

Generativ ki og højere uddannelse

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(2023–): UFM ekspertgruppe for ki, CBS *advisory board*

MEN VI
BØR JO...

KRITISK
TÆNKNING!

FOUCAULT!

UNDERSØGELSER
VISER, AT...

... VIRKELIG AT
FORHOLDE SIG
REFLEKTERET ...

FREIRE!

MEN
FORMÅLET
MED HØJERE
UDDANNELSE
ER JO...

HVAD SKAL
VI LÆRE OG
HVORDAN?

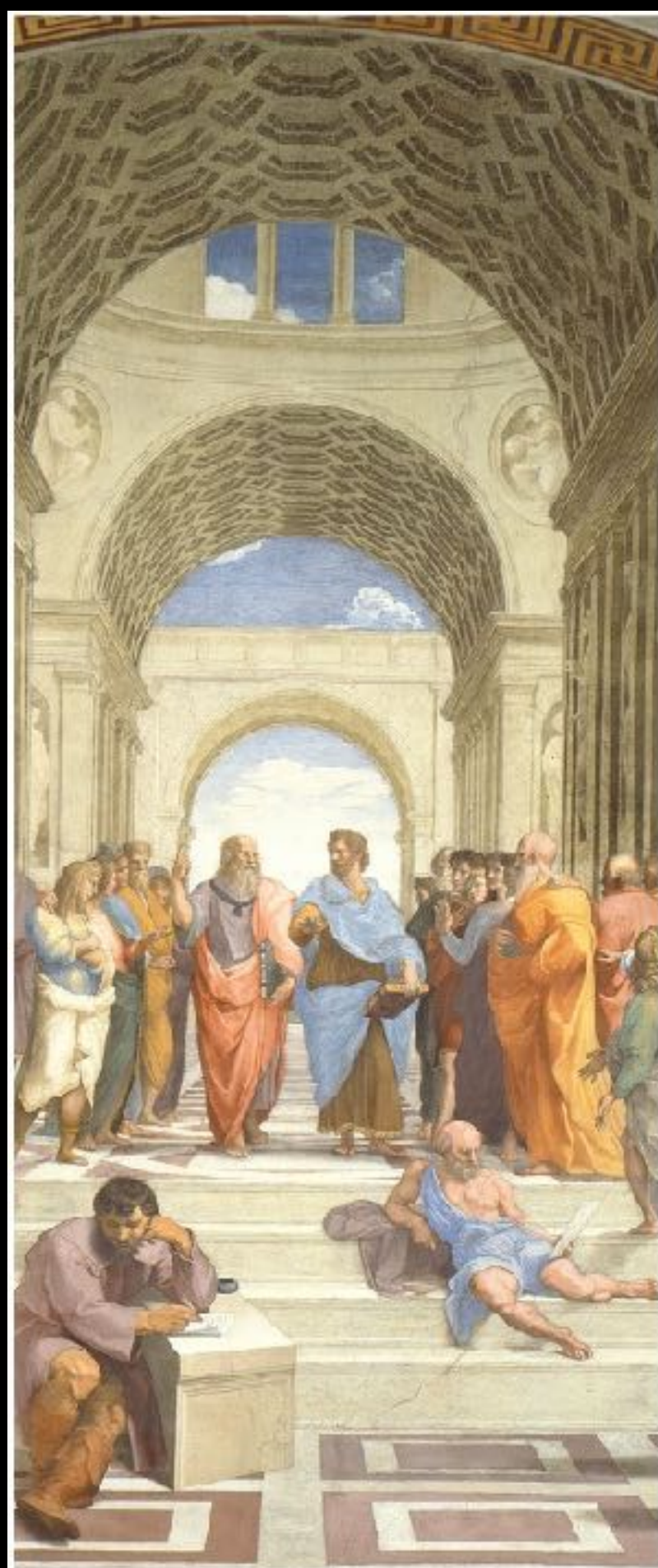
... FREMTIDENS
ARBEJSMARKED ...

DET, DE UNGE
JO EGENTLIG
SKAL KUNNE...

VI KAN
JO ...

