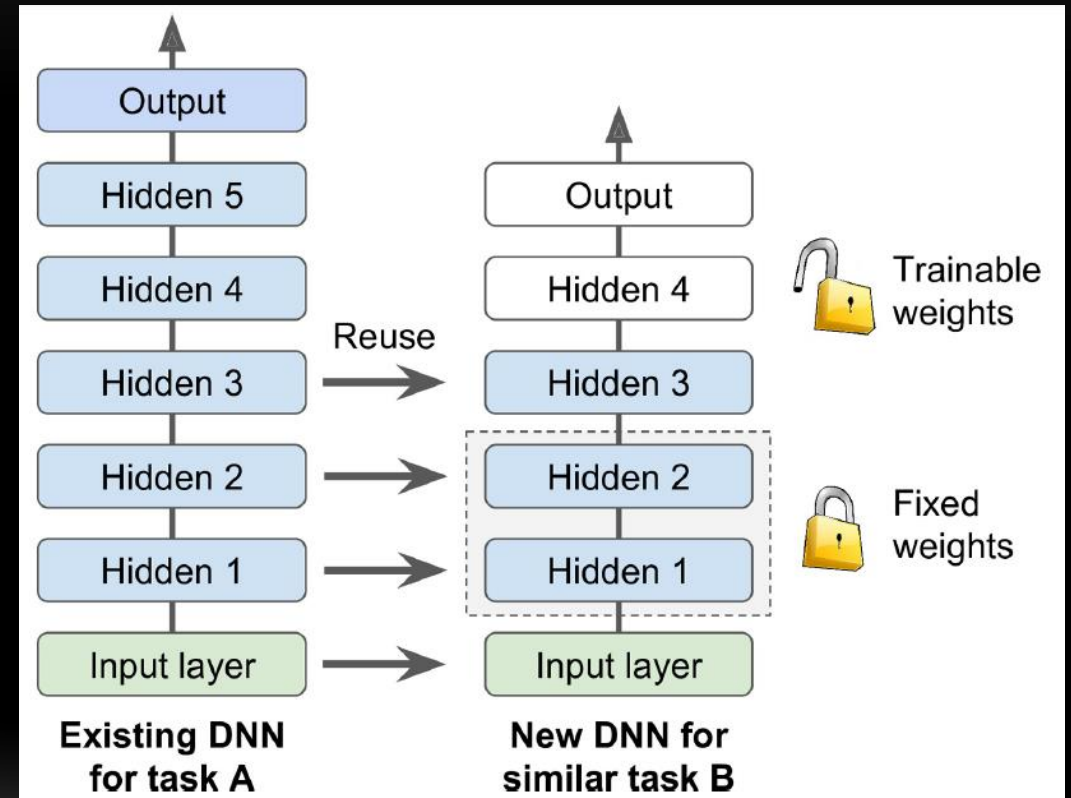


Achievements of Contemporary AI

- 1. Recognizes our voices and photos**
- 2. Recommends who to friend and what to watch and read**
- 3. Helps us in searching and retrieving information**
- 4. Translates natural languages**
- 5. Drives vehicles**
- 6. Secures our cities, systems and detects violations**

Achievements of Contemporary AI

7. Provides cheaper solutions with acceptable qualities
8. Provides trained models we can download and use
9. Allows transfer learning where a model trained for one task can be retrained to solve a different similar task



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Limitations of Contemporary AI

1. Contemporary AI is narrow AI
2. Deep learning requires huge datasets
3. Deep learning takes long training times
4. Deep learning needs powerful processors and computation accelerators

Nvidia GA100 GPU: 826 mm² chip, 54 billion transistors, 108 SM, 6,912 FP32 CUDA cores, 40 GB memory



