Resumen control 1 IA

- May 2014 Google effort in machine learning.
- Google founders motivated to create artificial intelligence in computers -> nowadays a major focus.
- AI Singularity: time in the near future when computers will become smarter than humans.
- 2011: created AI research group called Google Brain. Since then they have purchased AI startup companies: Applied semantics, DeepMind, Vision factory.
- Google is becoming an applied AI company -> solve intelligence and use it to solve everything else.

AI and GEB
- GEB: Gödel Escher Bach: and Eternal Golden Braid.
  - To address the deep questions of how intelligence, consciousness and the sense of self-awareness can emerge from the non-intelligent, nonconcious substrate of biological cells.
  - How intelligence and self awareness might be attained by computers.

Chess and the first seed of Doubt
- Hofstadter was terrified of AI at google. AI was possible but the enemy were the skeptical who were saying it was impossible. They didn't understand that a brain is a hunk of matter that obeys physical law and the computer can simulate anything.
- He thought that human-level AI had no chance of occurring in his lifetime. He was dead wrong. Rapid improvement from 80's and 90's (specifically chess) due to the steep increase in computer speed. Chess mastery seen as human intelligence had succumbed to a brute force approach.

Music: The bastion of humanity
- Hofstadter said that music was a language of emotions so there's no way a computer can write something beautiful. But then 1990's was created EMI, created pieces in the style of classical composers, by following a large set of rules meant to capture a general syntax of composition.

Google and the singularity
- Google wanted self-driving cars, speech recognition, natural-language understanding, translation between languages, computer generated art, music composition and more.
- The worries were that the singularity (empowered by its ability to improve itself and learned on its own) will reach and exceed human-level intelligence.
- He didn't wanted that people rushed to create this thing.

Why is Hofstadter terrified?
- terrified that intelligence, creativity and consciousness itself would be too easy to produce (what he valued more in humanity would end up being a bag of tricks that a superficial set of brute force algorithms you.d explain the human spirit)
- Feared that AI might show us that the human qualities we most value are disappointingly simple to mechanize

I am confused
- underestimating the power and promise of current day AI
- We should start worrying about superhuman AI.
- The development of full artificial intelligence could spell the end of the human race. AI is our biggest existencial threat and with it we are summoning the demon.

What this book is about
- Understanding the true state of affairs in AI: what computers can do now and what we can expect from them over the next decades.
- Sort out how dar AI has come and elucidate its goals.
- Answer question of what we mean by general human or superhuman intelligence.
- What are the dangers, and how can AI challenge how we think about our humanness.

1. The roots of artificial intelligence
Two months and ten men at Dartmouth
- Digital computers are symbol manipularos pushing around combinations of the symbols 0 and 1. They saw strong analogies between computers and the human brain (it was obvious to them that it could be replicated).
- Founding of AI 1956 Dartmouth college workshop (McCarthy)

Definitions and getting on with it
- Building a fully intelligent machine was the goal, would it require us to reverse engineer the human brain? Or is there a shortcut (algorithms)?
- What does fully intelligent mean?
- Most people would say that humans are intelligent and dust is not. We say that humans are more intelligent than worms. There are different dimensions of intelligence.
- Intelligence can be binary (is or not), on a continuum (> intelligent) or multidimensional (high verbal but low emotional).
- Intelligence is an overpacked suitcase zipper on the verge of breaking.
- AI has ignored this focusing on science and practicality.
  - Science: investigation mechanisms of natural (biological) intelligence by trying to embed it in computers.
  - Practical: create computer programs that perform tasks as well or better than humans without worrying about if this programs are actually thinking in the way humans do.
- Current state of AI: branch of computer science that studies the properties of intelligence by synthesizing intelligence

An anarchy of methods
- Because we don't deeply understand intelligence or know how to produce general AI, rather than cutting off any avenues of exploration, to truly make progress we should embrace AI's anarchy of methods.
- Deep learning has risen above the anarchy to become the dominant AI paradigm.
  - AI: field that includes a broad set of approaches with the goal of creating machines with intelligence
  - DL: is only one such approach. One method among many in the field of machine learning, a subfield of AI in which machines learn from data or from their own experiences.

Symbolic AI
- Words or phrases (symbols) understandable to a human along with rules by which the program can combine and process these symbols in order to perform its assigned task.
- Ex: GPS (general problem solver) could solve puzzles by recording students thinking out loud solving the problem to mimic what they believed were the stunts thought processes.