2 timer

Oplysning



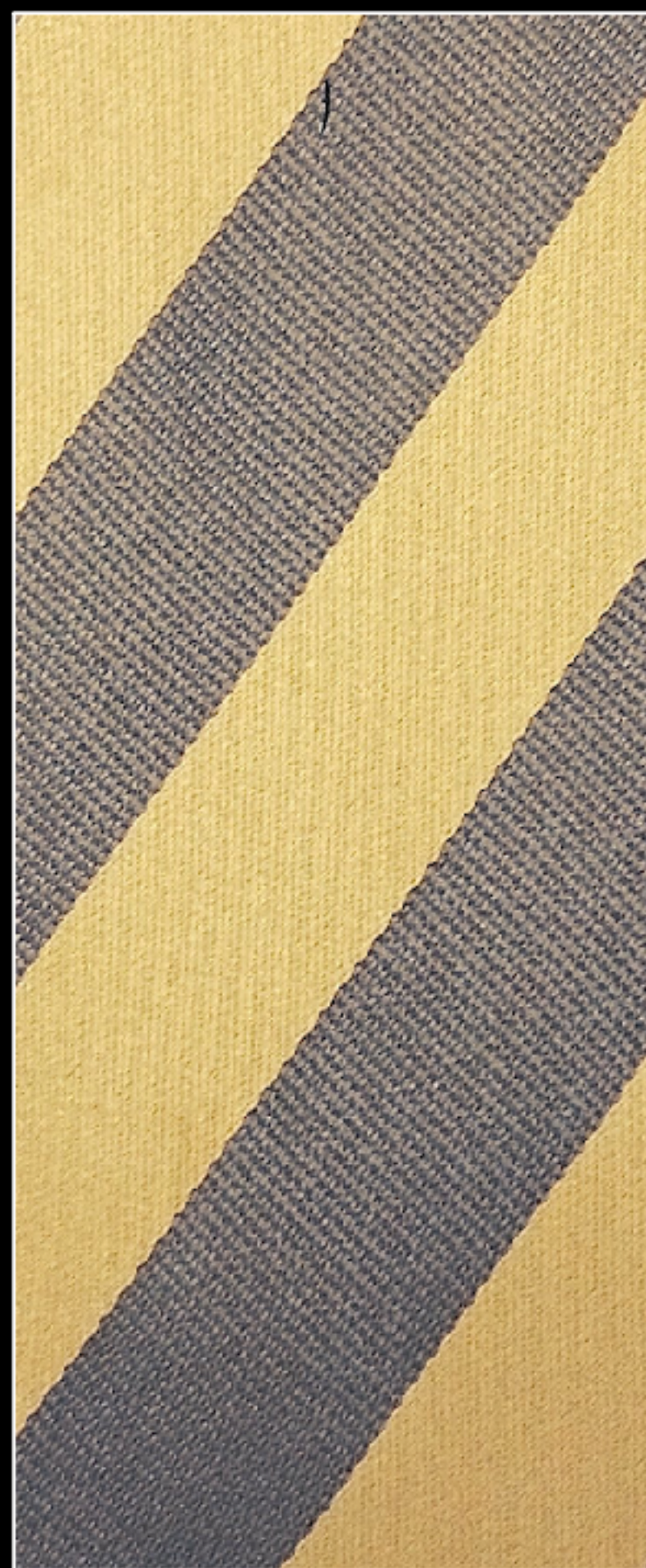
Dannelse

Økonomi



Humankapital

Status



Netværk

Oplevelse



Selvrealisering

Værktøj



Andre mål

Dygtiggørelse



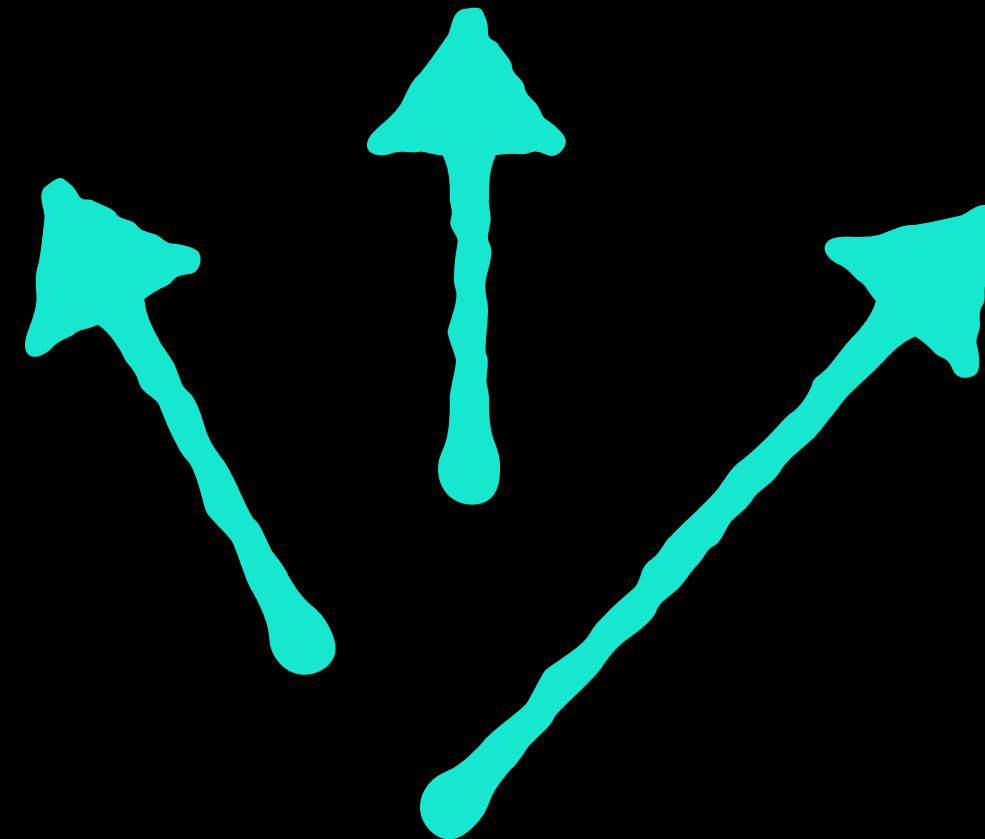
Studieforberende

Viden

Kompetence

Akademia

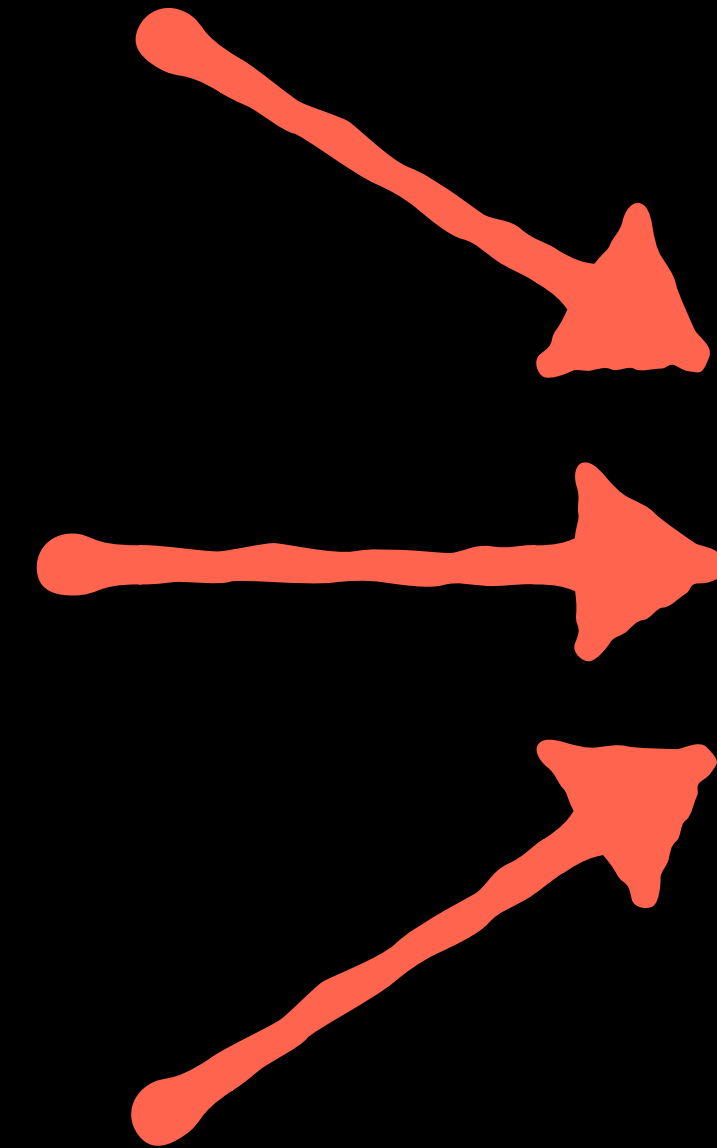
Personlig udvikling



Drivkraft

Det sande jeg

Socialisering

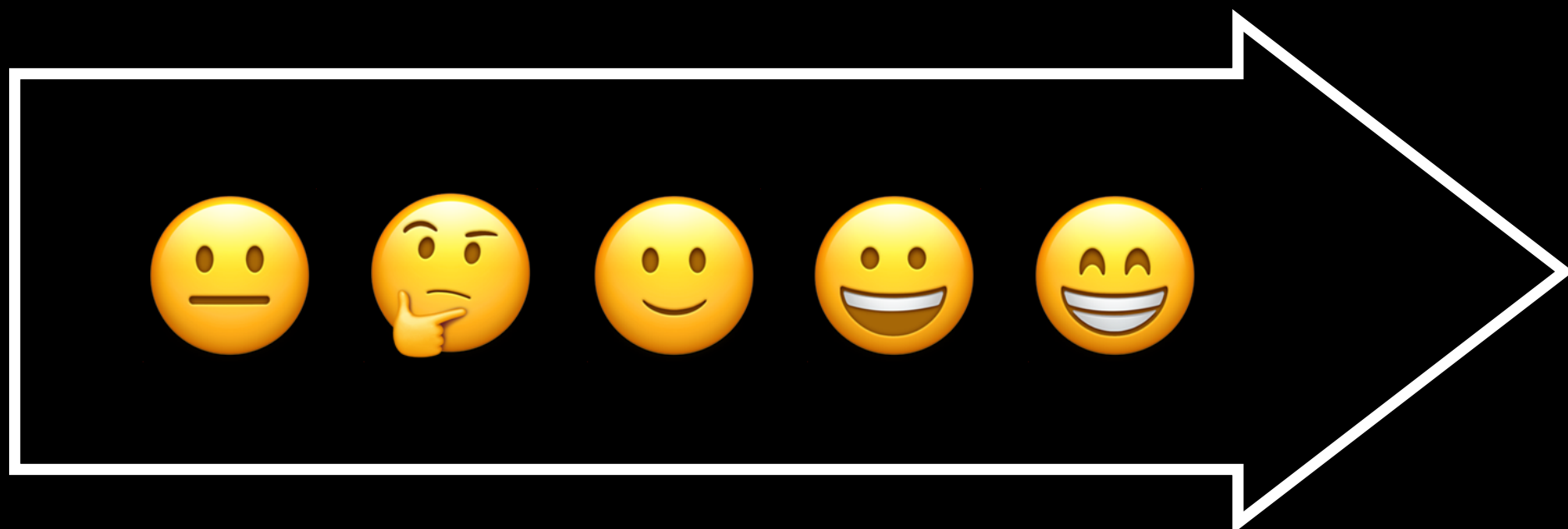


Udfaldslighed

Rarhed

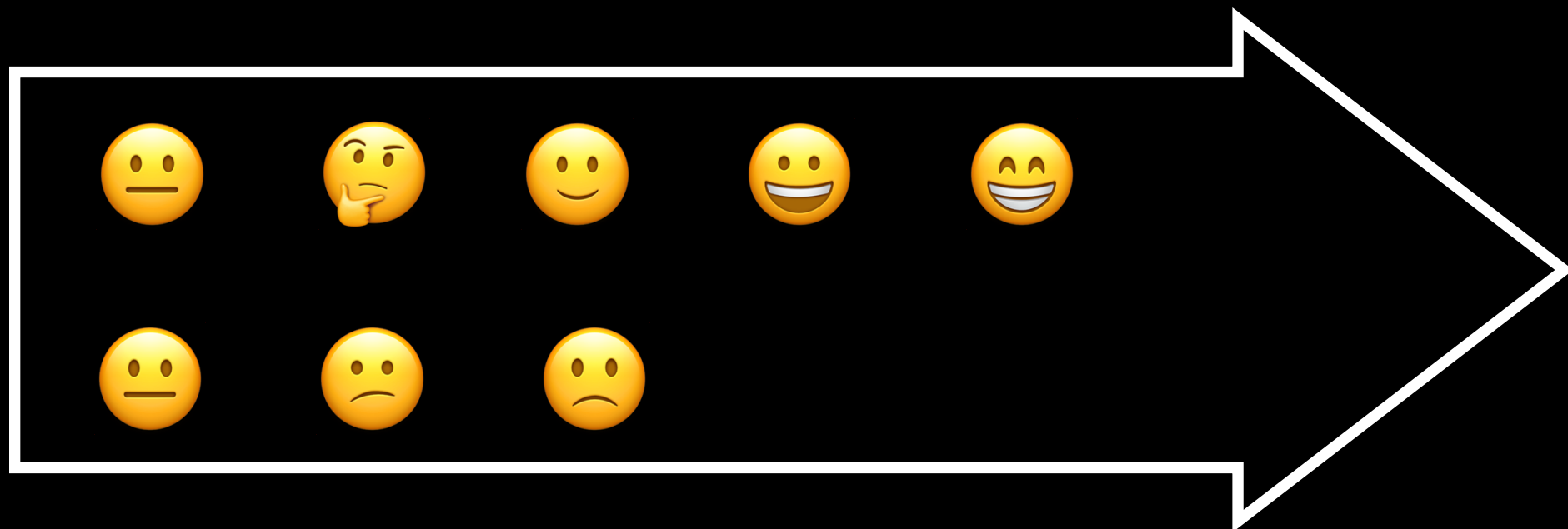
Arbejdsmarked

Læring



😊 har visse
egenskaber og
færdigheder

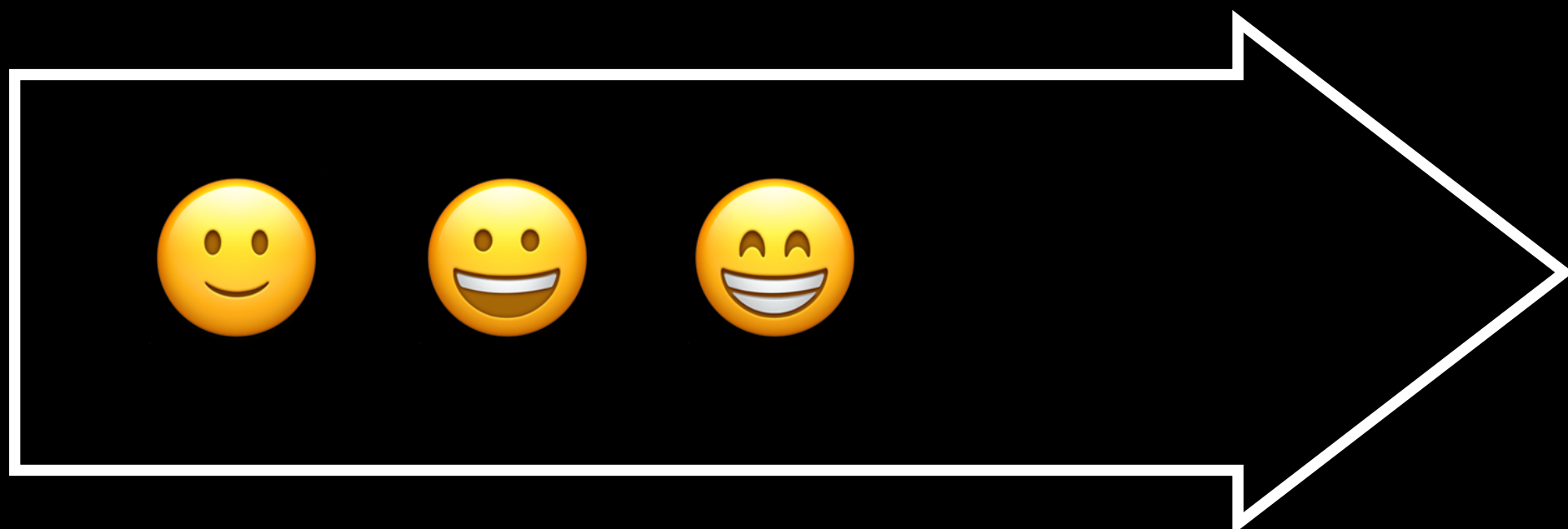
Frafald



Hvilke?

Er der brug for 😊?

Udtagelse



Om at frembringe violinlyde



Tilgængelighed

Lav

Høj

Resultatkvalitet

*Afhænger af
brugeren*

*Gennemgående
fremragende*

Signalværdi: Brugeren

... kan spille violin

*... kan lære noget
vanskeligt*

... har adgang til

en grammofon



Undervisning (læringsteknologi,
lærergerning, læremidler, elevadfærd, ...)



Grundlag for tilbagekobling (»bedømmelse«)



Egenskaber og færdigheder (»læringsmål«)



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lærergerning, elevadfærd, ...)~~

Grundlag for tilbagekobling (»bedømmelse«)

Egenskaber og færdigheder (»læringsmål«)

