



The history and future of AI

A walk down memory lane and a fantasy about a time yet to come

Who is this guy?

- Dennis Vroegop (1970)
- Writes software since 1982
- Studied Business Informatics in Amsterdam 1989-1993
- Still writes software today...



Welcome the the amazing mind reader!

Think of a person, I will guess who you are thinking off!
Is it a man?
|

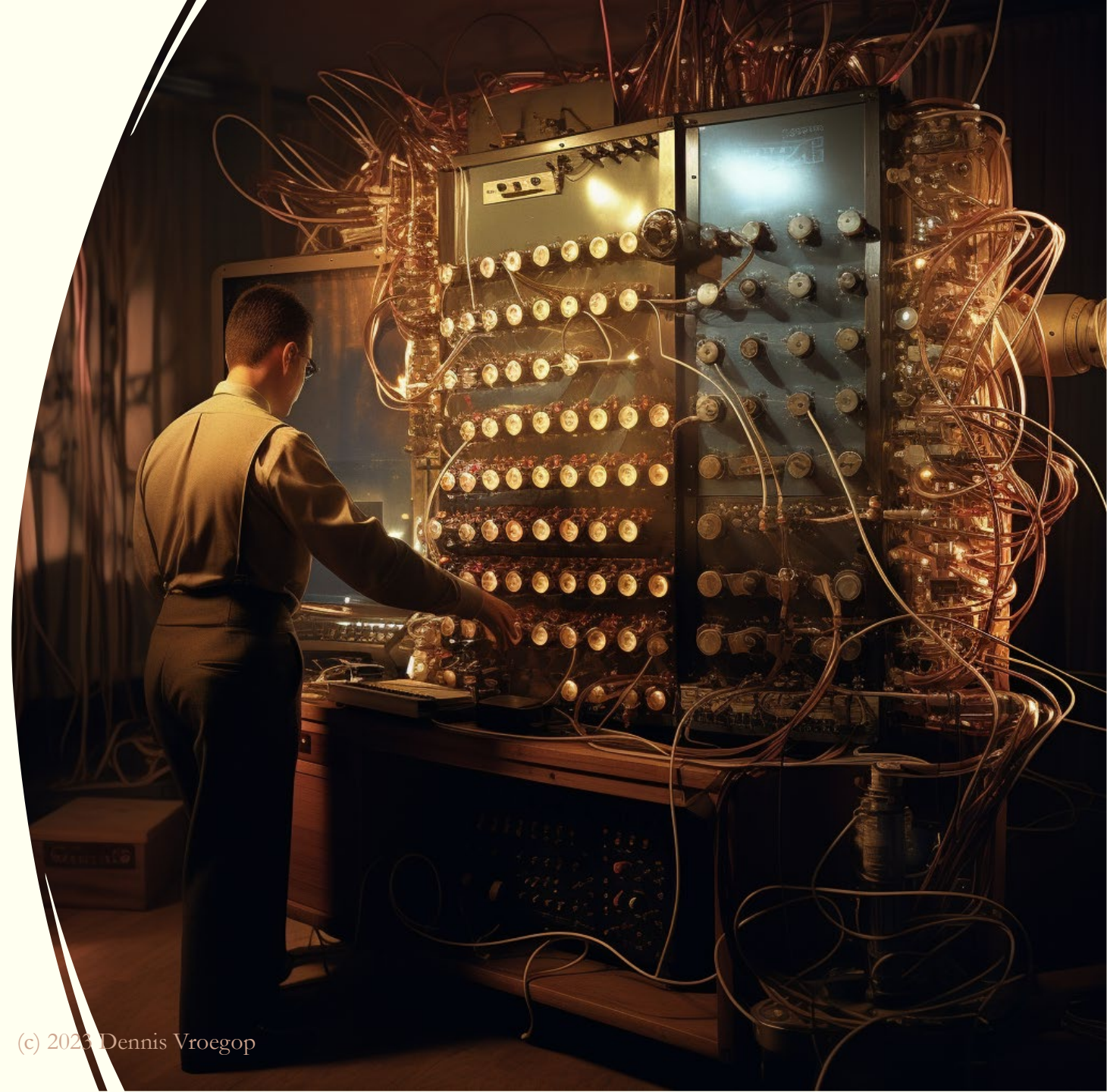


In the beginning...

... and the developers said: "Let there be AI!"

