

Agenda: AI & Health Data

IN5090

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UNIVERSITY
OF OSLO



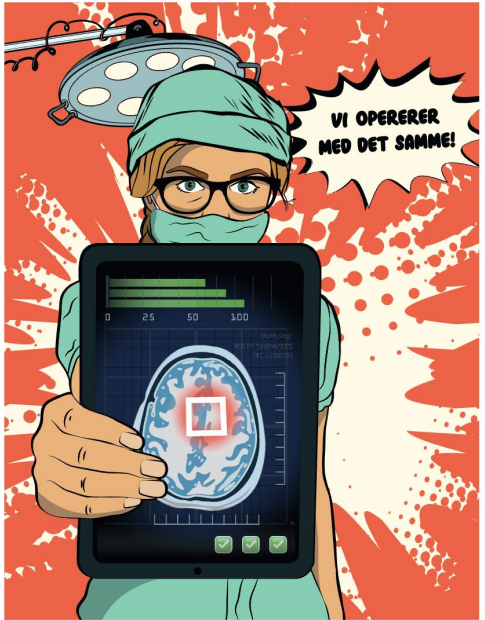
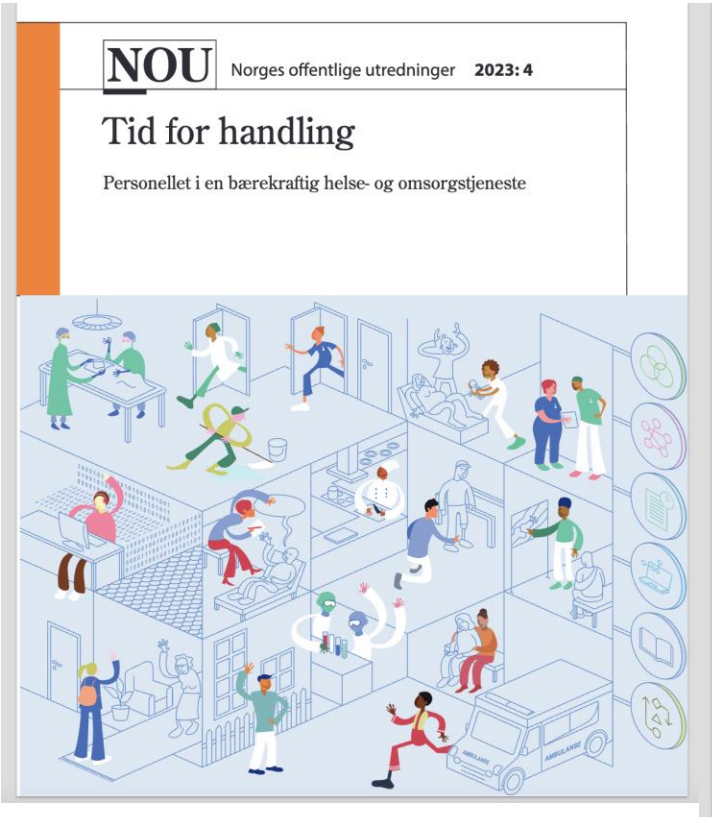
Agenda: AI & Health Data

Visions and use cases of AI in healthcare

General intro to AI

What is special about contemporary AI
(hint: data)

Group discussions



KUNSTIG INTELLIGENS I KLINIKKEN

Seks trender for fremtidens helsetjeneste

Teknologirådet

Felles KI-plan for trygg og effektiv bruk av KI i helse og omsorgstjenesten 2024 - 2025