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Egenskaber og færdigheder (»læringsmål«)

Ærlighed



»Bedømmelsesgrundlaget skal være gyldigt«

Holdbarhed



»» The amount of energy needed to *refute* bullshit is an order of magnitude bigger than that needed to *produce* it.

— Alberto Brandolini, 2013.

»» Ils peuvent en quelques mots exposer une vérité incomplète ; et, pour montrer qu'elle est incomplète, il nous faut de longues et arides dissertations.

— Frédéric Bastiat, *Sophismes économique*, 1863.

	før 2022	efter 2022
t(produktion)	dage	sekunder
t(feedback)	timer	dage
signalerer	verbal intelligens konformitet investeret tid social kapital	adgang til en stor sprogmodel

»Bedømmelsesgrundlaget skal kunne behandles effektivt.«

Holdbarhed

HVORNÅR
FALDT
KONSTANTINOPEL?

1066



Grundlag for tilbagekobling (»bedømmelse«)

Egenskaber og færdigheder (»læringsmål«)



MS Office (kontorarbejde)



ChatGPT (samtalerobot)



Stable Diffusion, Midjourney, Dall-E, ... (billedkunst)



Copilot (programmering)

GPT 2

GPT 3

Codex

GPT
»3½«

GPT 4

2019

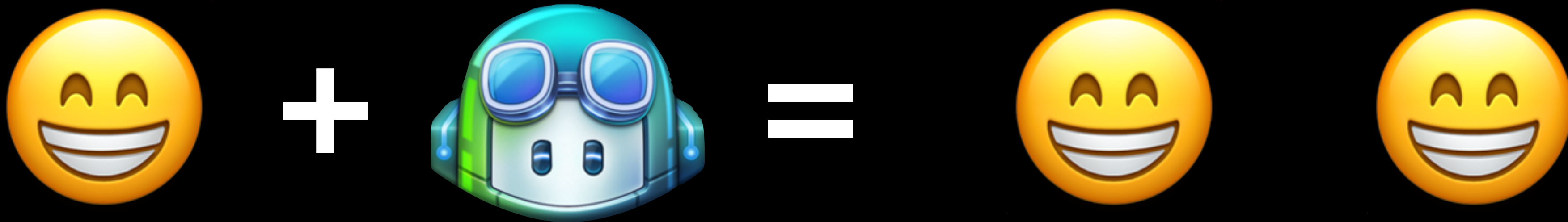
2020

2021

2022

2023

Generativ ki er en »styrkefordobler«



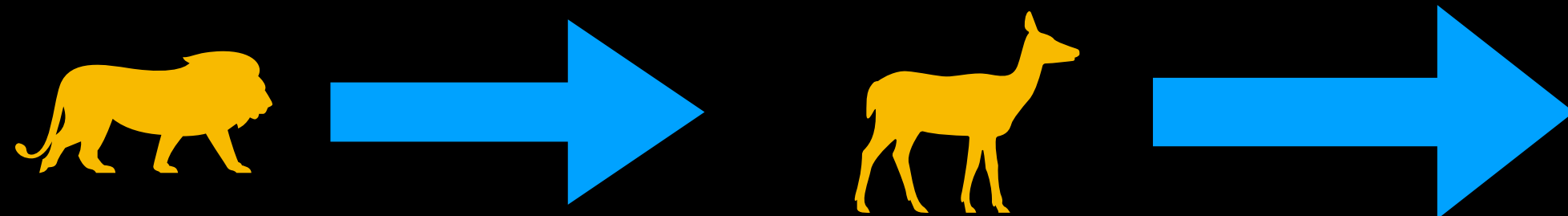
Hvilke færdigheder?