1950s-1960s - Early AI Programs:

- Logic Theorist was written.



1956 - Dartmouth Workshops

“Every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it.”



1957: The Perceptron (Frank Rosenblatt)

Let's build an AI system by hand...



The problem:

- We have coordinates (X,Y)
- Above or below a line?
- Don't calculate, reason!

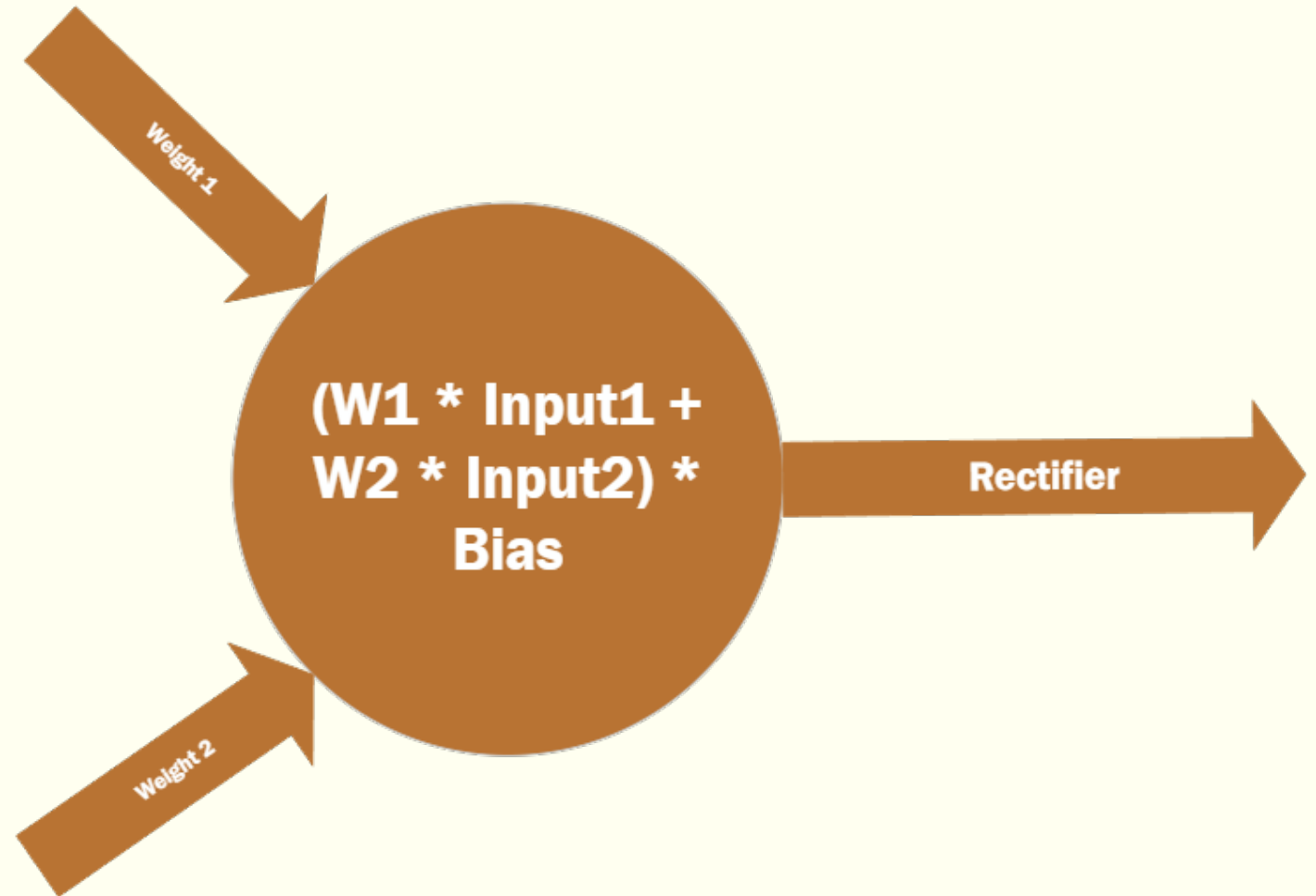


Training set

X	Y	Position (0=below, 1=on or above)
0.1	0.2	1
0.4	0.6	1
0.7	0.3	0
0.3	0.7	1
0.6	0.1	0
0.9	0.8	0
0.2	0.4	1
0.8	0.5	0



