



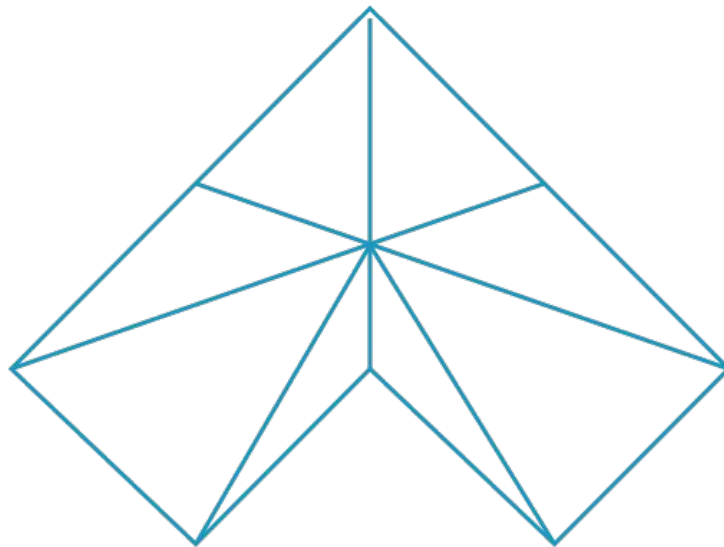
# Input fra en nørd

BIM AARHUS - 28/3/2019



# Jacob Frølund

Programmør | IT arkitekt  
IT projektleder | Scrum Master





# Agenda

- At tænke eksponentielt
- AI / ML
- Software udvikling

# At tænke eksponentielt





# Matematisk

$$f(x) = 2x + 4$$

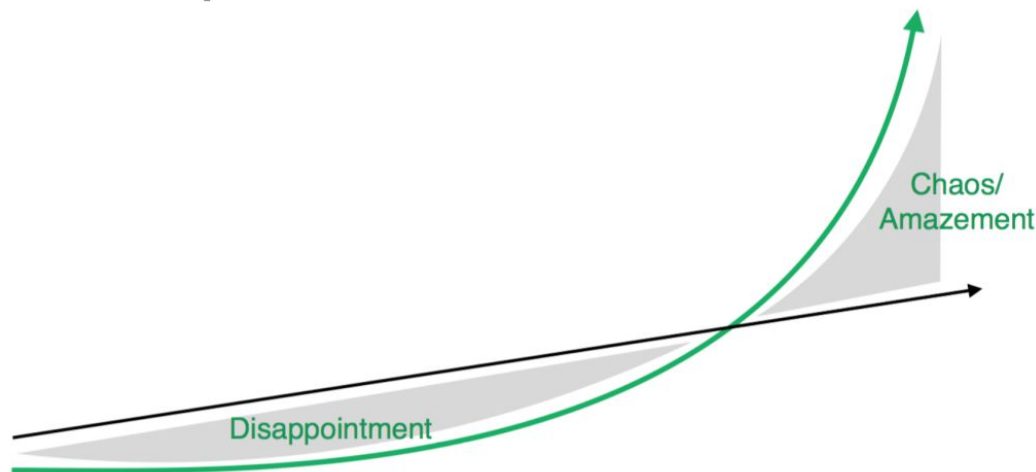
Lineær

$$f(x) = 2^x$$

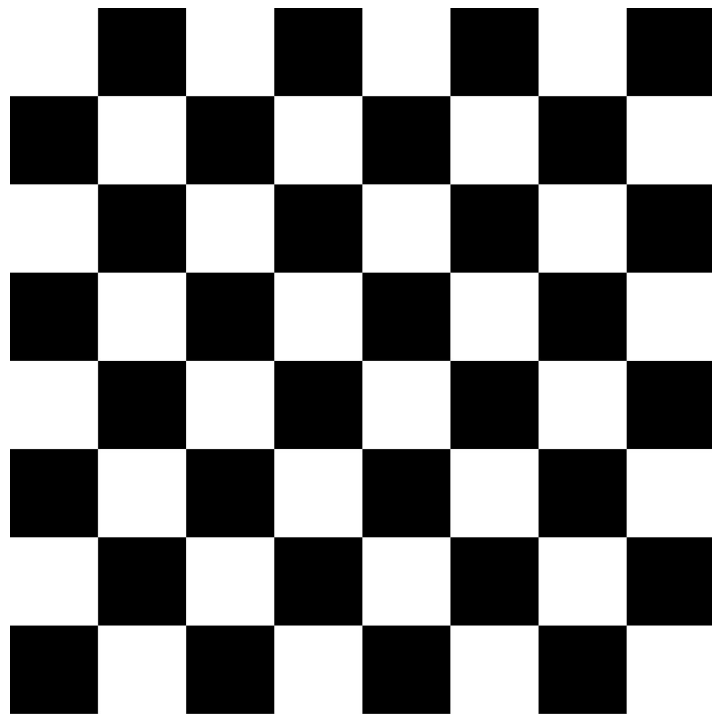
Eksponentiel

# Eksponentielt mod lineært

Deception of linear  
vs exponential



# Opfindelsen af skak



Felt: 1 - Riskorn: 1

Felt: 2 - Riskorn: 2

Felt: 3 - Riskorn: 4

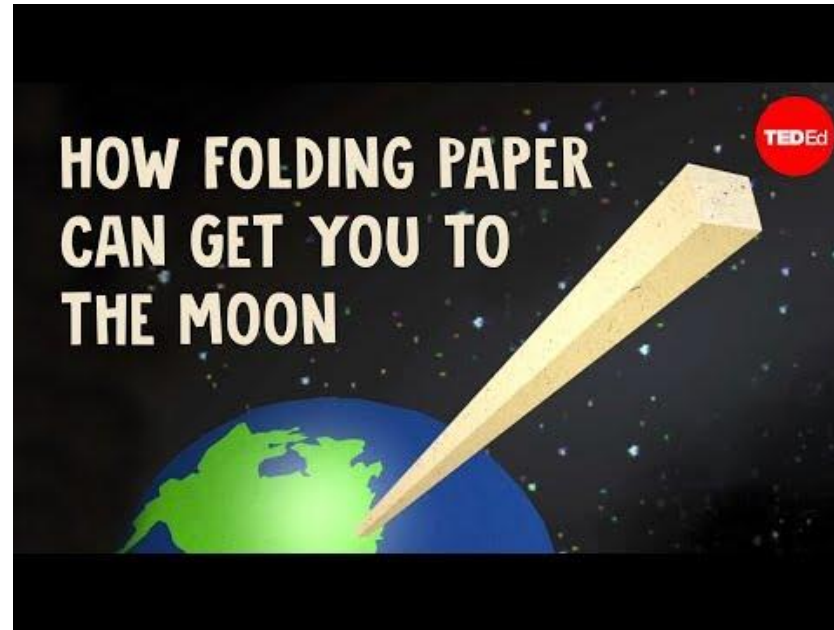
Felt: 4 - Riskorn: 8

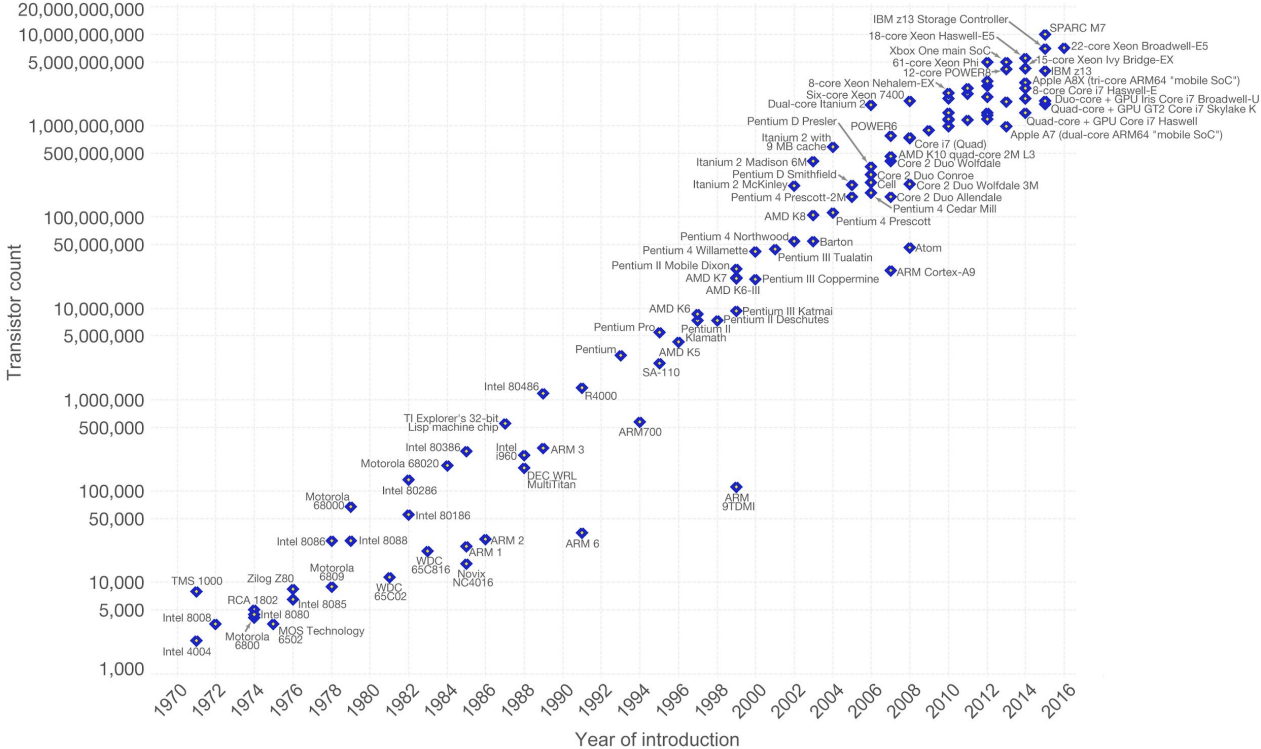
Felt 32: - Riskorn: 4.294.967.295