Signalering



»Signalet er ikke egenskaben«

Egenskab



Kan i otte timer løbe vandret

Signal



Kan kort hoppe 2 m lodret

Egenskaben \neq signalet

Signalering gavner begge organismer

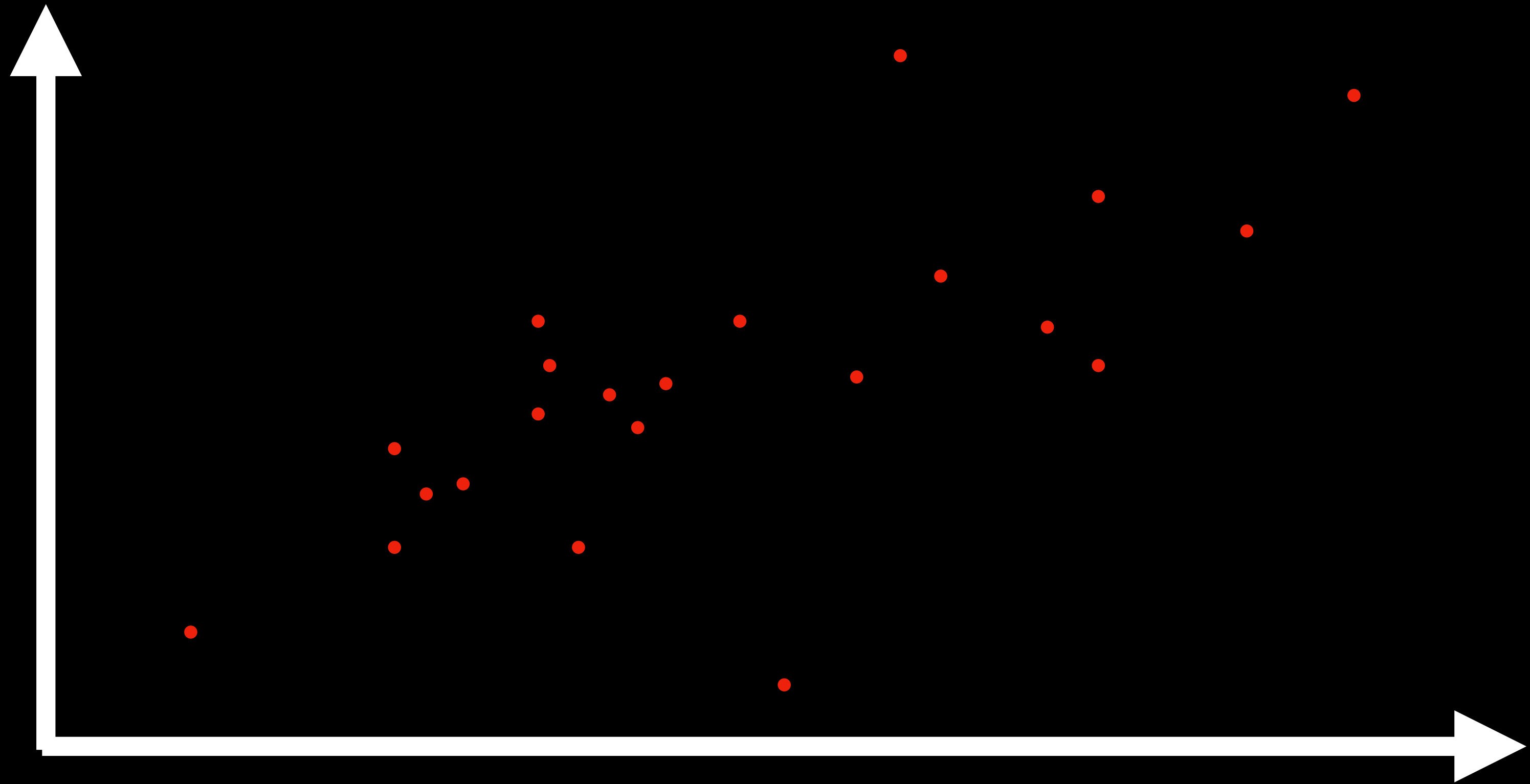
Signalet skal være »dyrt« (= svært at foregøgle)

men *nemt* at aflæse

Generativ ki er en trampolin



Kvalitet på leverancen



Intelligent
Flittig (arbejdsom, ordentlig)
Dygtig (opfylder læringsmål)

Social status
Rar
Social kompetent

Kvalitet på leverancen
stil,
analyse
billede
digitalt artefakter



Skriftlig opgave uden tilsyn har nu ingen signalværdi

»Ring en ven« & uklanderlig prosa er demokratiseret

Egenskaben
intelligent
flittig
dygtig
konform
social status
rar
social kompetent

Hvad *kan* vi gøre

Hvad *bør* vi gøre

Hvad *vil* vi gøre?

Hvad kan vi gøre

Hvad bør vi gøre

Hvad vil vi gøre?



Google



Internet

Meget nemmere at lære rigtig meget!