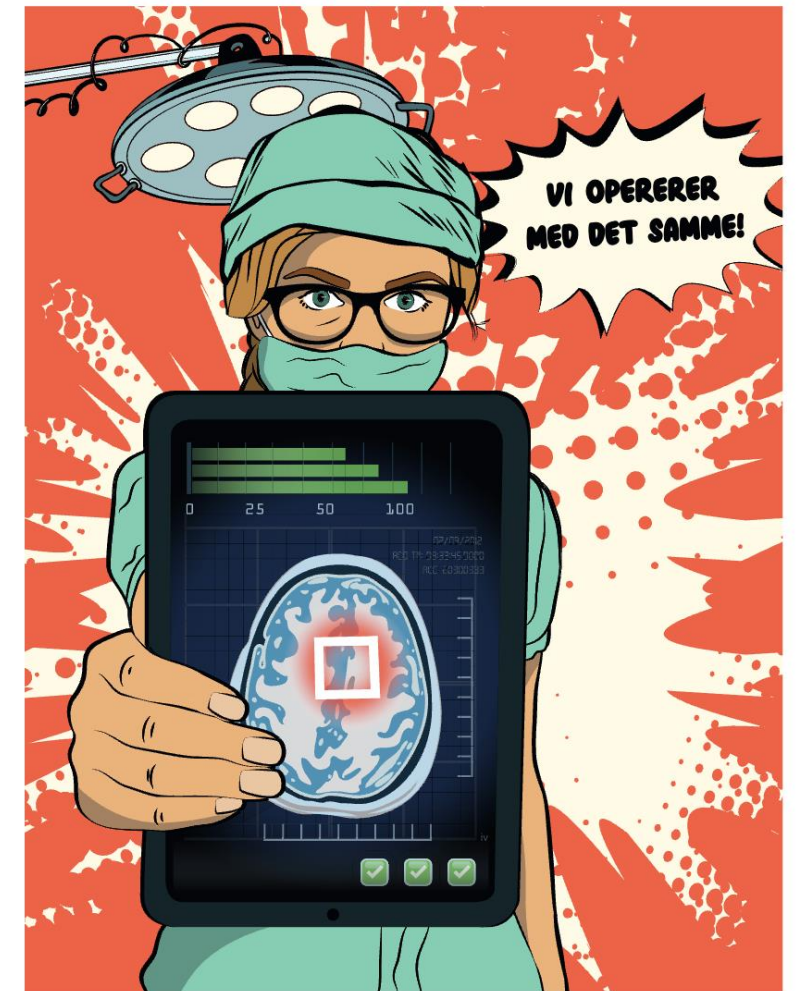
Publisert: 13. august 2024

Innhold

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Innledning	→
Kapittel 1 Sektorsamarbeid om KI	→
Kapittel 1.1 Igangsatt: KI-råd for helse- og omsorgssektoren	→
Kapittel 1.2	

Six Trends for the Future of Healthcare:

- Better administration (automation of labor-intensive routines)
- Medical research
- Clinical applications
- Public health-related applications



KUNSTIG INTELLIGENS I KLINIKKEN

Seks trender for fremtidens helsetjeneste



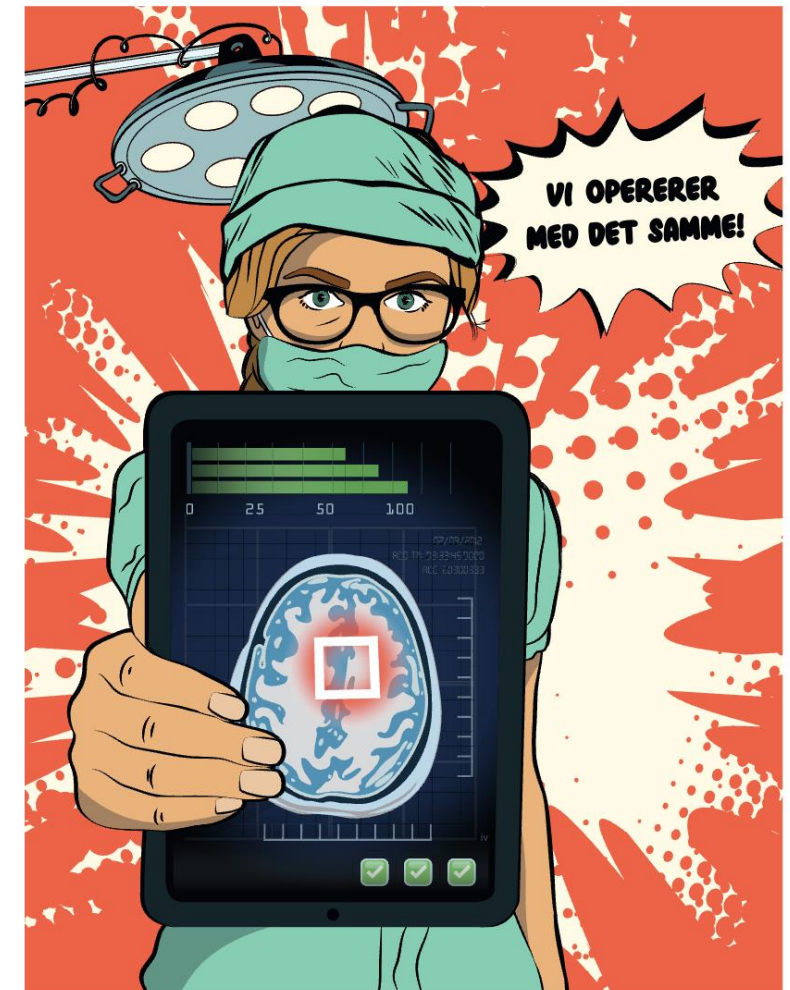
Teknologirådet

- **General practitioner services:** where there is a need to inform a large number of patients and relatives about concrete, well-documented diagnoses and health conditions. It will be possible to develop automated solutions that provide information, refer patients to specialists, and suggest treatment options.

- **Support for healthcare personnel:** such as interpreting tests and medical images, quickly summarizing literature, and assessing prognoses for alternative treatments. This would lead to faster analyses, decision-making, and initiation of treatment, while also reducing the number and duration of doctor consultations.

- **Automatic data transfer from patients and users:** which can be used to notify when treatment, consultations, or medication is needed. This could enable significantly faster diagnostics than what is possible through traditional methods.

- **Monitoring tasks:** such as selecting individuals for participation in screening programs, based on composite information that calculates the probability of developing different types of diseases. This would allow for better targeting of preventive examinations and treatments, ensuring that only individuals with a high likelihood of developing a disease are examined.



KUNSTIG INTELLIGENS I KLINIKKEN

Seks trender for fremtidens helsetjeneste



Teknologirådet

Eit norsk dataprogram med kunstig intelligens skal gi fastlegen meir tid til pasienten, og samtidig gjera arbeidsdagen enklare for legen.