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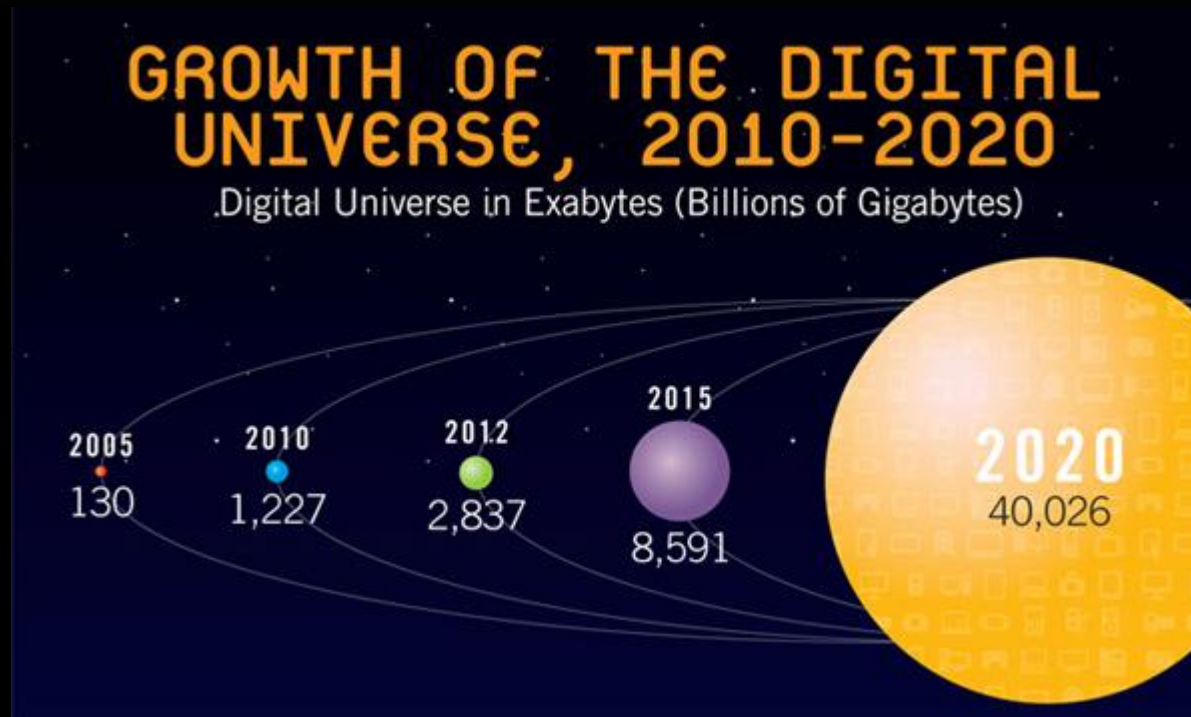
Why AI is Succeeding Now?