The perceptron:



Weights and Bias

- Weight X: 1
- Weight Y: 2
- Bias: 3



Results

X	Y	Position	Weighted Sum	Activated	Correct?
0.1	0.2	1	3.5	1	0
0.4	0.6	1	4.6	1	0
0.7	0.3	0	4.3	1	1
0.3	0.7	1	4.7	1	0
0.6	0.1	0	3.8	1	1
0.9	0.8	0	5.5	1	1
0.2	0.4	1	4.0	1	0
0.8	0.5	0	4.8	1	1



Adjusted Weights and Bias

- Weight X: -5.60181
- Weight Y: 5.26007
- Bias: -0.34797



Adjusted results

X	Y	Position	Weighted Sum	Activated	Correct?
0.1	0.2	1	0.145049	1	0
0.4	0.6	1	0.570909	1	0
0.7	0.3	0	-2.68944	0	0
0.3	0.7	1	1.657691	1	0
0.6	0.1	0	-3.18246	0	0
0.9	0.8	0	-1.17679	0	0
0.2	0.4	1	0.63807	1	0
0.8	0.5	0	-2.19642	0	0



Predictions...

X	Y	Weighted sum	Position (0=below, 1=on or above)
0.5	0.3	-1.56907	0
0.5	0.6	0.01073	1
0.5	0.51	-0.46321	0



1965 - ELIZA:

Joseph Weizenbaum, MIT



1969 - DENDRAL

Inferring possible molecular structures.

First real-world usage of AI





1970s - AI Winter:

No results, no funding...

A close-up, low-angle shot of a golden, mechanical robot head. The robot has two large, circular, glowing eyes that emit a warm, orange light. The head is highly detailed with various mechanical components, including a small rectangular panel on the forehead and a circular vent on the side. The robot is holding an open book with both hands, and the pages are visible. The background is a soft, out-of-focus bokeh of warm, golden light, suggesting an indoor setting with many small lights. The overall mood is nostalgic and intellectual.

1980s - Expert Systems

Bring back Dendral!

1986 - Backpropagation

Rumelhart, Hinton, and Williams introduced backpropagation for training multi-layer neural networks, laying the groundwork for modern deep learning.



1990s - Machine Learning:

This decade saw the rise of machine learning, with algorithms like decision trees, support vector machines, and boosting becoming popular.

1997 - Deep Blue Defeats Kasparov

IBM's chess-playing computer, Deep Blue, defeated world chess champion Garry Kasparov.