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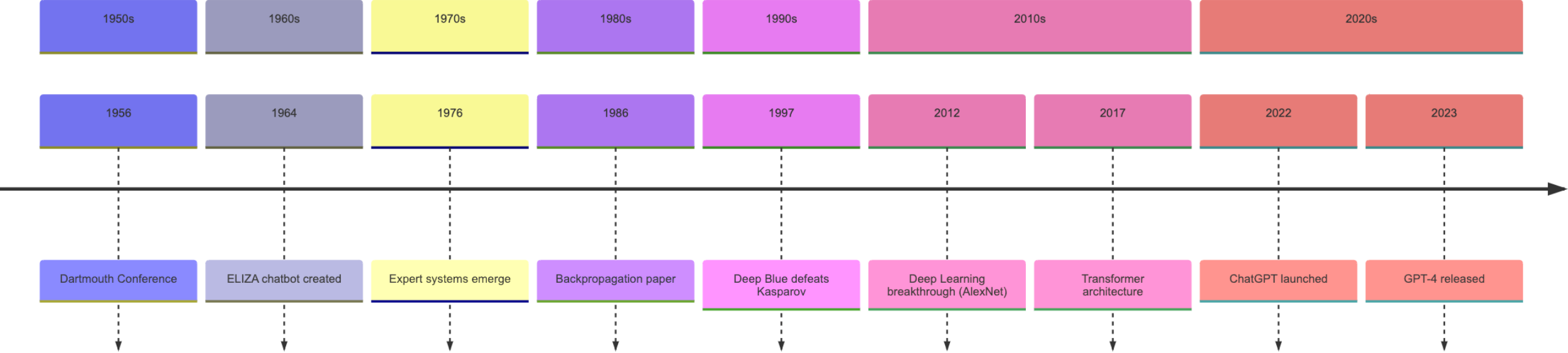


Ingvald Nordmark
Journalist

Publisert 28. okt. 2024 kl. 21:30

FOTO: JONAS KROKEN SÆVEREIDE

Key Milestones in Artificial Intelligence



«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»

John McCarthy (Dartmouth College), Marvin L. Minsky (MIT), Nathaniel Rochester (IBM), and Claude Shannon (Bell Laboratories) , 1955

Part of [Chapter I: General Provisions](#)

Article 3: Definitions

Date of entry into force:

2 February 2025

According to:

Article 113(a)

Inherited from:

Chapter I

See here for a [full implementation timeline](#).

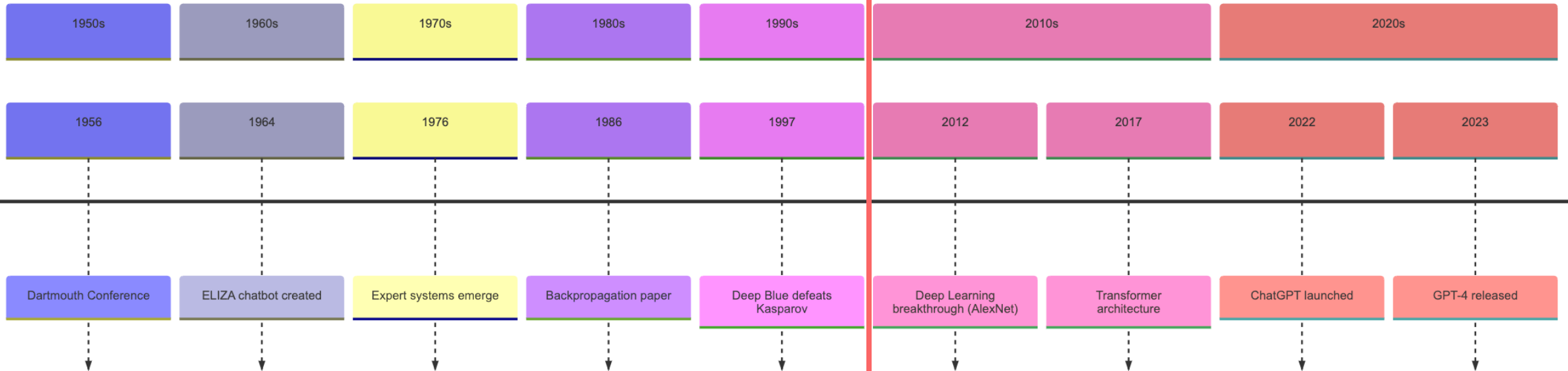
SUMMARY +

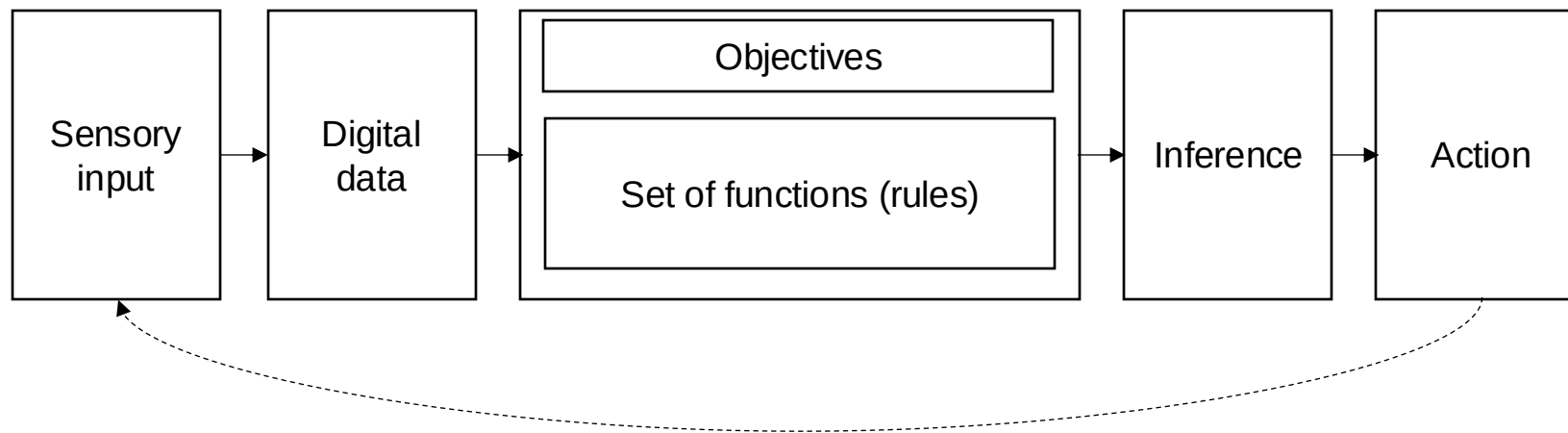
For the purposes of this Regulation, the following definitions apply:

