



New era with AI

Challenges and opportunities

CMB - Ledarskapsdagen 2019

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The new spring in artificial intelligence is the most significant development in computing in my lifetime

— Sergey Brin, President ALPHABET



The development of full artificial intelligence could spell the end of the human race.... It would take off on its own, and re-design itself at an ever increasing rate. Humans, who are limited by slow biological evolution, couldn't compete, and would be superseded.”
— Stephen Hawking told the BBC

AI in the world



MIT is investing \$1 billion in an AI college



EU investing 1.5 billion euros in AI to catch up with US, Asia



China's Brave New World Of AI \$150 billion 2030

Sweden



WALLENBERG AI
AUTONOMOUS SYSTEMS
AND SOFTWARE PROGRAM

4+1 BSEK

AI Innovation Sweden 50 MSEK
Vinnova...



400 MSEK + Partners

Why is AI so important?



**Who is the
composer?**



Who is the painter?

Rembrandt

... next...



THE ULTIMATE GO CHALLENGE

GAME 5 OF 5

15 MARCH 2016



RESULT

**W+
Res**

NUMBER
OF MOVES

280

TIME
WHITE

2h+

TIME
BLACK

2h+

A photograph showing a patient lying on a table in a medical setting, possibly a hospital. The patient is wearing a colorful striped shirt and is lying on their back. A person in blue scrubs is standing next to the table, and their hands are visible near the patient's head. The scene is framed by a circular opening, suggesting a view through a doorway or a window. The background shows a typical hospital environment with a doorway and some medical equipment.

Soon, AI will prevent heart attack
GP, Sahlgrenska University Hospital



Autonomous driving

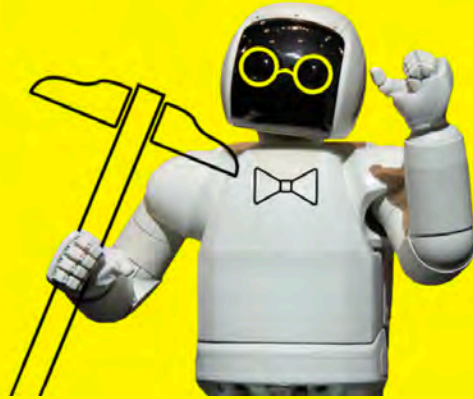


Finding dark matter by AI



Object/pattern recognition

Will Automation Affect Architects?



According to [The Economist](#), 47% of the work done by humans will have been replaced by robots by 2037, even those traditionally associated with university education. While the [World Economic Forum](#) estimates that between 2015 and 2020, 7.1 million jobs will be lost around the world

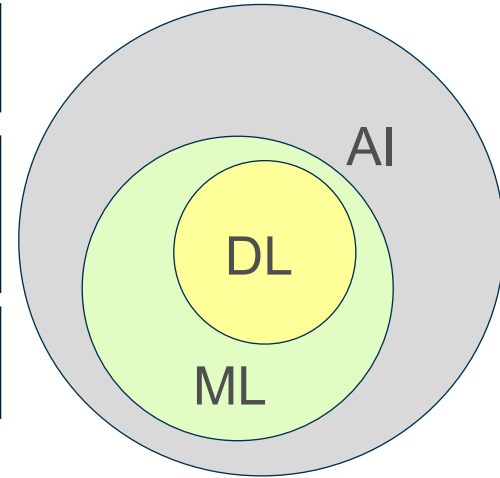
What is AI?