CURRENT STATE:
LEFT-BANK = [3 MISSIONARIES, 3 CANNIBALS, 1 BOAT]
RIGHT-BANK = [EMPTY]

DESIRED STATE:
LEFT-BANK = [EMPTY]
RIGHT-BANK = [3 MISSIONARIES, 3 CANNIBALS, 1 BOAT]

- At each step it tries to make it more similar to the desired state. The programs has operators that can transforma the current into a new and rules that encode the constraints of the task. To the computer the meaning of the symbols derives from the ways in which they can be combined, related to one another and operated on.
- This approach of AI believes that to attain intelligence it would not be necessary to build programs that mimic the brain, general intelligence can be captured by the right kind of symbol-processing program.

Subsymbolic AI: Perceptrons
- Took inspiration from neuroscience and sought capture the unconscious thought processes underlying fast perception (recognizing faces and identifying spoken words).
- Do not contain human-understandable language, it is a stack of equations. Learn from data how to perform a task.
- Ex: the perceptron (1950, Frank Rosenblatt). Influential great grand parent of modern AI's most successful tool, deep neural networks. Inspired by the way in which neurons process information.
- Sums up the inputs it receives from other neurons and if the total sum reaches a threshold level the neuron fires. Adjustment to the strength of connections between neurons is a key part of how learning takes place in the brain.
- Information processing in neurons can be simulated by a computer program (a perceptron) that has multiple numerical inputs and on output.

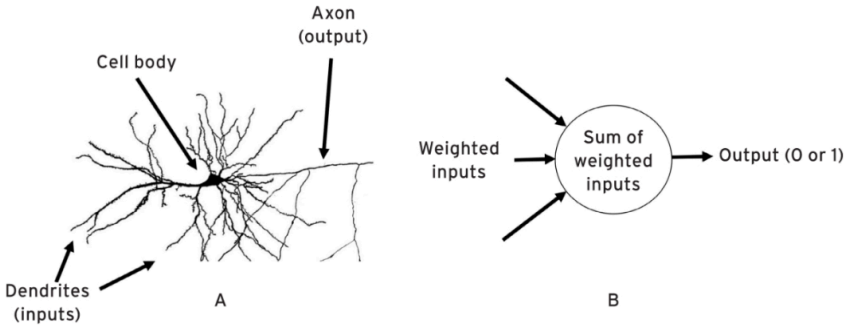

FIGURE 1: *A*, a neuron in the brain; *B*, a simple perceptron

- numerical weight assigned to each of a perceptron's inputs. Each input is multiplied by its weight before being added to the sum.
- The threshold is a number set by the programmer (learned by the perceptron itself).
- In short words: a perceptron is a simple program that makes a yes or no decision based on weather the sum of its weighed inputs meets a threshold value.
- Networks of perceptrons could perform visual tasks such as recognizing faces and objects.

Our perceptron's Inputs
- Example to recognize an 8 we can have a grid of pixels with a numerical intensity.

Learning the perceptron's weights and threshold
- A perceptron doesn't have any explicit rules to perform its task, all of its knowledge is encoded in the numbers making up its weights and threshold.
- The perceptron should learn this values on its own. Via conditioning. Being rewarded when it fires correctly and punished when it errs: Supervised Learning. During training we give an example, produces an output and it is then given a supervision signal, tells how much the system's output differs from the correct output. Uses the signal to adjust its weights and threshold.

- Supervised learning is key in modern AI. Requires training set: large set of positive examples (8's written by different people) and negative (other numbers, not 8). Each example is labeled by humans with its category. Label -> supervision signal.
- The test set: remainder, used to evaluate the system's performance after it is trained.
- Perceptron-learning algorithm: a perceptron could be trained from examples to determine weights and threshold that would produce correct answers.
- For a certain class of tasks, perceptrons with sufficient training could learn to perform these task without error.
- Major difference between Symbolic AI and Sybsymbolic AI: The fact that a perceptron's knowledge consists of a set of numbers means that it is hard to uncover the rules its using in performing the recognition task, the RULES ARE NOT SYMBOLIC. It gets worse with modern neural networks, that have millions of weights. Our neural firings can be considered SUBSYMBOLIC (they underlie the symbols our brains somehow create).

Limitations of perceptrons
- The types of problems a perception could solve perfectly were limited
- Its learning algorithm would not do well in scaling up to tasks requiring a large number of weights and threshold.
- If a perceptron is augmented (by adding a layer of simulated neurons) the types of problems that it can solve is much broader. -> multilayer neural network, found most of the modern AI. Difficult to train.

AI Winter
- Decrease in government funding for AI research in the UK and US.
- Two part cycle:
  - 1: new ideas create optimism in the research community, results are promised and hyped, money from the government. -> AI Spring
  - 2: the breakthroughs don't occur o rare less impressive, the funding dries up and the research slows. -> AI Winter

Easy things are hard
- AI was harder than we thought. It has uncovered a paradox, easy things are hard. We are least aware of what our minds do best. It has helped to know how complex our own minds are.