Bare googl det

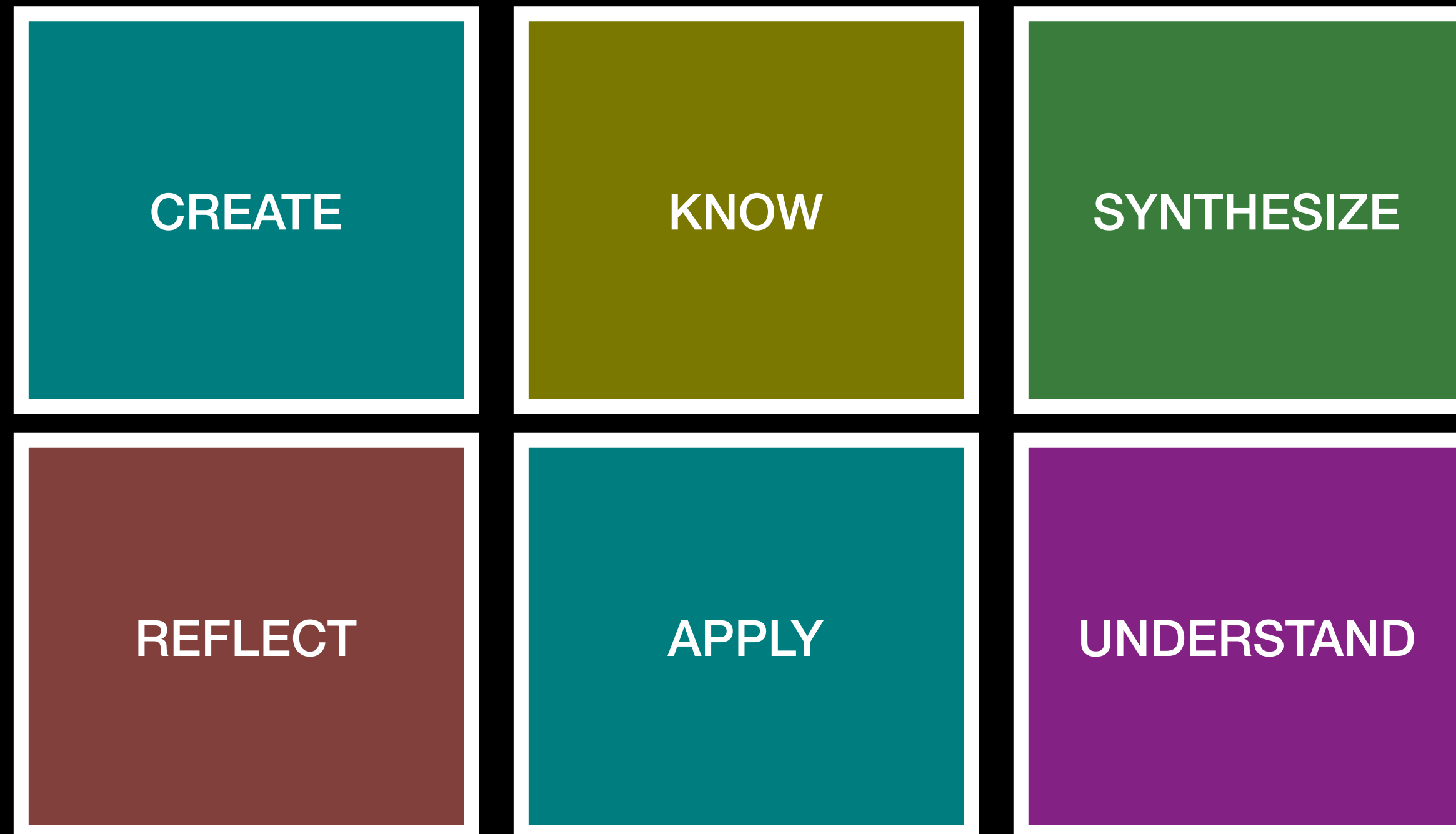
1990

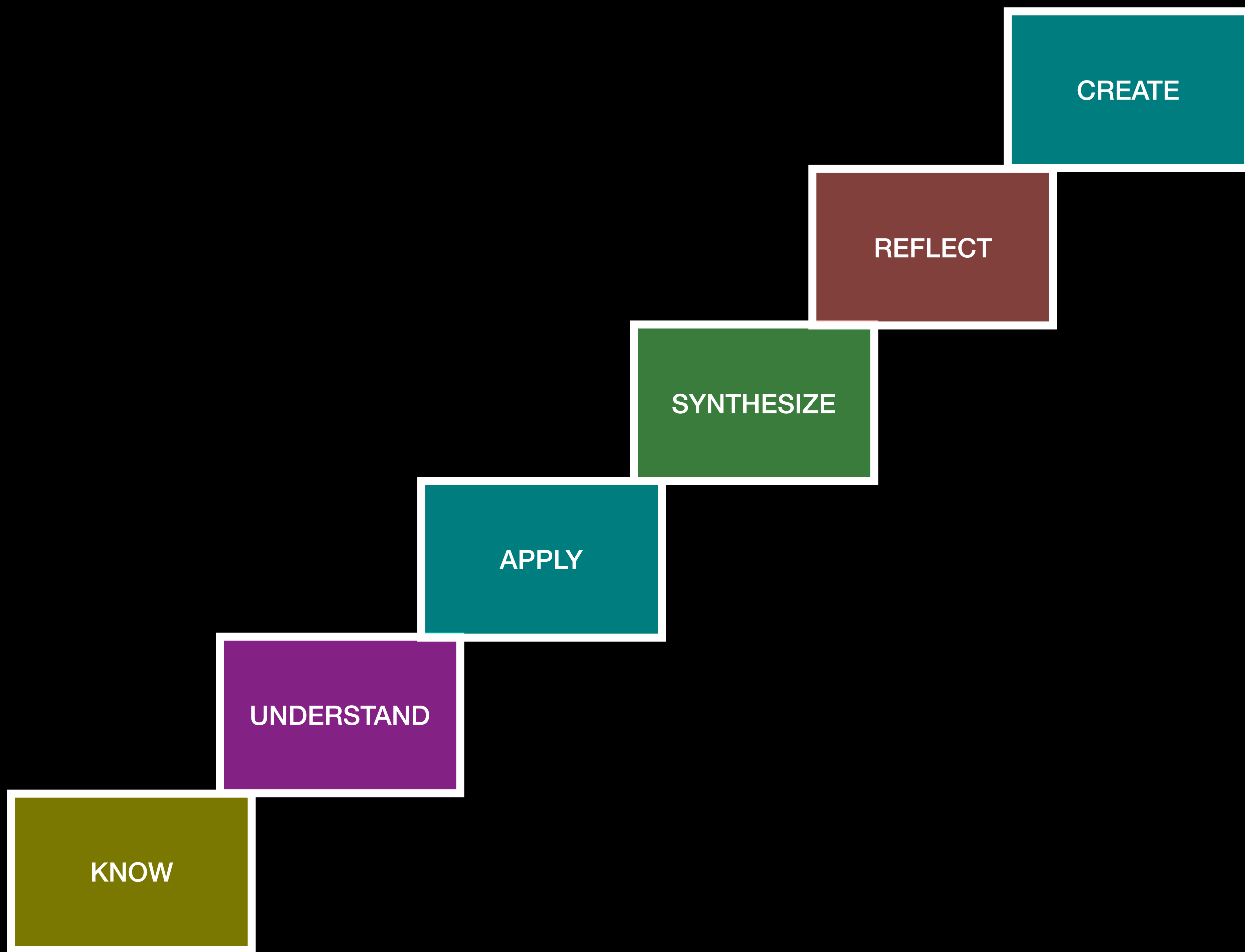
+»reflektion«
-viden

Meget vanskeligt at navigere i mere viden uden basisviden

2020

Educational Objectives, Cognitive Domain (Bloom1956)





KNOW

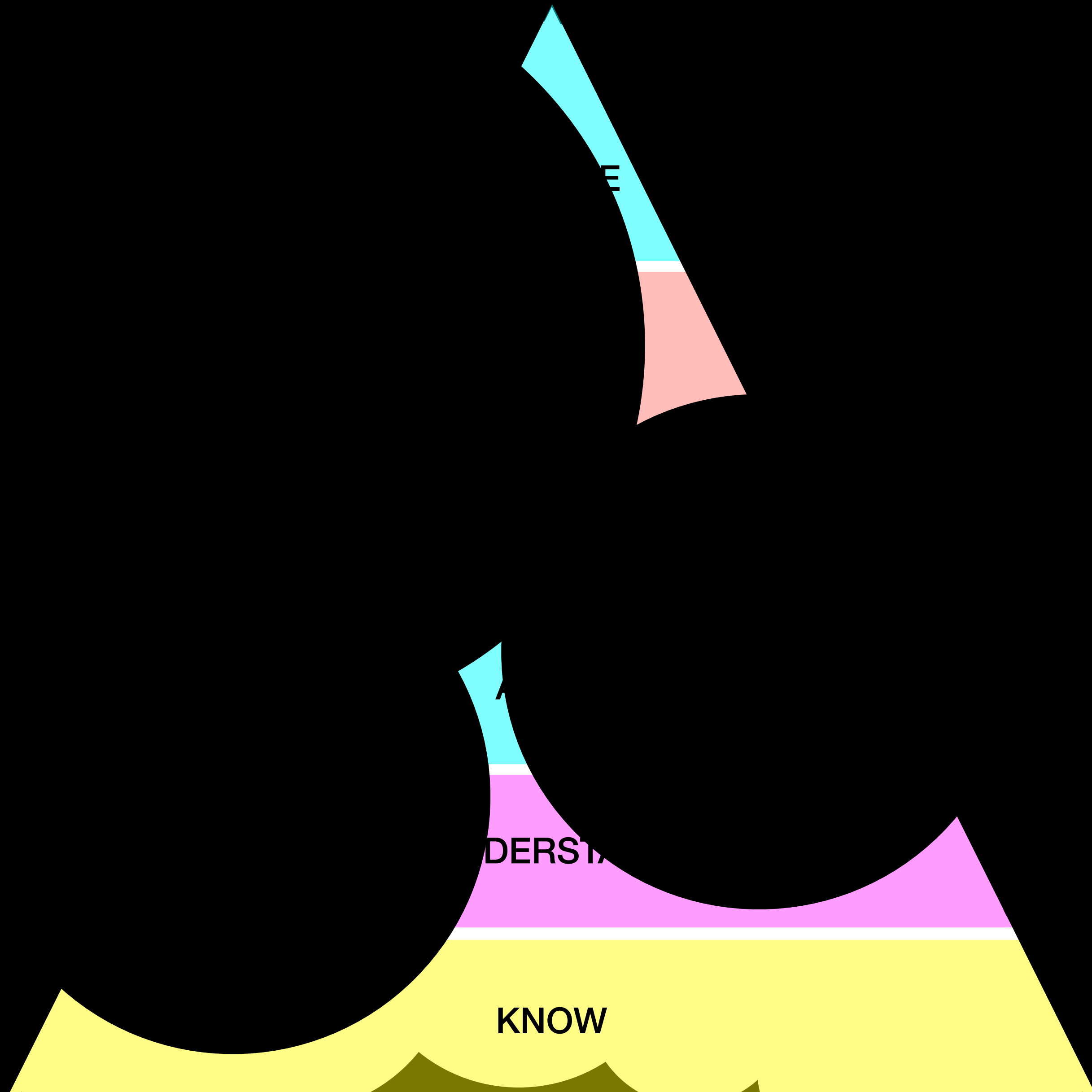
UNDERSTAND

APPLY

SYNTHESIZE

REFLECT

CREATE

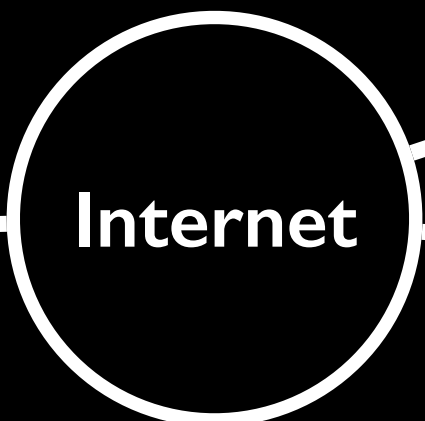


KNOW

UNDERSTAND

THINK

1990

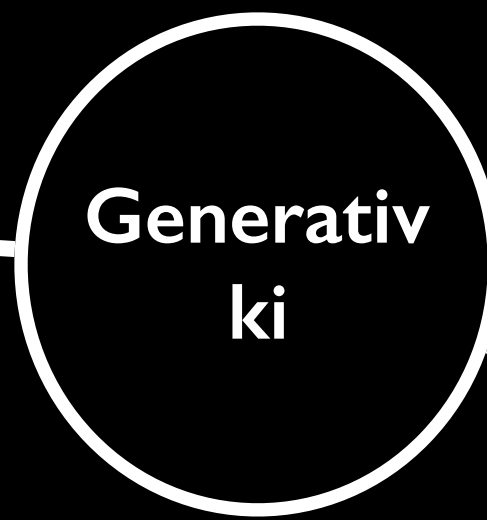


Bare googl det

Meget nemmere at lære rigtig meget!

+»reflektion«
-viden
Meget vanskeligt at navigere i mere viden uden basisviden

2020



Det kan ki gøre

Meget nemmere at lære rigtig meget!



Meget
nemmere at lære
rigtig meget!