(1) ‘AI system’ means a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments; [Related: Recital 12](#)

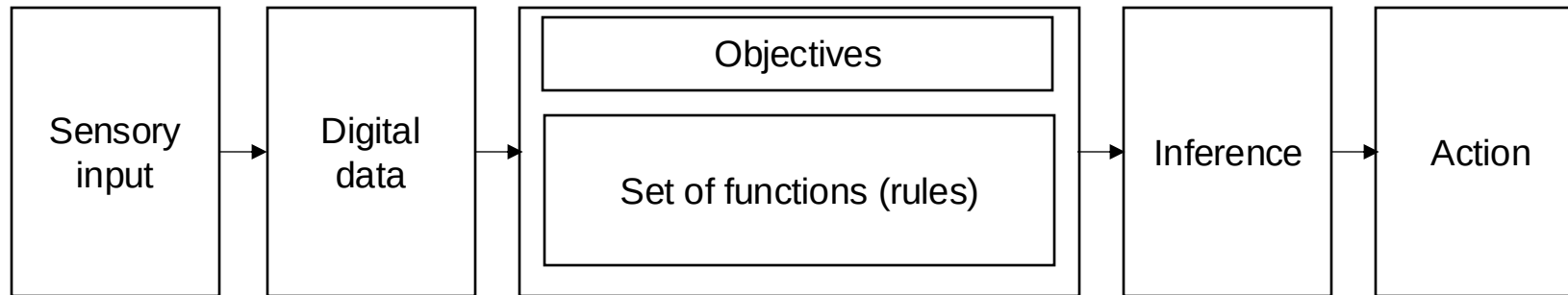
Symbolic AI

Machine learning -> Deep learning





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```

FUNCTION DetectHypertension(patient)
  // Initialize tracking variables
  readings = []
  consecutiveHighReadings = 0
  riskScore = 0

  // Collect multiple readings over time
  FOR i = 1 TO 3
    systolic = GetSystolicPressure(patient)
    diastolic = GetDiastolicPressure(patient)
    readings.append([systolic, diastolic])
    WAIT_TIME(5 minutes)
  END FOR

  // Calculate average readings
  avgSystolic = CalculateAverage(readings.systolic)
  avgDiastolic = CalculateAverage(readings.diastolic)

  // Assess blood pressure classification
  IF avgSystolic >= 180 OR avgDiastolic >= 120 THEN
    RETURN "Hypertensive Crisis - Seek Emergency Care"
  END IF

  IF avgSystolic >= 140 OR avgDiastolic >= 90 THEN
    classification = "Stage 2 Hypertension"
  ELSE IF avgSystolic >= 130 OR avgDiastolic >= 80 THEN
    classification = "Stage 1 Hypertension"
  ELSE IF avgSystolic >= 120 AND avgSystolic < 130 AND avgDiastolic < 80 THEN
    classification = "Elevated"
  ELSE
    classification = "Normal"
  END IF

```

```

// Assess risk factors
riskFactors = AssessRiskFactors(patient)
FOR EACH factor IN riskFactors
  SWITCH factor
    CASE "age > 65": riskScore += 2
    CASE "obesity": riskScore += 2
    CASE "family_history": riskScore += 2
    CASE "smoking": riskScore += 1
    CASE "high_sodium_diet": riskScore += 1
    CASE "physical_inactivity": riskScore += 1
    CASE "excessive_alcohol": riskScore += 1
    CASE "diabetes": riskScore += 2
    CASE "high_cholesterol": riskScore += 1
  END SWITCH
END FOR

// Generate recommendation
recommendation = GenerateRecommendation(classification, riskScore)