Artificial intelligence (AI, also machine intelligence, MI) is intelligence displayed by machines, in contrast with the natural intelligence (NI)

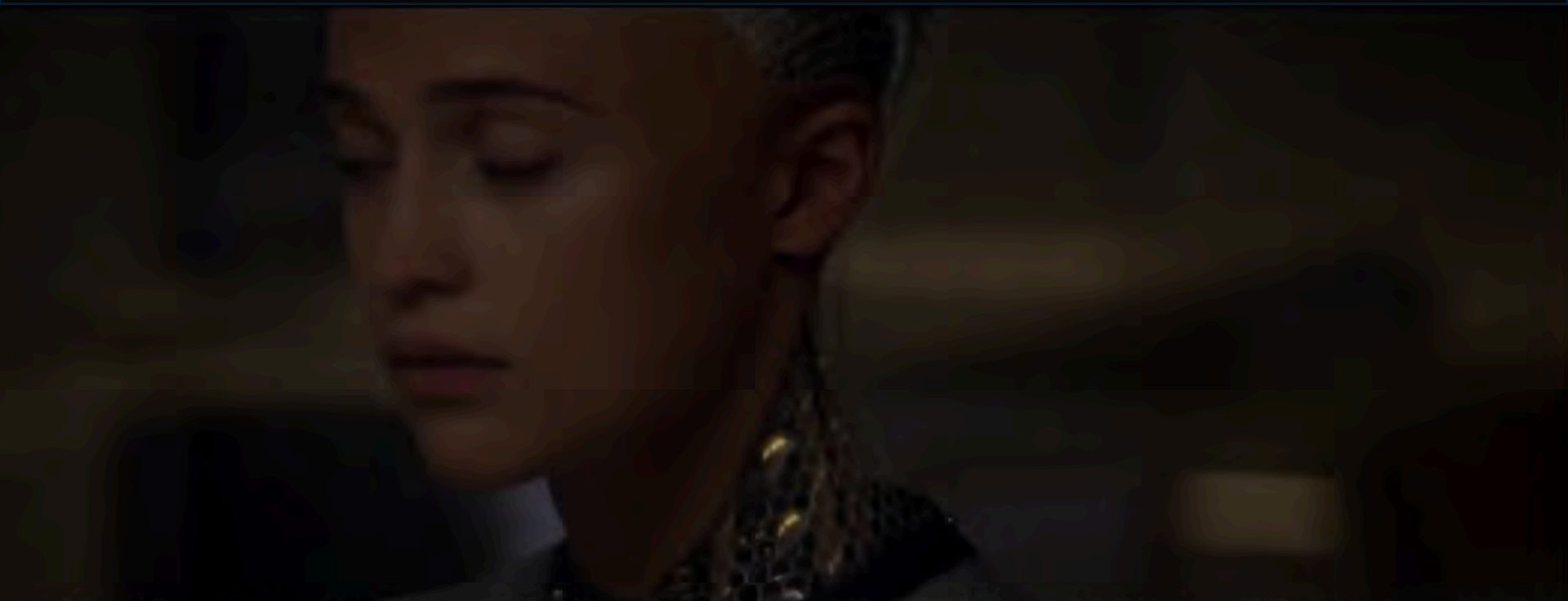
Machine learning is an application of AI that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.

Deep Learning is used in layers to create an Artificial “Neural Network” that can learn and make intelligent decisions on its own.

Artificial general intelligence (AGI) is the intelligence of a machine that could successfully perform any intellectual task that a human being can.