Felt 56: - Riskorn: 72.057.594.037.927.935

Felt 64: - Riskorn: 18.446.744.073.709.551.615

# At foldepapir og nå månen





Data source: Wikipedia ([https://en.wikipedia.org/wiki/Transistor\\_count](https://en.wikipedia.org/wiki/Transistor_count))

The data visualization is available at [OurWorldinData.org](https://ourworldindata.org). There you find more visualizations and research on this topic.

Licensed under [CC-BY-SA](#) by the author Max Roser.

AI / ML





# Definition

**Algoritme** (a process or set of rules to be followed)

**Snæver AI** (narrow AI, is artificial intelligence that is focused on one narrow task)

**General AI** (would be capable of recursive self-improvement)

# Bubble sort

5 1 12 -5 16

unsorted

5 1 12 -5 16

5 > 1, swap

1 5 12 -5 16

5 < 12, ok

1 5 12 -5 16

12 > -5, swap

1 5 -5 12 16

12 < 16, ok

1 5 -5 12 16

1 < 5, ok

1 5 -5 12 16

5 > -5, swap

1 -5 5 12 16

5 < 12, ok

1 -5 5 12 16

1 > -5, swap

-5 1 5 12 16

1 < 5, ok

-5 1 5 12 16

-5 < 1, ok

-5 1 5 12 16

sorted

```
public void bubbleSort(int[] arr) {  
    boolean swapped = true;  
    int j = 0;  
    int tmp;  
    while (swapped) {  
        swapped = false;  
        j++;  
        for (int i = 0; i < arr.length - j; i++) {  
            if (arr[i] > arr[i + 1]) {  
                tmp = arr[i];  
                arr[i] = arr[i + 1];  
                arr[i + 1] = tmp;  
                swapped = true;  
            }  
        }  
    }  
}
```