1. Data Availability
2. Improved ML Algorithms
3. Fast Processors

AI Will Continue to Succeed

1. More data will be available for machine learning

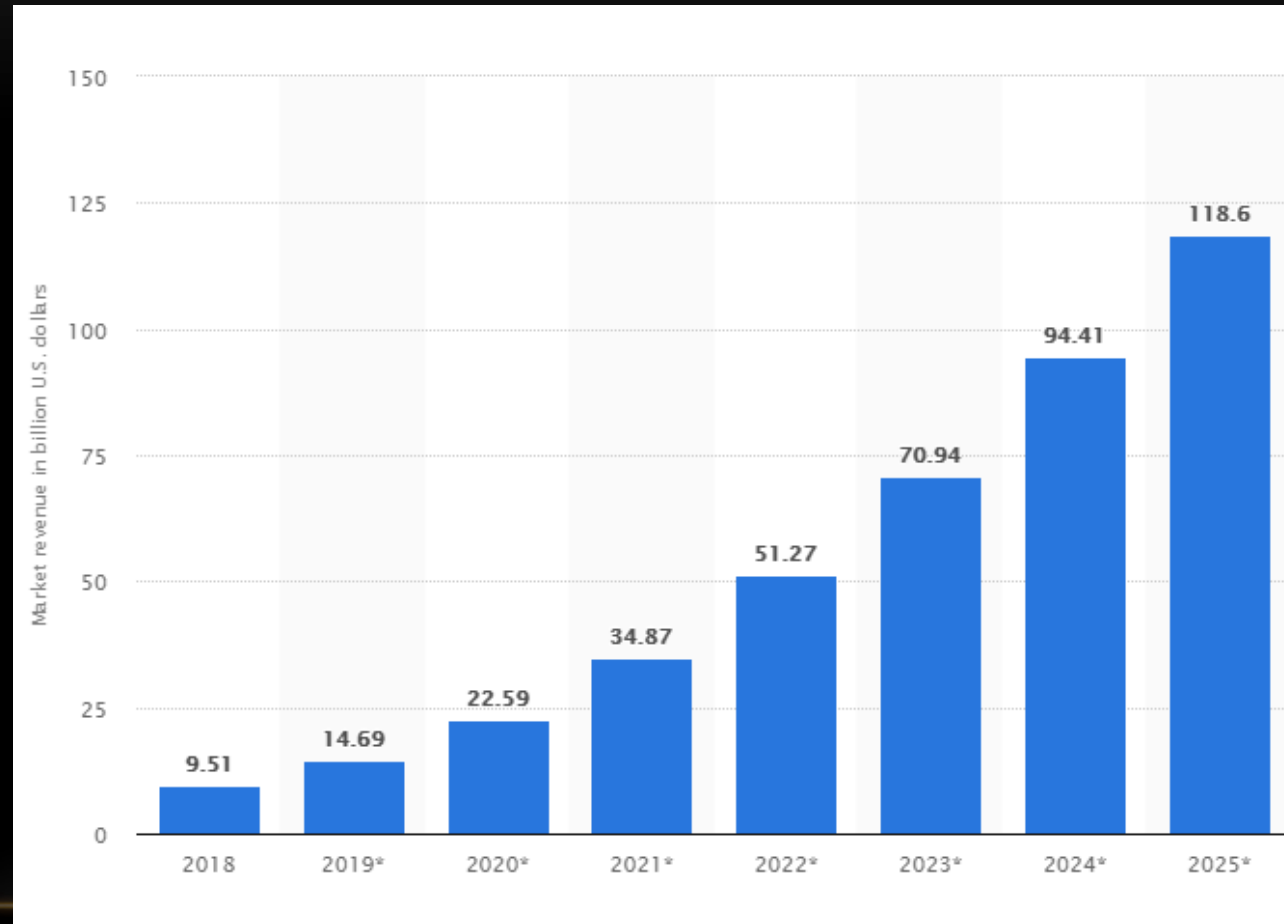
Digital Content Doubles Every Two Years



AI Will Continue to Succeed

1. More data will be available for machine learning
2. Better algorithms and AI applications will continue to develop

Global AI Software Market

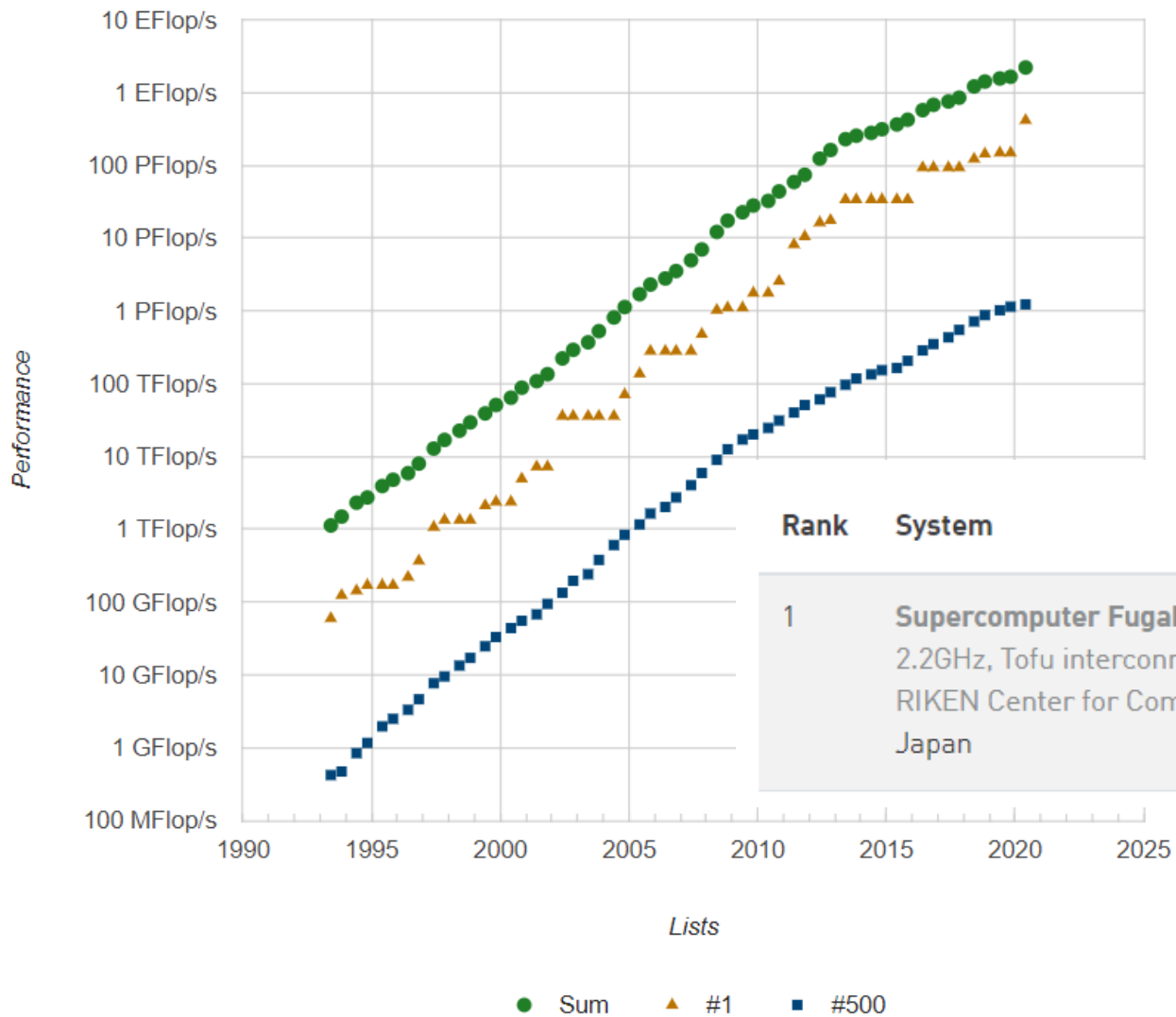


AI Will Continue to Succeed