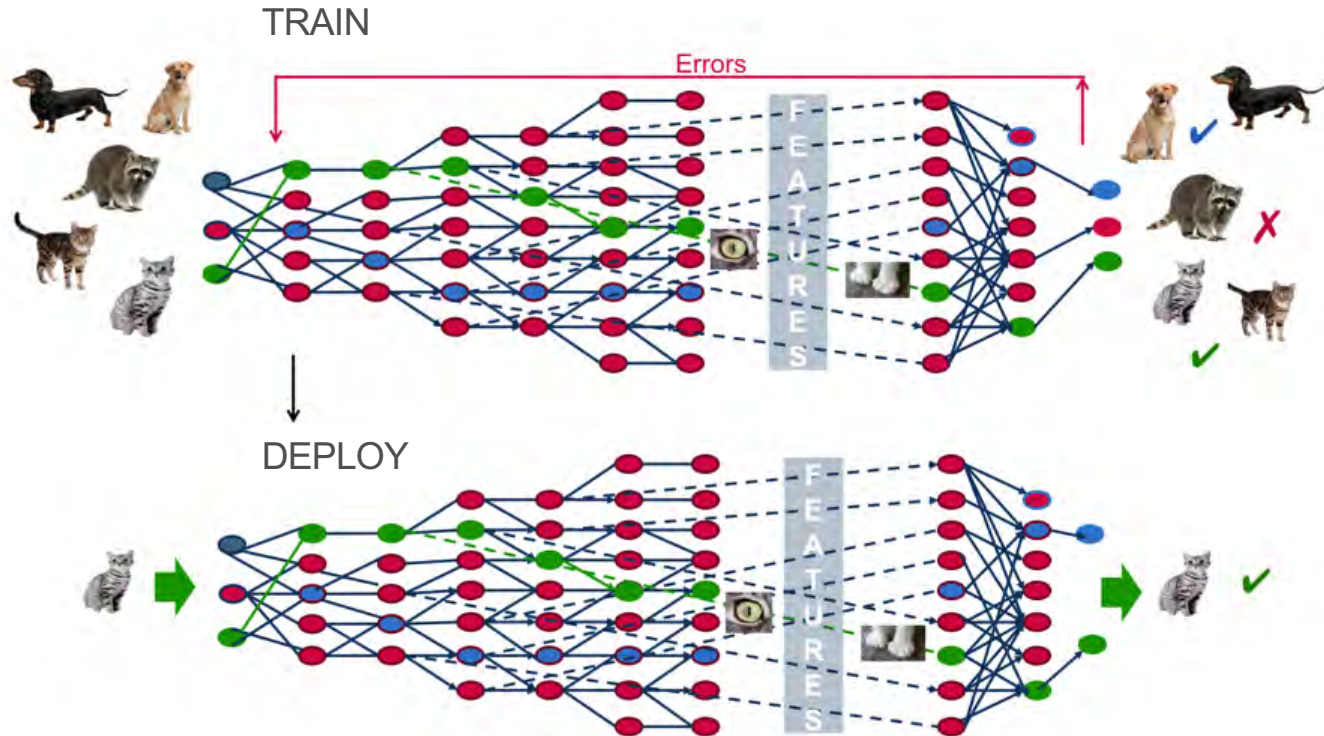


Artificial general intelligence - ex Machina



The challenge is to show you that she's a robot, and then see if you still feel she has consciousness.

What is Machine Learning/Deep learning?

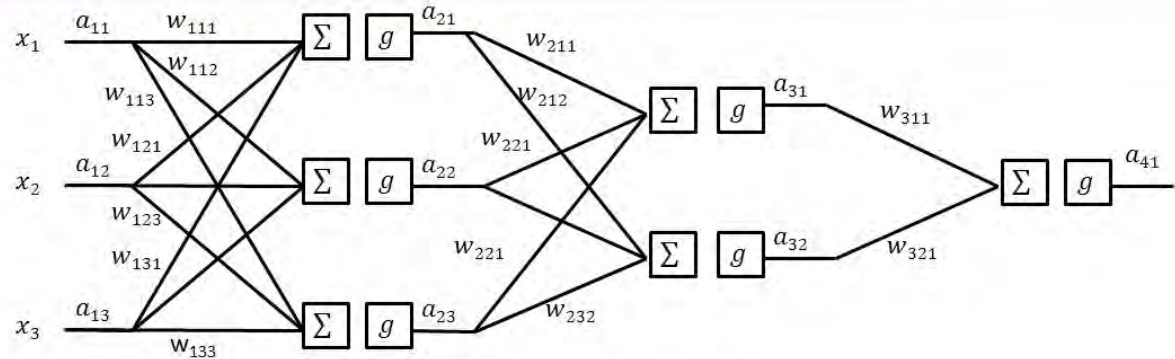


IS ML DIFFICULT TO PROGRAM?

Neural Network Equations

NO!