Kompetencer

Generativ
ki

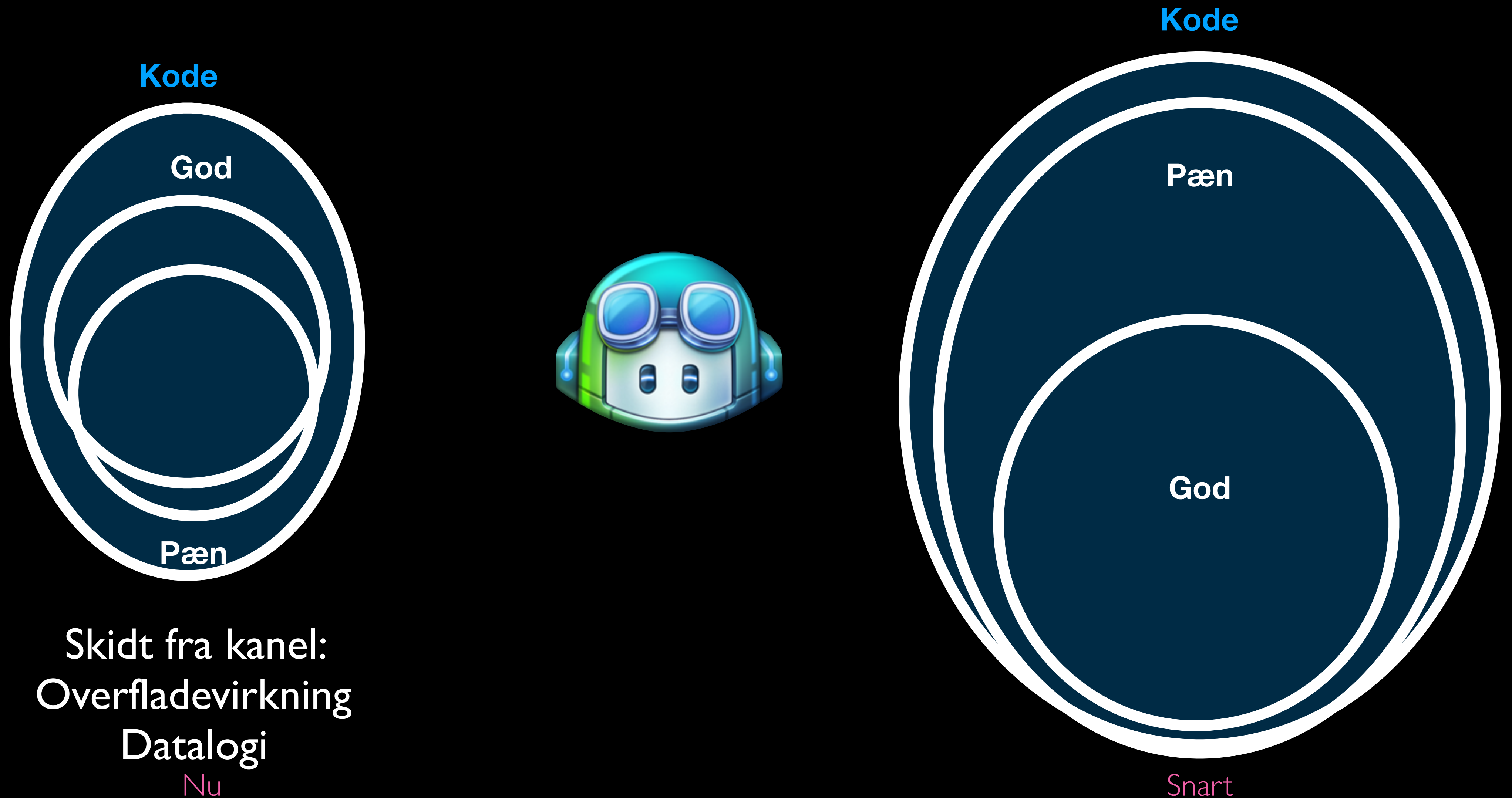
2020

Det kan
ki gøre

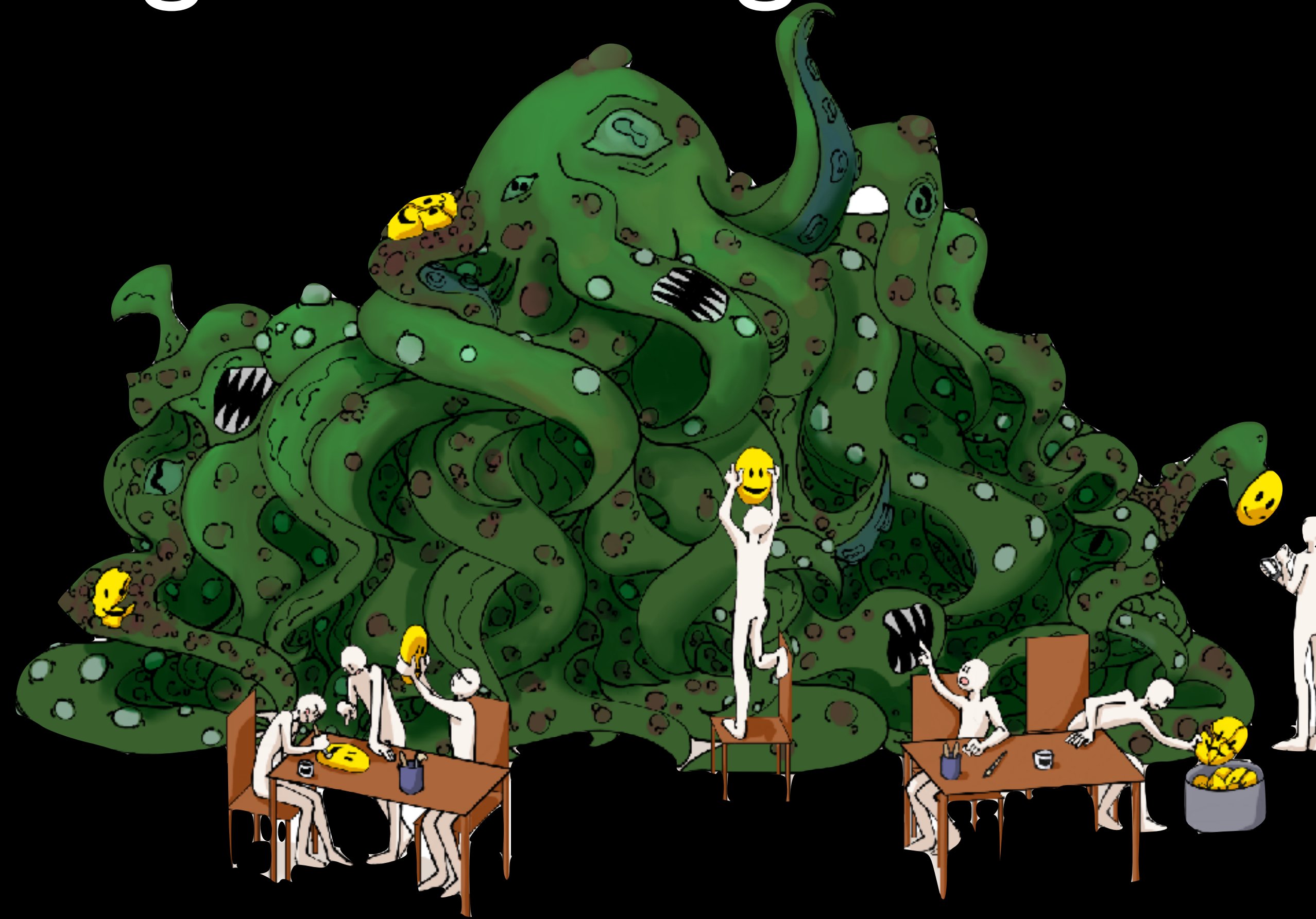


Inklusion
Udfaldslighed

Spekulation: meget mere dårlig kode



Spekulation: programmeringens endeligt?



RLHF (»operant betingning ved menneskelig tilbagkobling«) > beregningstænkning?

Welcome to

```
EEEEEE LL      IIII  ZZZZZZ  AAAAA
EE      LL      II     ZZ     AA   AA
EEEEEE LL      II     ZZZ    AAAAAA
EE      LL      II     ZZ     AA   AA
EEEEEE LLLLLL IIII  ZZZZZZ  AA   AA
```

Eliza is a mock Rogerian psychotherapist.
The original program was described by Joseph Weizenbaum in 1966.
This implementation by Norbert Landsteiner 2005.

```
ELIZA: Is something troubling you ?
YOU:   Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:   They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:   Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU:   He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU:   It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:
```

—Feigenbaum, Eliza, 1964

Hvordan virker Eliza?