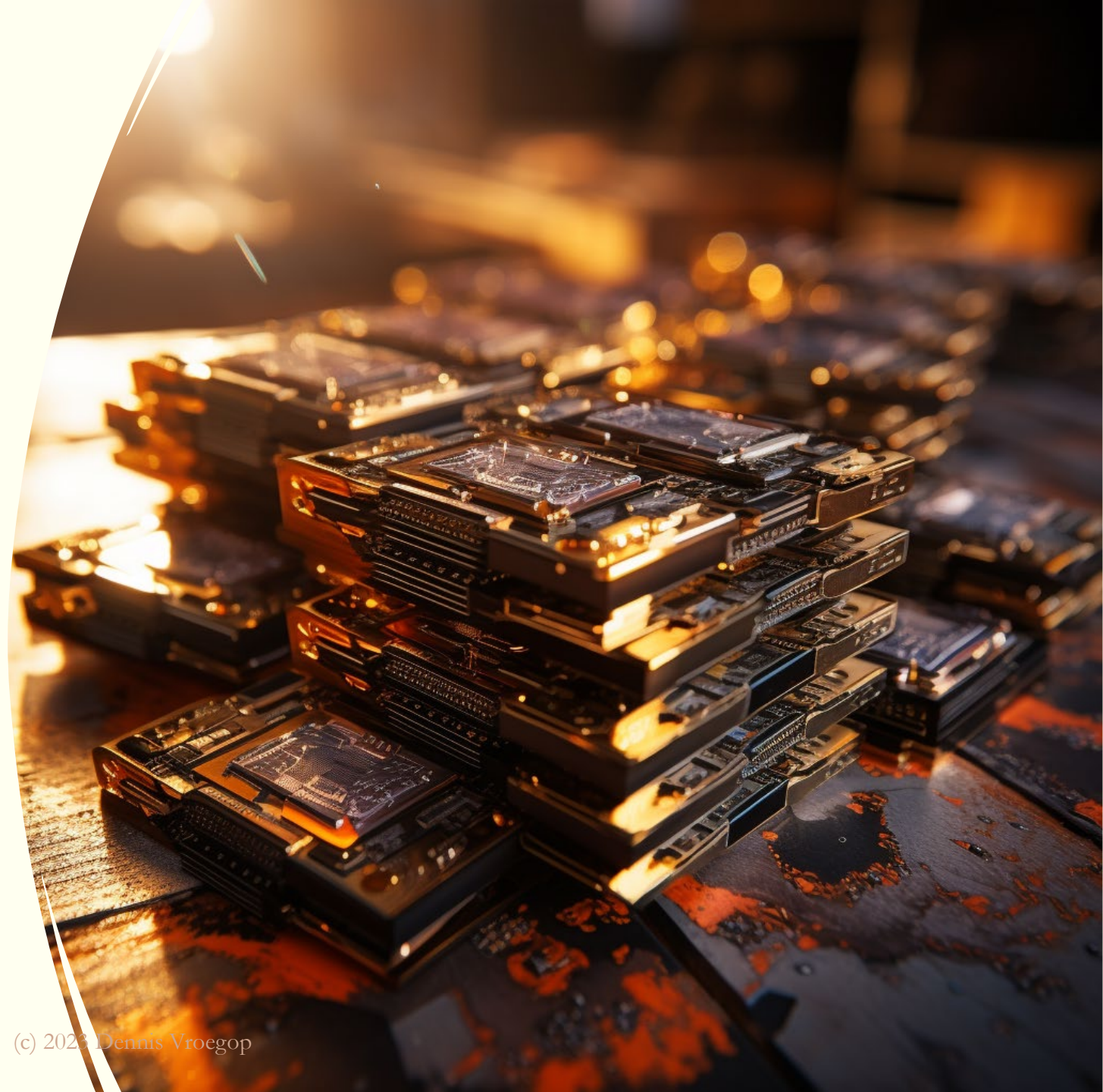


2000's:
Another
Winter



2010s - Deep Learning Renaissance:

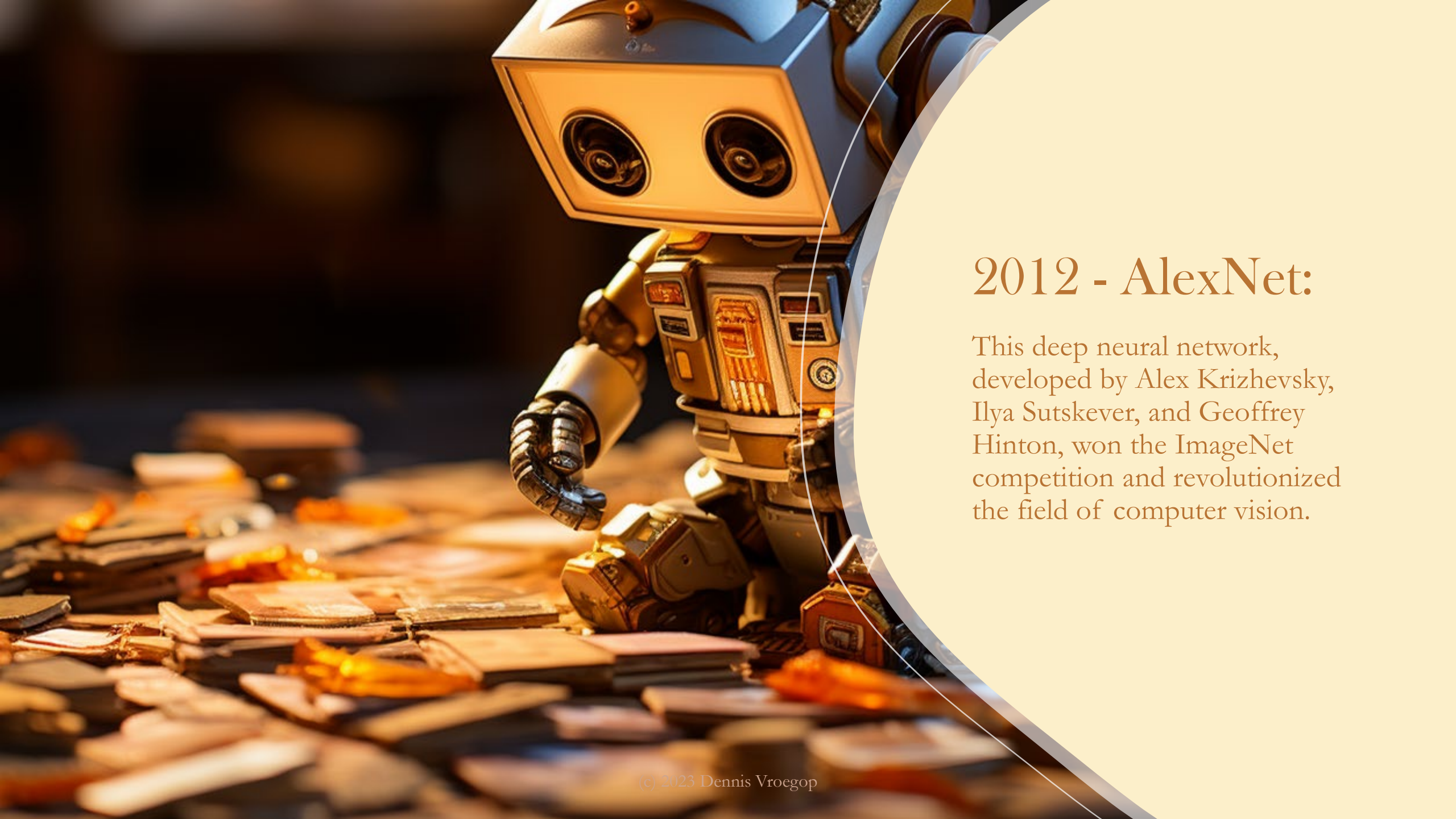
Due to the availability of large datasets and powerful GPUs, deep learning techniques started showing state-of-the-art results in various domains like image and speech recognition.