WAYMO

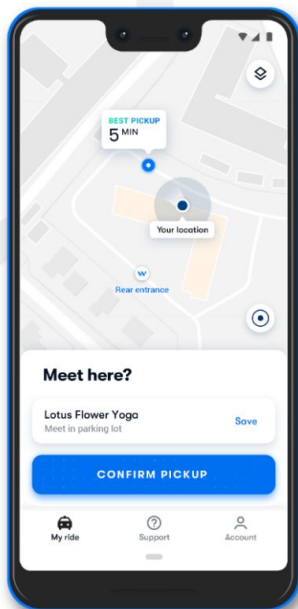
2009 - 10 ture af 100 miles uden  
afbrydelser.

2012 - 300.000 miles kørt - udvikling af egne  
sensorer.



2015 - Første tur på offentlig vej uden føre

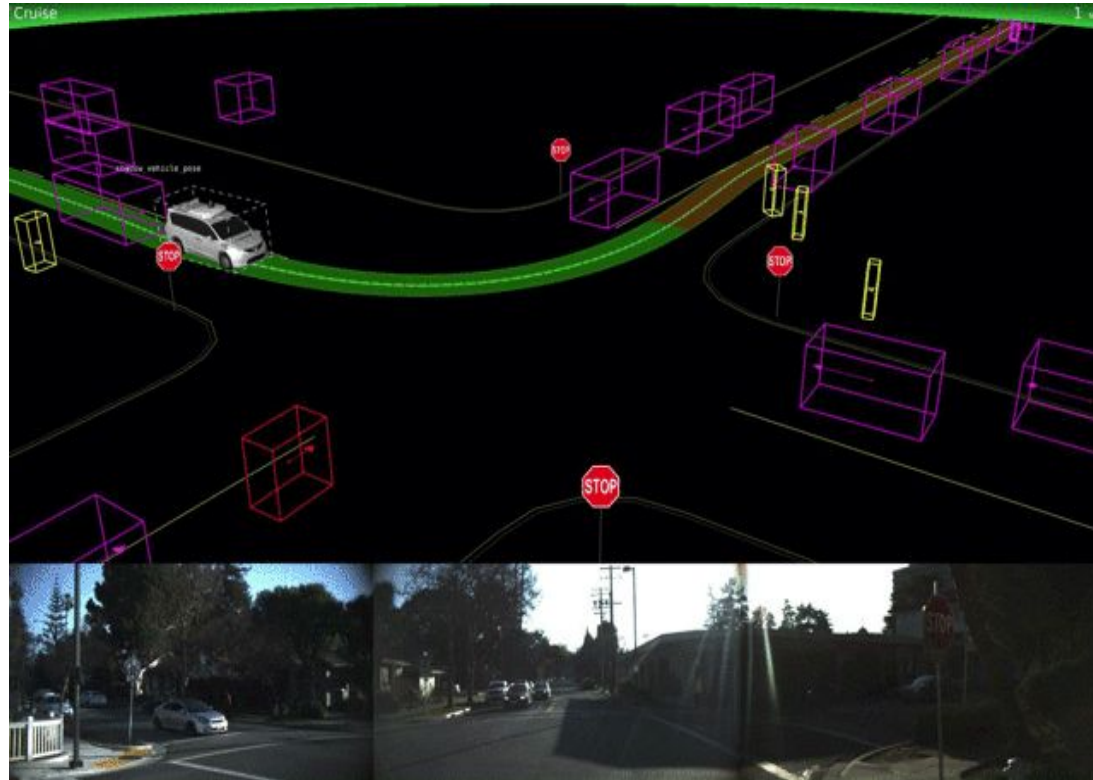
2017 - Første produktions eksemplar af en selvkørende bil. Offentlig test i Phoenix



Sit back, relax and enjoy!