- 1. More data will be available for machine learning**
- 2. Better algorithms and AI applications will continue to develop**
- 3. Computers will continue to get faster**

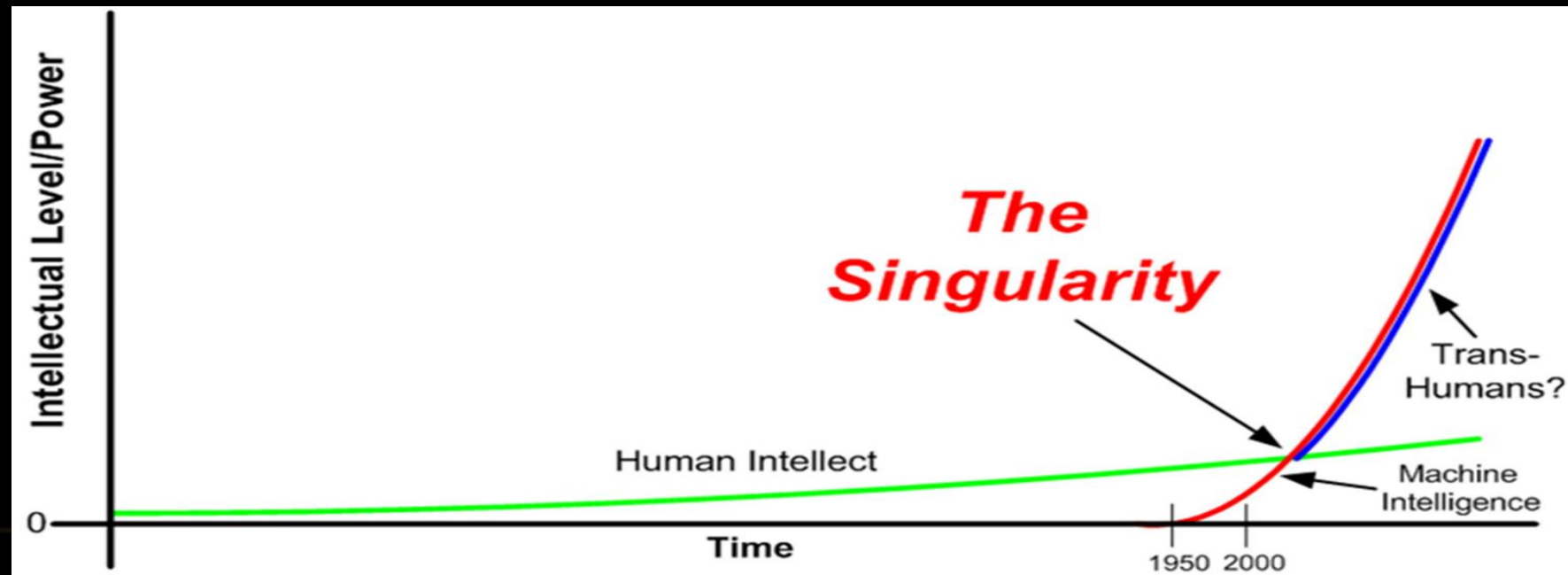
Perf. Improves 100x every 10 years

Performance Development



To where we are heading?

- Continued AI development will lead to Singularity



Summary

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Thank You

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