2011 - Watson Wins Jeopardy!

IBM's Watson, a question-answering system, defeated two of the best human Jeopardy! players.





2012 - AlexNet:

This deep neural network, developed by Alex Krizhevsky, Ilya Sutskever, and Geoffrey Hinton, won the ImageNet competition and revolutionized the field of computer vision.



2015 - AlphaGo

Developed by DeepMind, AlphaGo defeated the world champion Go player Lee Sedol in 2016. Go was considered a challenging game for AI due to its complexity.

2017: “Attention is all you need!”

(Vaswani et al, Google)

- Self-attention mechanism
- Multi-head attention
- Positional encoding
- Feed-forward neural networks
- Layer Normalization
- Encoder / Decoder structure
- Parameter sharing
- Scalable



2020s - GPT & Transformers

OpenAI's GPT (Generative Pre-trained Transformer) models and other transformer-based architectures have shown remarkable capabilities in natural language processing and understanding.



2022 - 2023: Turing Tests

- Google LaMDA
- ChatGPT 4
- “Eugene Goostman”



ChatGPT: Some numbers...

- Number of Parameters for GPT-4: around 220 billion
(GPT3 had 175 billion)
- Costs of training the set: > \$12.000.000 per run
- Trained on 45 terabytes of text
- Since released, answered over 1 billion questions
- Backed by Microsoft for over \$10.000.000.000
- Hit 1 million users in the first 5 days....





The future!

What's next?

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Energy

Finally solve the fusion problem?

A photograph of a hospital room during the golden hour. A hospital bed with white linens is the central focus. To the left, a medical monitor is on a stand. In the background, a desk with a computer monitor and a chair is visible. Large windows let in warm sunlight, and a vase of orange flowers sits on a table to the left.

Medications & drugs

Invent new drugs and ways to treat diseases?



Education

Per person tailor-made education?



Construction

Make cities livable again?



Entertainment

The sky is the limit...



Crime...

Cyberthreats, attacks, frauds...

Ethics...

- Bias and fairness
- Transparency and explainability
- Privacy and data rights
- Accountability and responsibility
- Environmental impact



Who do we need?

- AI Developers
- Data Scientists
- Cyber Security
- Network Engineers
- Hardware Specialists
- Software Engineers
- Business and Management, with knowledge of IT



The future is yours! *(quite literally)*

- Thanks for listening to me!
- For questions:
dennis@vroegop.org
- Have a great day!