Output=f(input)



$$h_w(x) = a_{4,1}$$


$$a_{4,1} = g\left(\sum_i w_{3,i,1} a_{3,i}\right)$$

$$a_{3,1} = g\left(\sum_i w_{2,i,1} a_{2,i}\right)$$

$$a_{\ell,1} = g\left(\sum_i w_{\ell-1,i,1} a_{\ell-1,i}\right)$$

$$a_{1,1} = x_1$$

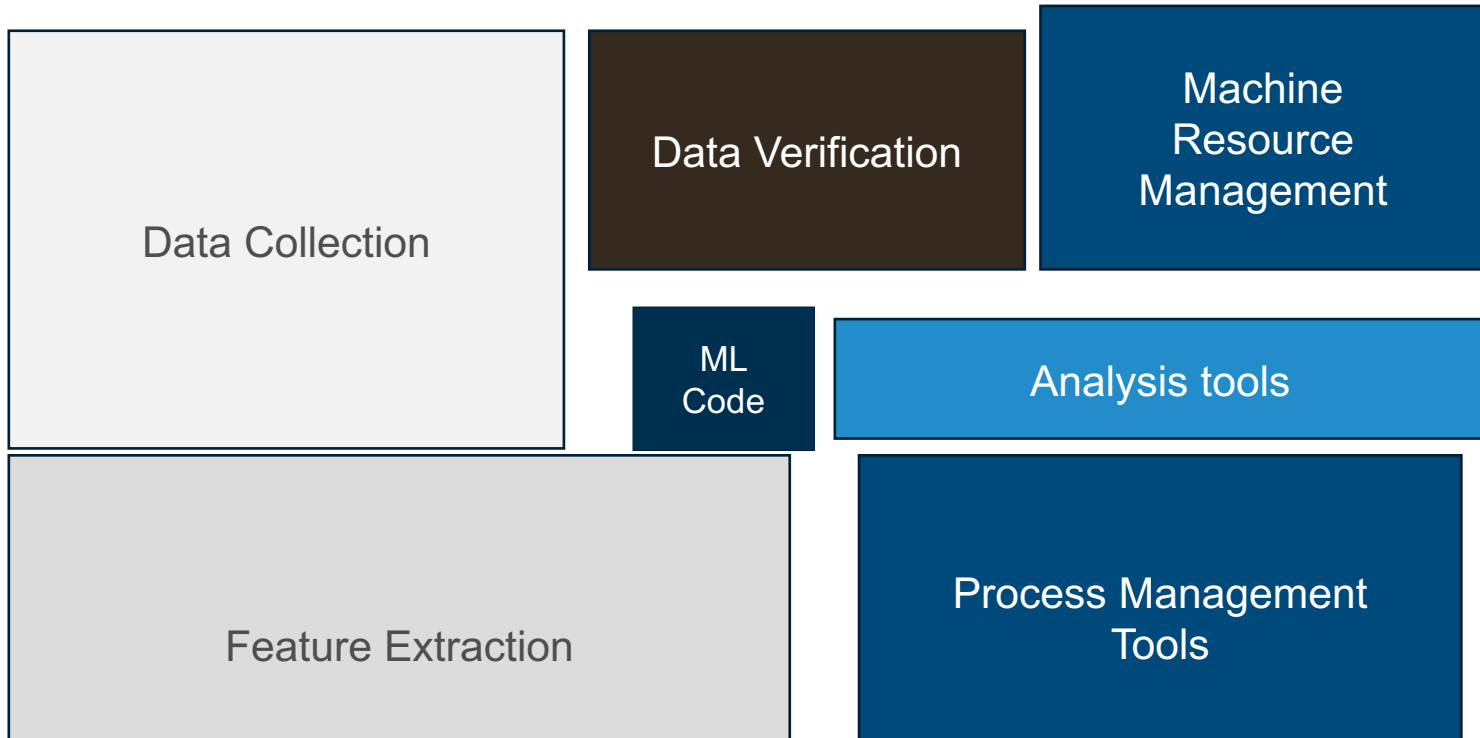
$$h_w(x) = g\left(\sum_k w_{3,k,1} g\left(\sum_j w_{2,j,k} g\left(\sum_i w_{1,i,j} x_i\right)\right)\right)$$