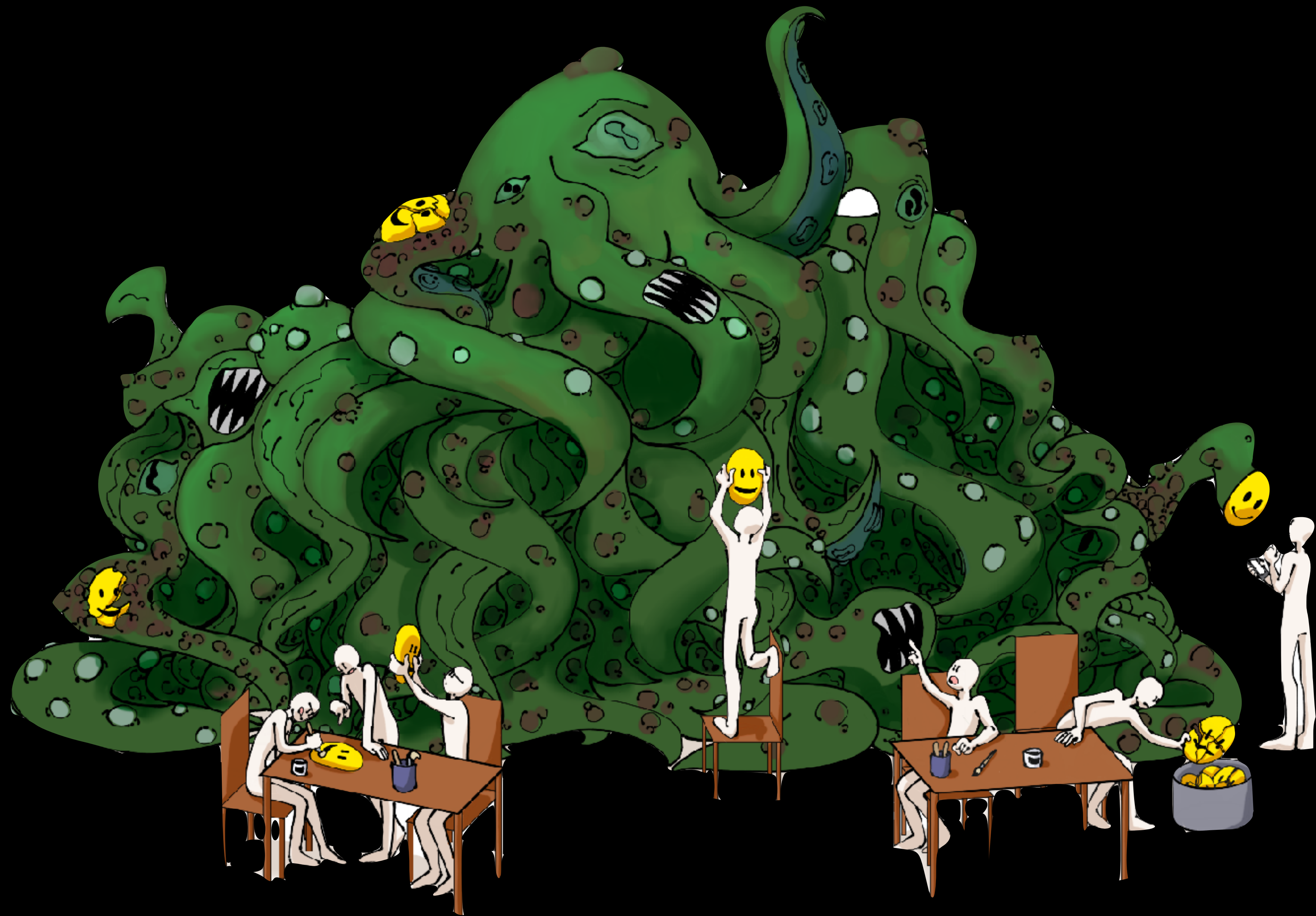
```
key: remember 5
  decomp: * i remember *
    reasmb: Do you often think of (2) ?
    reasmb: Does thinking of (2) bring anything else to mind ?
  decomp: * do you remember *
    reasmb: Did you think I would forget (2) ?
    reasmb: What about (2) ?
    reasmb: goto what
pre: equivalent alike
synon: belief feel think believe wish
```

Hvordan virker GPT?

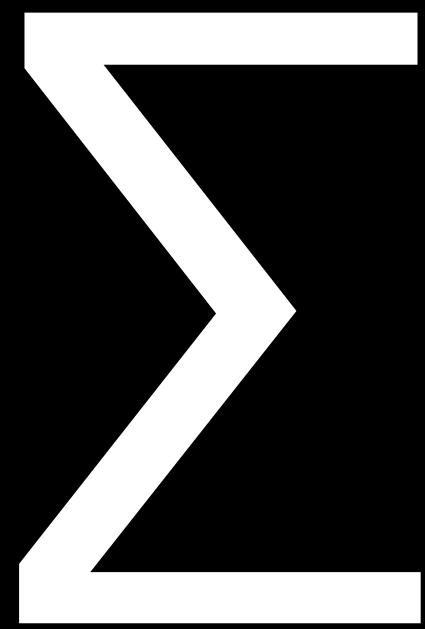
0.8113343900477030 0.275312941780790 1.143191403040900 -1.951303707701200 0.12940120120977230
-0.7867714481279366 0.7065814579035381 0.3335619654056507 0.19813832363201397 -0.8142222506213771
1.0866115863623567 -1.3525763895155665 -0.017222788485716154 -1.082074672038546 0.6923335035547151
1.4178013398788807 -0.29595798268277596 -0.544592267936524 -0.19017577326656274 -0.2813609735055221
-0.2723040265202662 0.25962204968114627 -1.2075429988033952 -0.5108400786248819 -0.8949288567817734
1.4469750278986784 -0.4519338887427109 -0.6253474049220229 -0.537966358328835 -0.4212358316488312
0.5760967844824633 0.5449629371382955 0.9011203062416006 -0.6265621765392312 0.2684344330418421
-2.887992226659539 -0.1462822637393419 0.045969291467169444 -0.09973486425592275 -0.17867778278609728
-0.4236157416888609 1.4085228020673255 -1.1013963578808106 0.17934959969346864 2.046074286297879
-0.6551821095421503 0.6994695061899573 -0.9387416595827696 -2.2625240226362524 -0.5230807256771716
-2.123478197857787 -0.9273342923566504 -0.29088650082593864 -1.4325305162112967 -0.38546816994296434
1.5355530691333923 -0.2855287046699752 0.94680149592137 -1.3307109184194856 0.28074470208862534
-0.45857774621484404 -1.9101025714535596 0.21328432504620767 -2.051936800198914 -1.1084190963395992
-0.5275753910906126 -1.2477002900427032 0.4000847617328186 -1.3771985681028003 0.02125046369523839
-0.4234567973925279 0.713667086992266 -1.009517861000337 1.1406179782221022 1.0970378217142316
0.5587415149893091 -0.14406015597100483 -0.8808988611306637 0.5702251960491618 1.4483531109927847
-1.4376959096669846 -1.1340869441063395 2.4783796369270013 -1.4900277542070737 0.21456868410574265
0.2929399158382123 -0.005231681361731191 -1.7676678642887482 -1.1042828927488735 0.09815597801639207
-0.7754785573097438 0.6971238560131782 0.20647923846502714 -1.4961792454391944 0.46906247439949555
1.161246501025446 1.5098193008695369 -2.1901430694361657 -0.4933564597214423 0.7588881193329783
0.380386677099361 -0.5731819212045001 -0.05513272936032314 -0.3883000502404011 -0.11195880155285792
0.12831619992457183 -1.4554829628284214 2.4018014772005203 0.2223068309562163 -0.08195266667928601
0.053679607902617714 0.23737060303637775 0.03248053414892346 -0.45253838841220023 -1.351993934947922
-0.19479620508451762 0.34429597873673506 -2.978462589584215 0.802254598096871 1.4608713597984502
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0.04536974837828212 0.7494592151079184 0.6099883897663217 0.06480457088633015 -1.524645647211468
-0.9832016200364718 1.1545130730581195 1.2332657501758435 0.25860998346291036 0.6305748074473086
0.7790157792688545 -0.23017226039410554 1.659460780487888 -0.46859866892092766 -0.056288007003880244
1.5499329922924656 -0.09094510130406454 0.9746177567519314 -0.7299257493157898 -0.9204718199740698

We use the same model and architecture as GPT-2, including the modified initialization, pre-normalization, and reversible tokenization described therein, with the exception that we use alternating dense and locally banded sparse attention patterns in the layers of the transformer, similar to the Sparse Transformer. To study the dependence of ML performance on model size, we train eight different sizes of model, ranging over three orders of magnitude from 125 million parameters to 175 billion parameters, with the last being the model we call GPT-3. Previous work suggests that with enough training data, scaling of validation loss should be approximately a smooth power law as a function of size; training models of many different sizes allows us to test this hypothesis both for validation loss and for downstream language tasks.