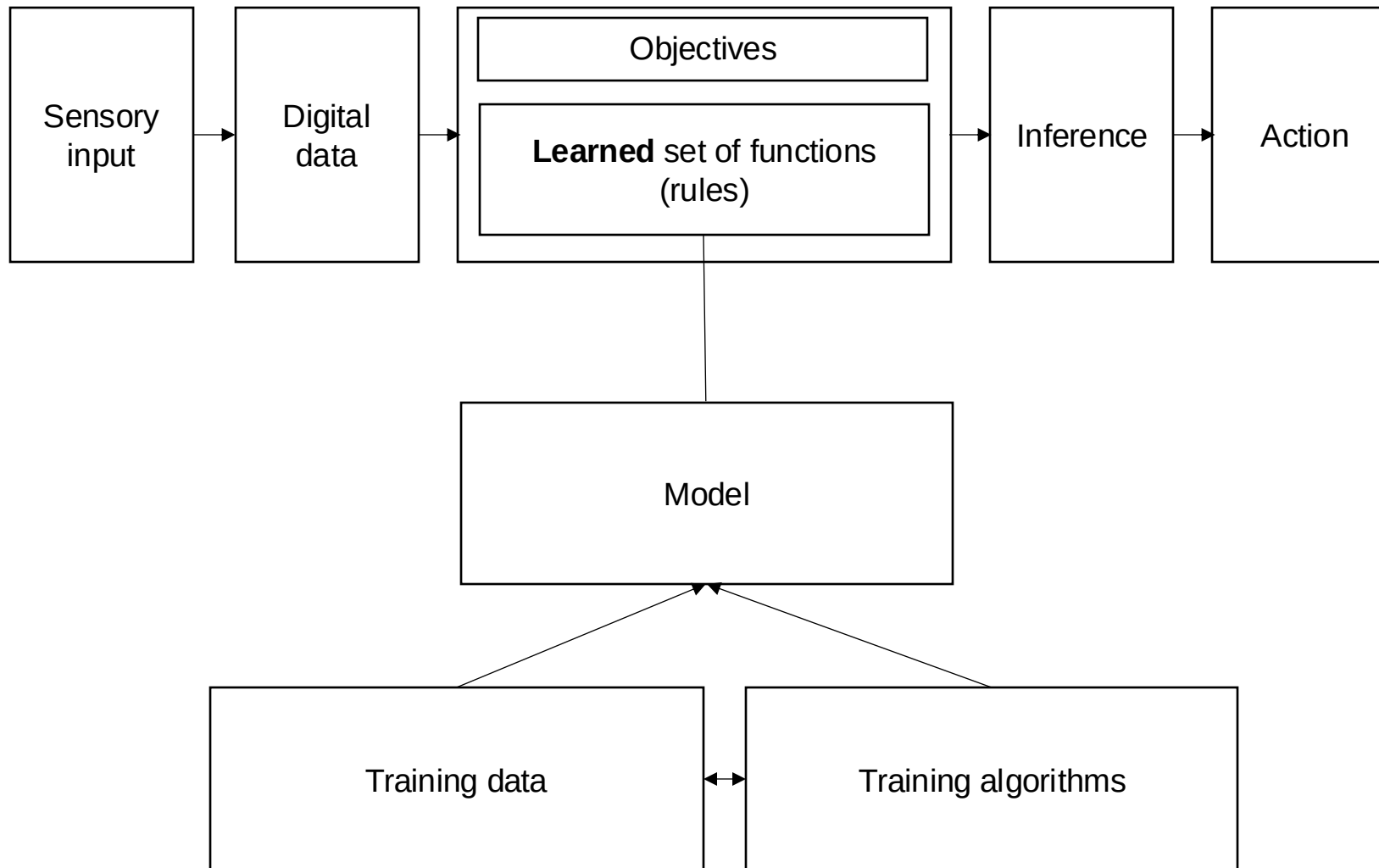
RETURN {
  "classification": classification,
  "average_systolic": avgSystolic,
  "average_diastolic": avgDiastolic,
  "risk_score": riskScore,
  "recommendation": recommendation
}
END FUNCTION

FUNCTION GenerateRecommendation(classification, riskScore)
  IF classification == "Normal" AND riskScore < 3 THEN
    RETURN "Annual screening recommended"
  ELSE IF classification == "Elevated" OR riskScore >= 3 THEN
    RETURN "Lifestyle modifications and monitoring every 3-6 months"
  ELSE IF classification == "Stage 1 Hypertension" THEN
    RETURN "Lifestyle modifications and possible medication, monthly monitoring"
  ELSE IF classification == "Stage 2 Hypertension" THEN
    RETURN "Immediate medication and lifestyle modifications, bi-weekly monitoring"
  END IF
END FUNCTION