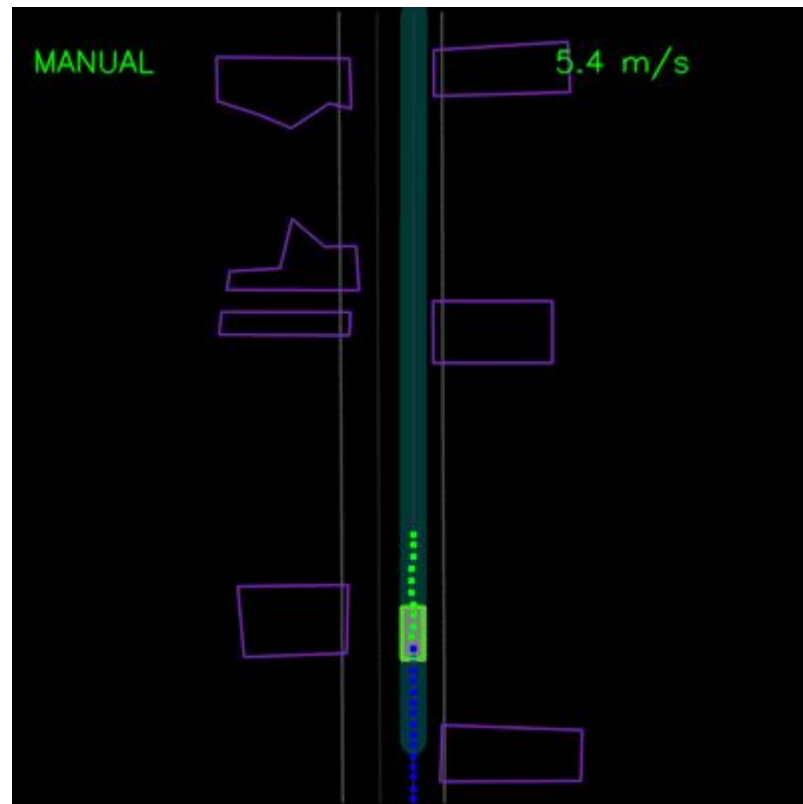
2018 - Waymo One lanceret i Phoenix

# Waymo sensors





# Simulation





## AlphaGo

Lærte at spille ved at se på tusindvis af spil spillede af mennesker.

## AlphaGo Zero

lærte at spille go ved at spille tilfældige spil mod sig selv.