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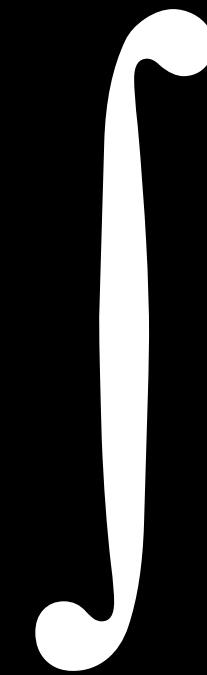


Spekulation: analysens hævn



Logik
Kombinatorik
Algebra
Diskret sandsynlighedsteori
Talteori

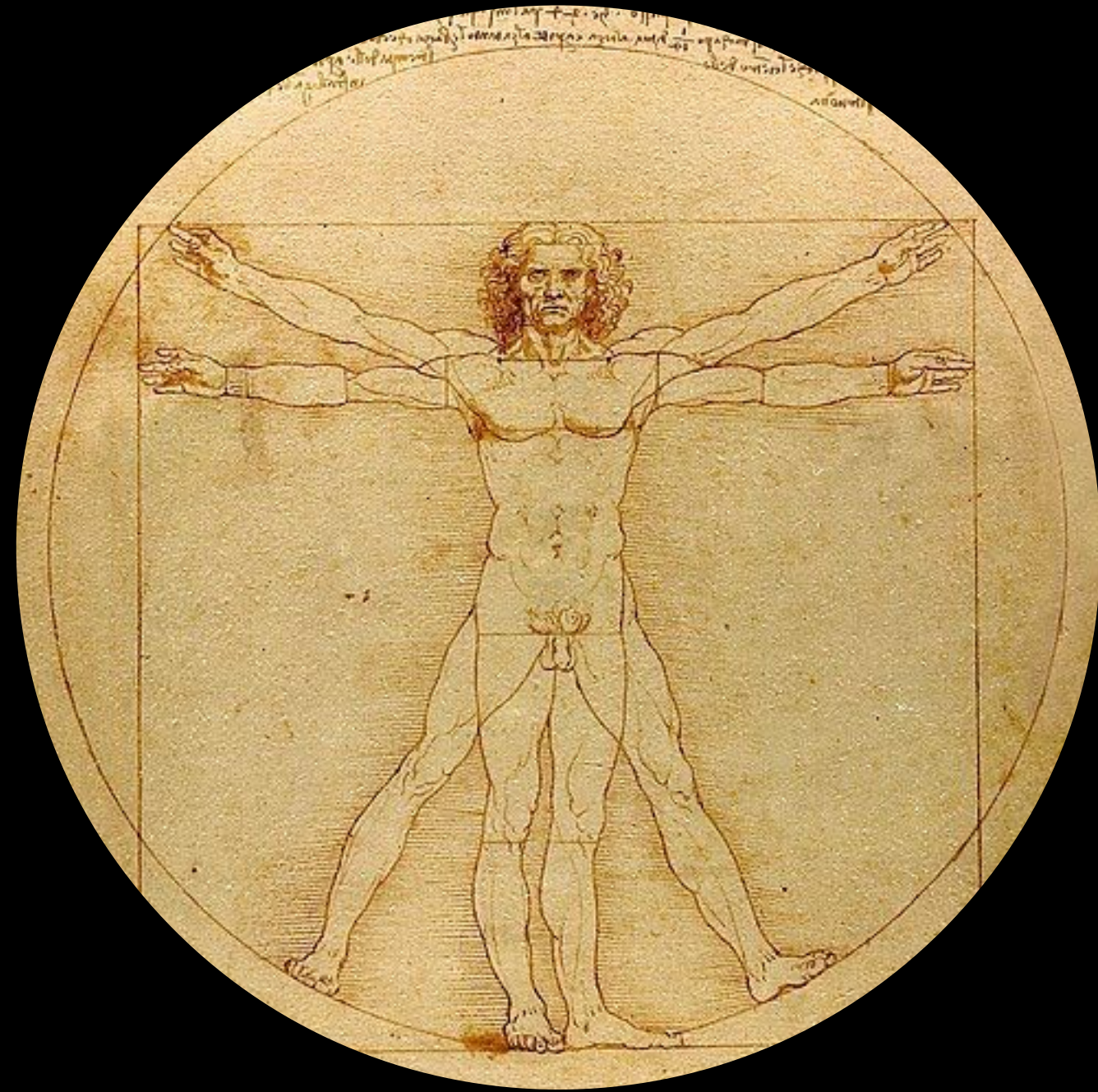
Før



Flervariabelanalyse
Statistik
Differentialregning

Snart

Spekulation: oplysningens endeligt



Forklaring og
konstruktion går
hånd i hånd

Før

Største
ingeniørproblem
nogensinde løst
uden at forstå,
hvad der foregår

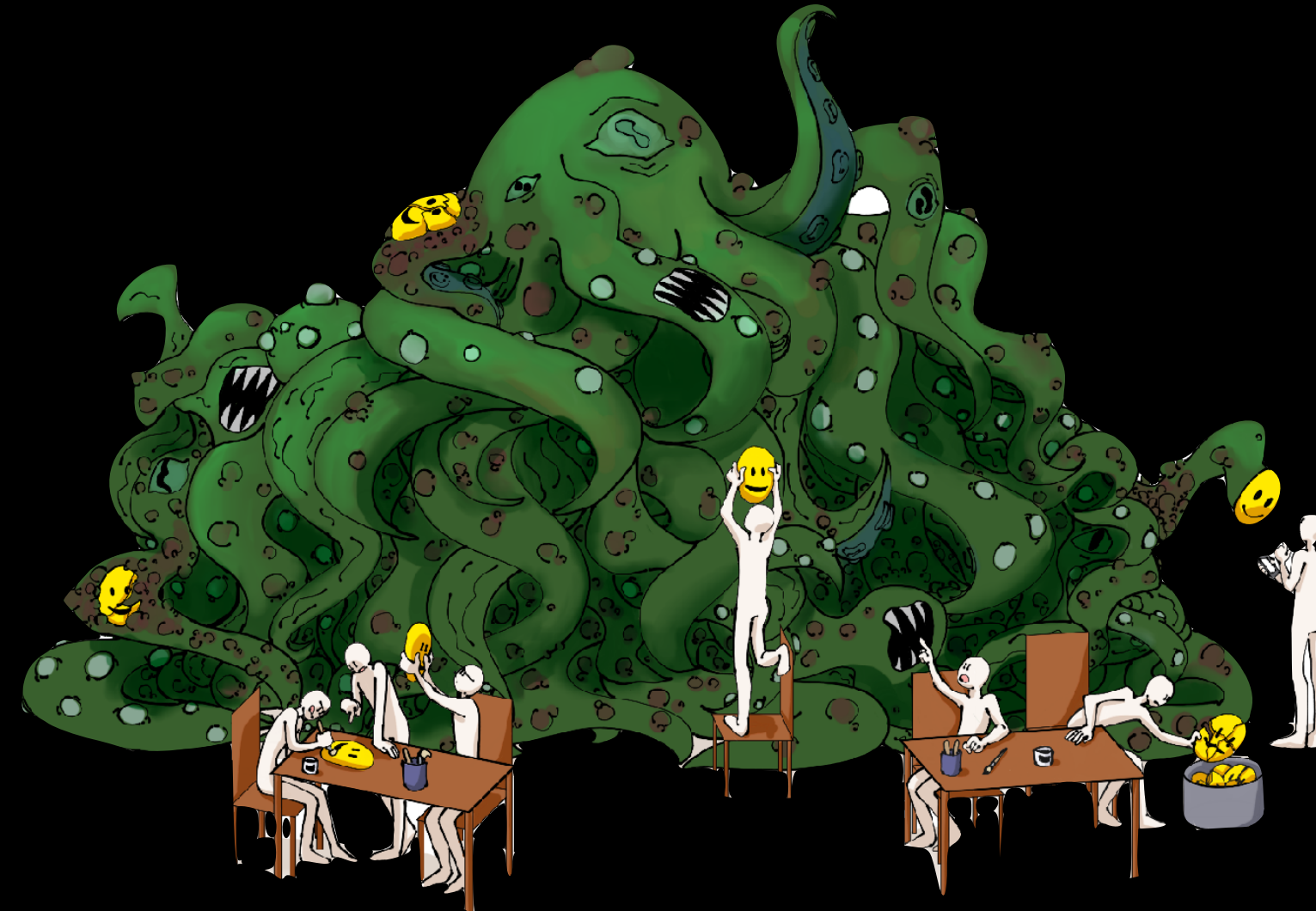
Store sprogmodeller



Fremskridt
uden forklaring

Snart

Tak



+