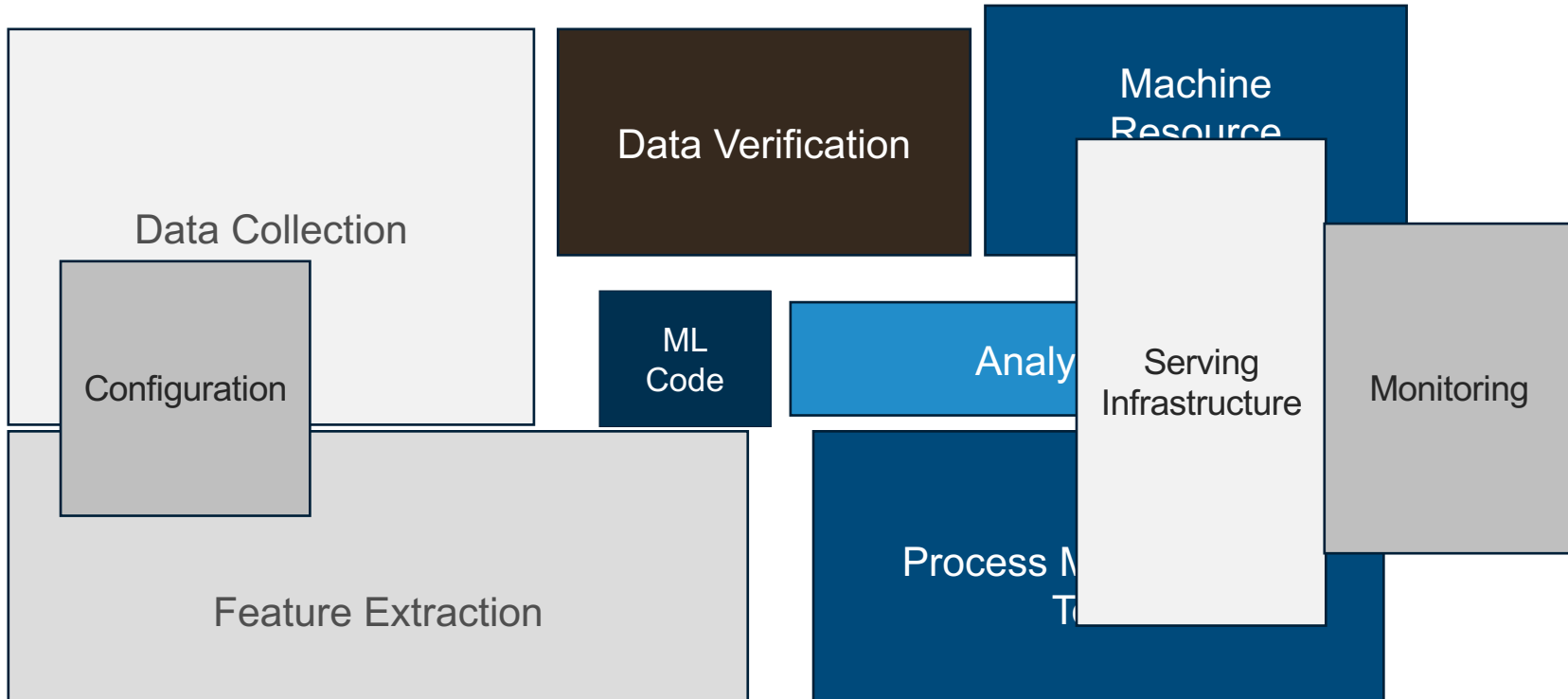
What is then a problem?

ML Code

Google: D. Sculley, G. Holt, D. Golovin, E. Davydov, T. Phillips, D. Ebner, V. Chaudhary, M. Young, J.-F. Crespo, and D. Dennison, "Hidden technical debt in machine learning systems," in *Advances in Neural Information Processing Systems*, 2015, pp. 2503–2511



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There will be winners & losers

New disruptive market leaders have moved full steam ahead with deep learning for years
(not mentioning big tech Amazon, Google, FB, Apple & Microsoft)

NETFLIX



TESLA





What shall we do?