# Software udvikling





# Agilitet

**Individuals and Interactions**

over  
processes and tools

**Working Software**

over  
comprehensive documentation

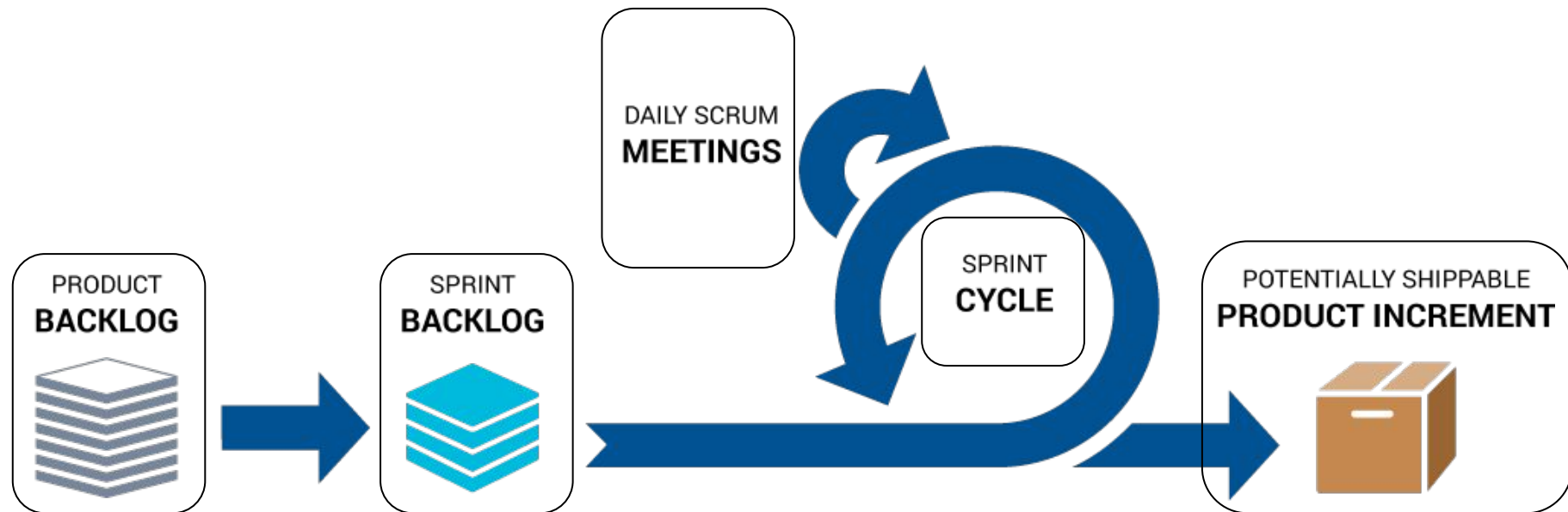
**Customer Collaboration**

over  
contract negotiation

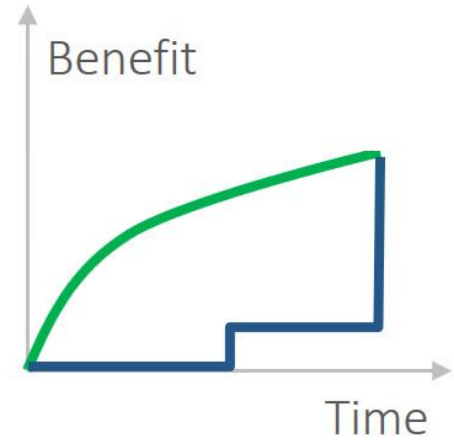
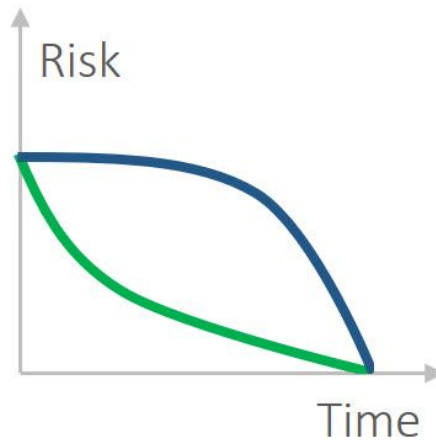
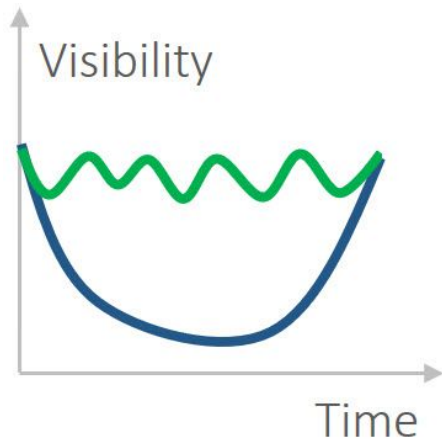
**Responding to Change**

over  
following a plan

# Scrum



# Ønsket effekt



— traditional — agile

## 30% spild

Verden ændre sig og det er derfor svært at definere et fast mål.





# Spørgsmål?

Slides på [liib.dk](http://liib.dk)