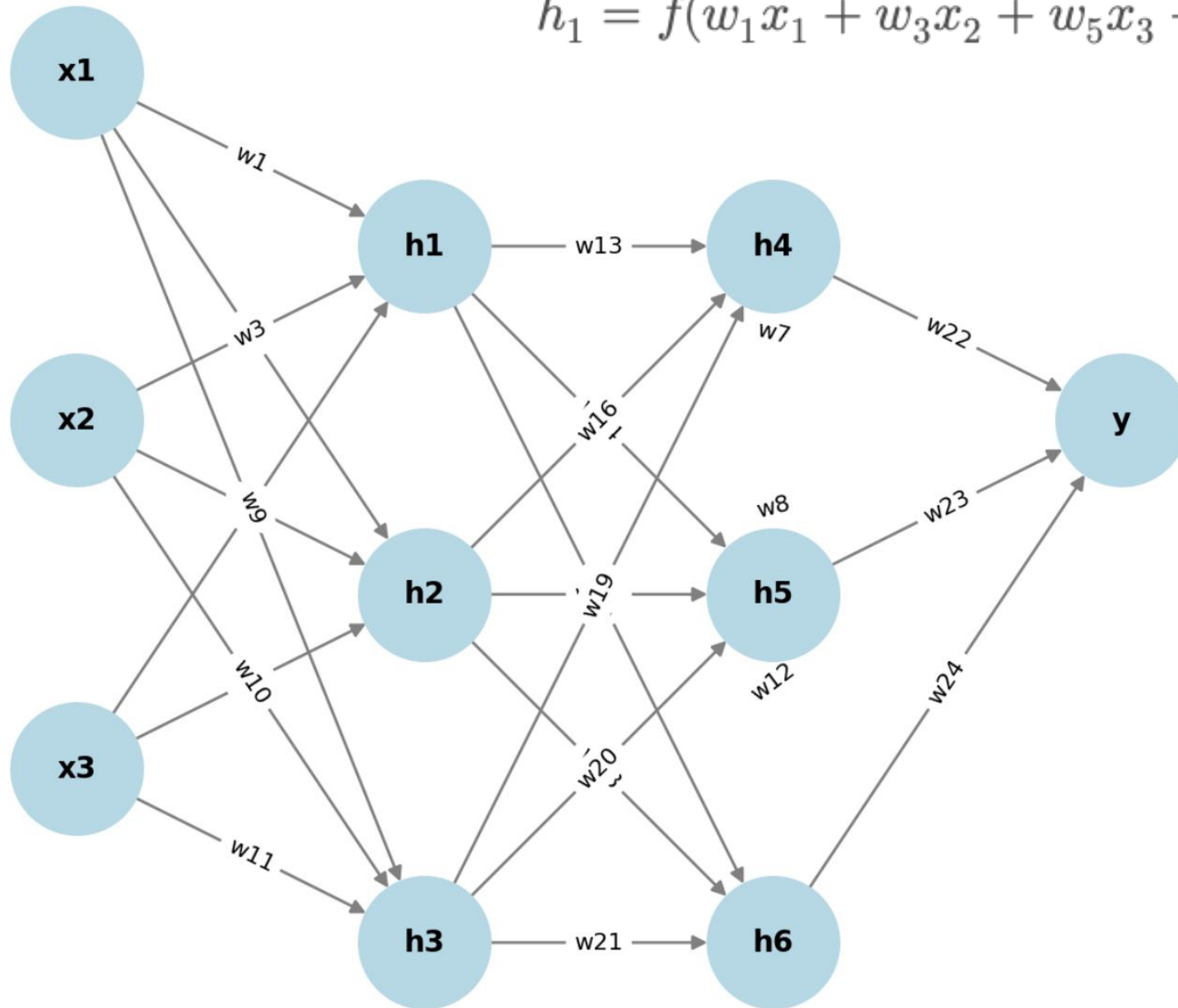
```



the cat sat on the ____

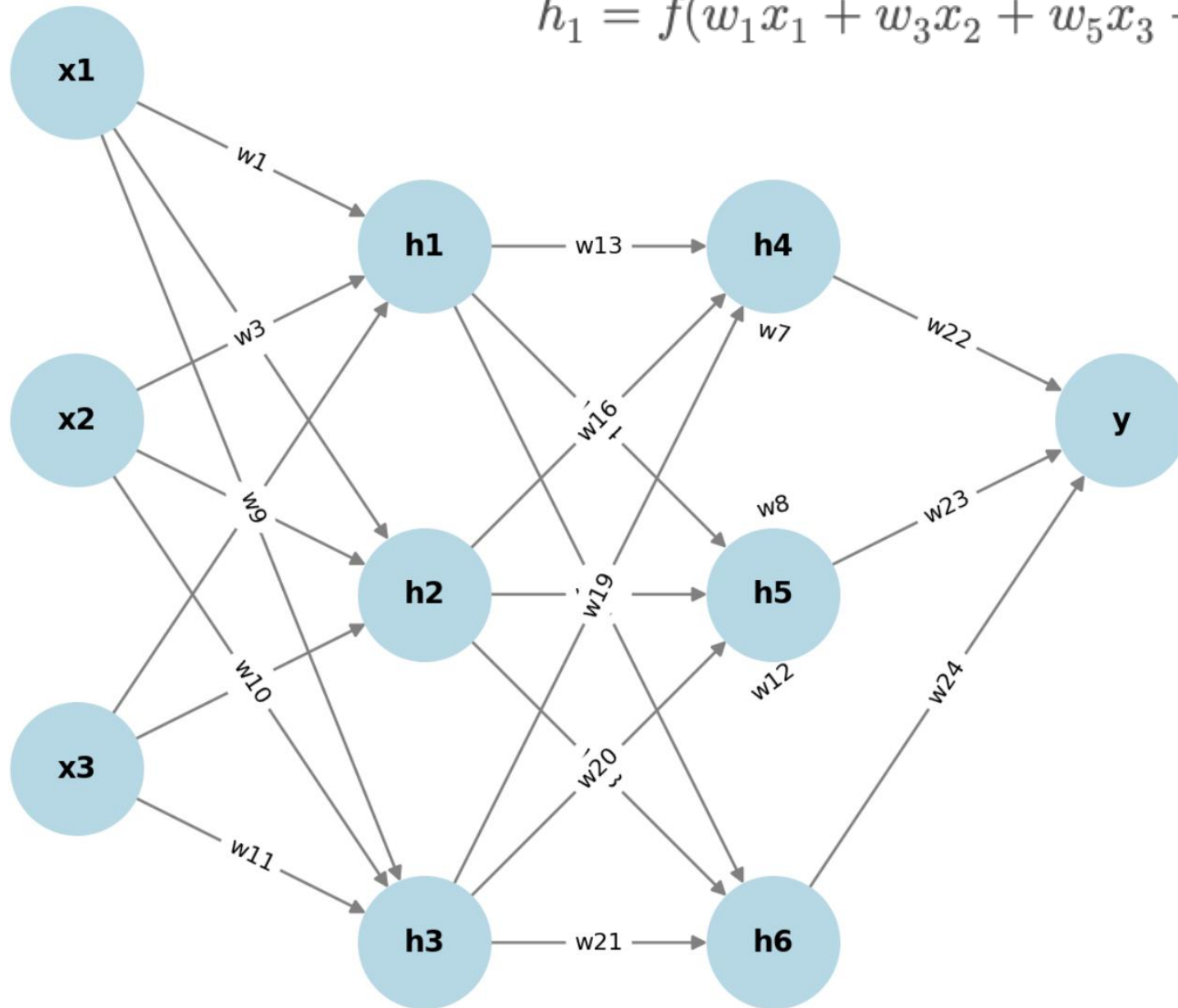


$$h_1 = f(w_1x_1 + w_3x_2 + w_5x_3 + b_1)$$



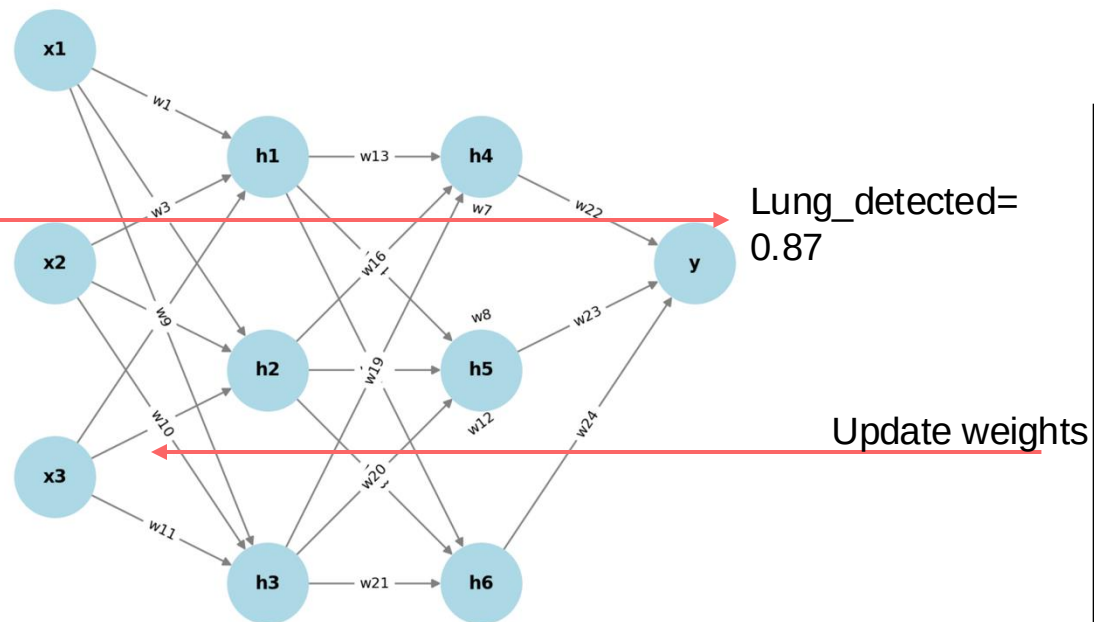
<https://www.youtube.com/watch?v=DwQyv4Uerc8>

$$h_1 = f(w_1x_1 + w_3x_2 + w_5x_3 + b_1)$$

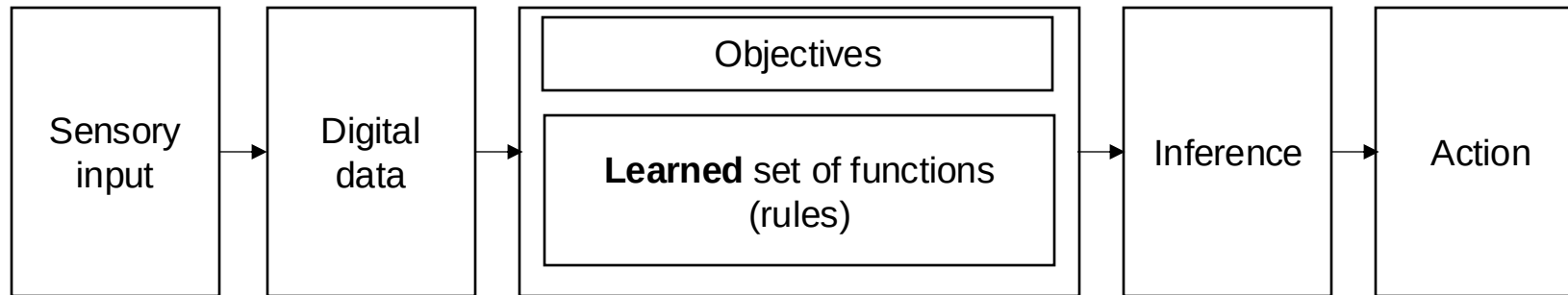


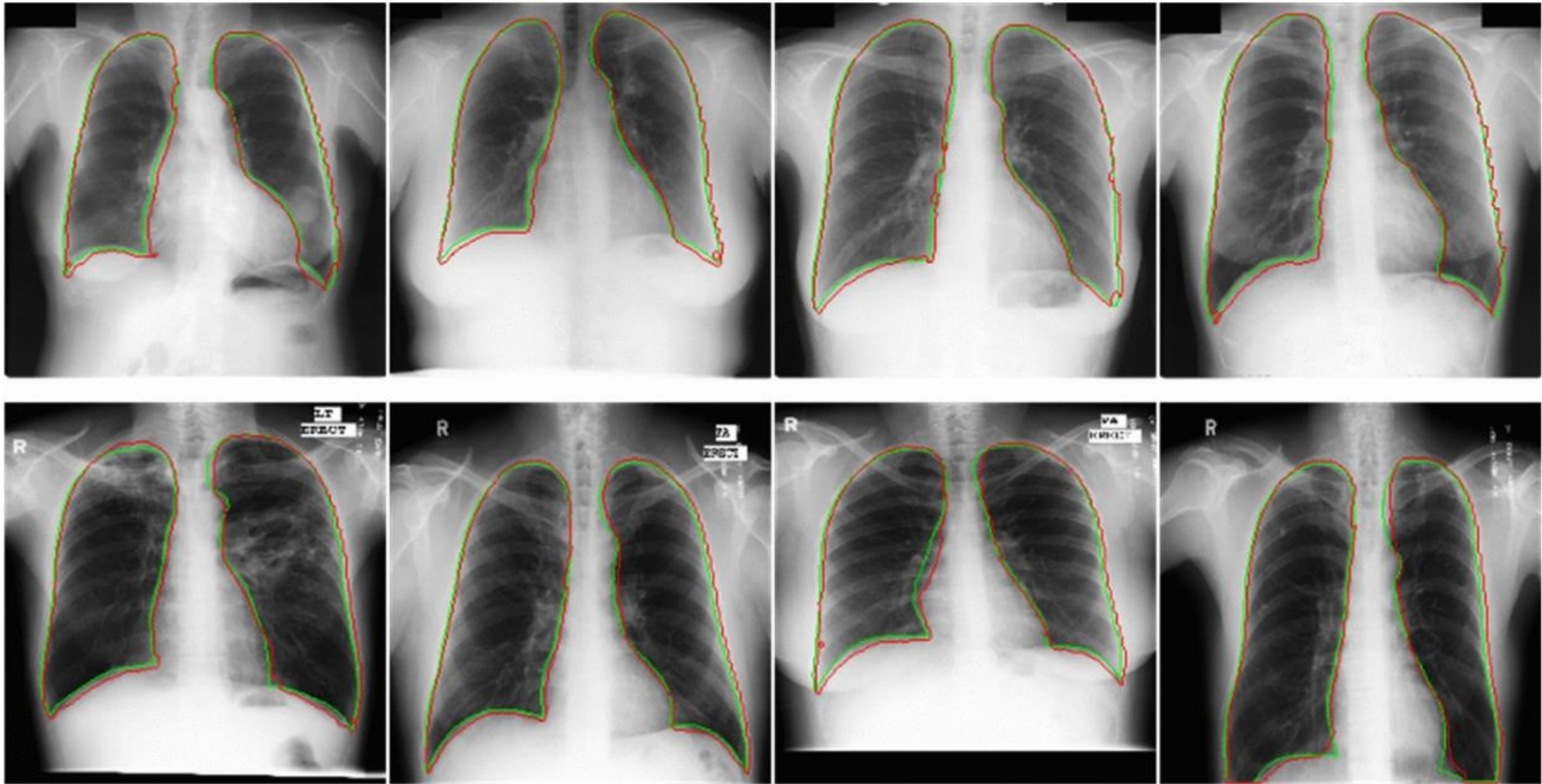


#	0
1	0.3176470588235294
2	0.043137254901960784
3	0.06666666666666667
4	0.06666666666666667
5	0.06666666666666667
6	0.06666666666666667
7	0.06666666666666667
8	0.06666666666666667



Evaluation
Lung_detected=1.0





The first row is the lung segmentation result in the JSRT dataset, and the second row is the segmentation results in the MC dataset. The ground-truth lung boundary is depicted in green, and the automatically segmented lung boundary by our method is presented in red color.

Group Case Analysis: AI for Diabetic Retinopathy Screening

- Create a google slide deck. Share it with your group and alexansk@uio.no
- The deck will have three slides
- Your slides can have both text and visualizations
- We will return to these slides later in the course – after you have learned about standardization, interoperability, etc.

Slide 1:

Recall our previous case: Manual grading of retinal images

- Questions to discuss:

- What is diabetic retinopathy and how do you detect it
- What was the case about?
- How do clinicians currently grade the retinal images?
- What data do they use?

Implementing AI: What are options?

When implementing AI, like automated diabetic retinopathy grading, organizations typically face a fundamental choice: they can either train their own model using local data and expertise, or they can procure an existing model that has already been developed and validated. Both approaches present distinct data-related challenges that need careful consideration.

Slide 2:

What data challenges would we face if developing and implementing our own AI model for diabetic retinopathy grading?

Slide 3:

What data challenges would we face when procuring and implementing a pre-trained model?