**Chalmers Foundation
& Chalmers University of Technology**

**Investment ca 400 MSEK
Chalmers AI Centre
(CHAIR) 2019-2028**

**+ partners
200-300 MSEK**





VOLVO
Volvo Group



CEVT

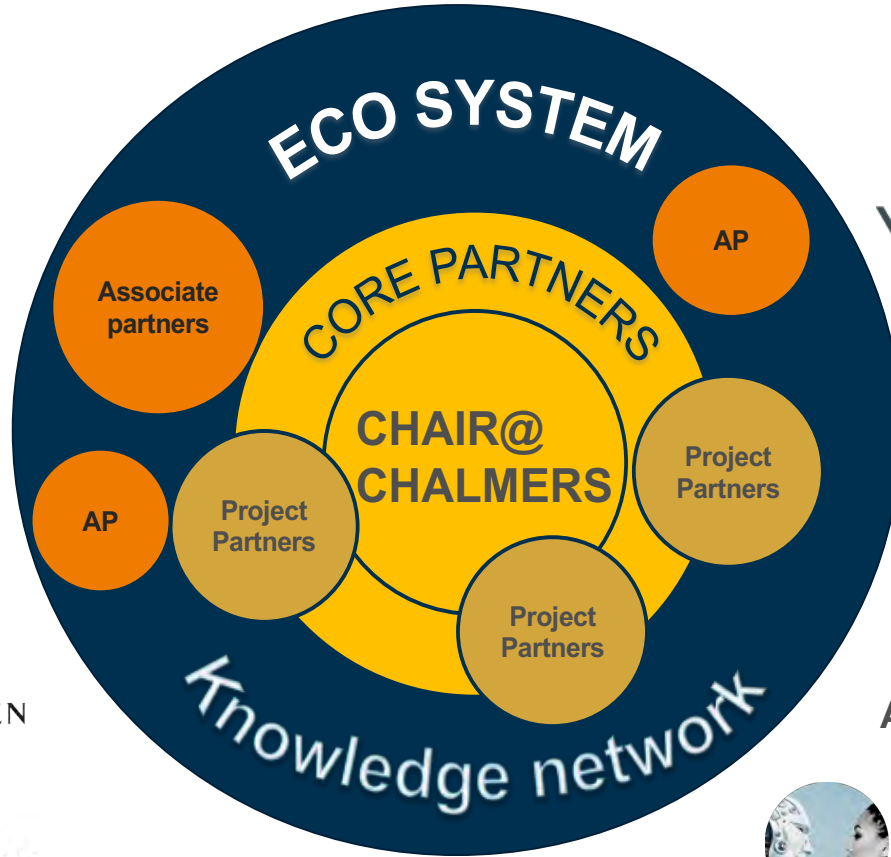
ERICSSON

veoneer

ZENUITY
Make it real.

**VÄSTRA
GÖTALANDSREGIONEN**

FRAUNHOFER CHALMERS
RESEARCH CENTRE FOR INDUSTRIAL MATHEMATICS



AstraZeneca

WASP | WALLENBERG AI,
AUTONOMOUS SYSTEMS
AND SOFTWARE PROGRAM



VINNOVA
Sveriges innovationsmyndighet.



SAAB

AI Innovation of Sweden



AI SUSTAINABILITY CENTER

PRICIPLES & STRATEGY – selected areas in AI

Focus and openness to new ideas

COLLABORATION PROJECTS
- with partners

Transport

Automation and IoT

Life science and Health E.

Ethics
Sustainability

AI ENABLERS

AI-based Systems and Software

Equality

CHALMERS PROJECTS
Advancing CHAIR activities

AI FOUNDATION

AI Theories and Algorithms

Innovation



“LET’S HUNT SOME ORC.”
ARAGORN

Let’s do
some
AI



CHALMERS
UNIVERSITY OF TECHNOLOGY