Overcoming The First Hurdle of AI/ML Implementation in Environmental Workflows:

The AI Accountability Paradox

NEBC Business & The Environment Conference, 2025

Demystifying AI and Its Real World Applications

Gunnar Guddal, Anchor QEA

December 9, 2025

ANCHOR QEA

Gunnar Guddal

- Data scientist, statistician, modeler, environmental chemist, and co-lead of platform & productivity engineering group at Anchor QEA
- A lifelong passion for and over a decade of professional experience using technology to advance environmental problem solving

ANCHOR QEA

The AI Accountability Paradox

Outline

- Definitions
- The Accountability Paradox
- Overcoming The Paradox
- What Comes Next

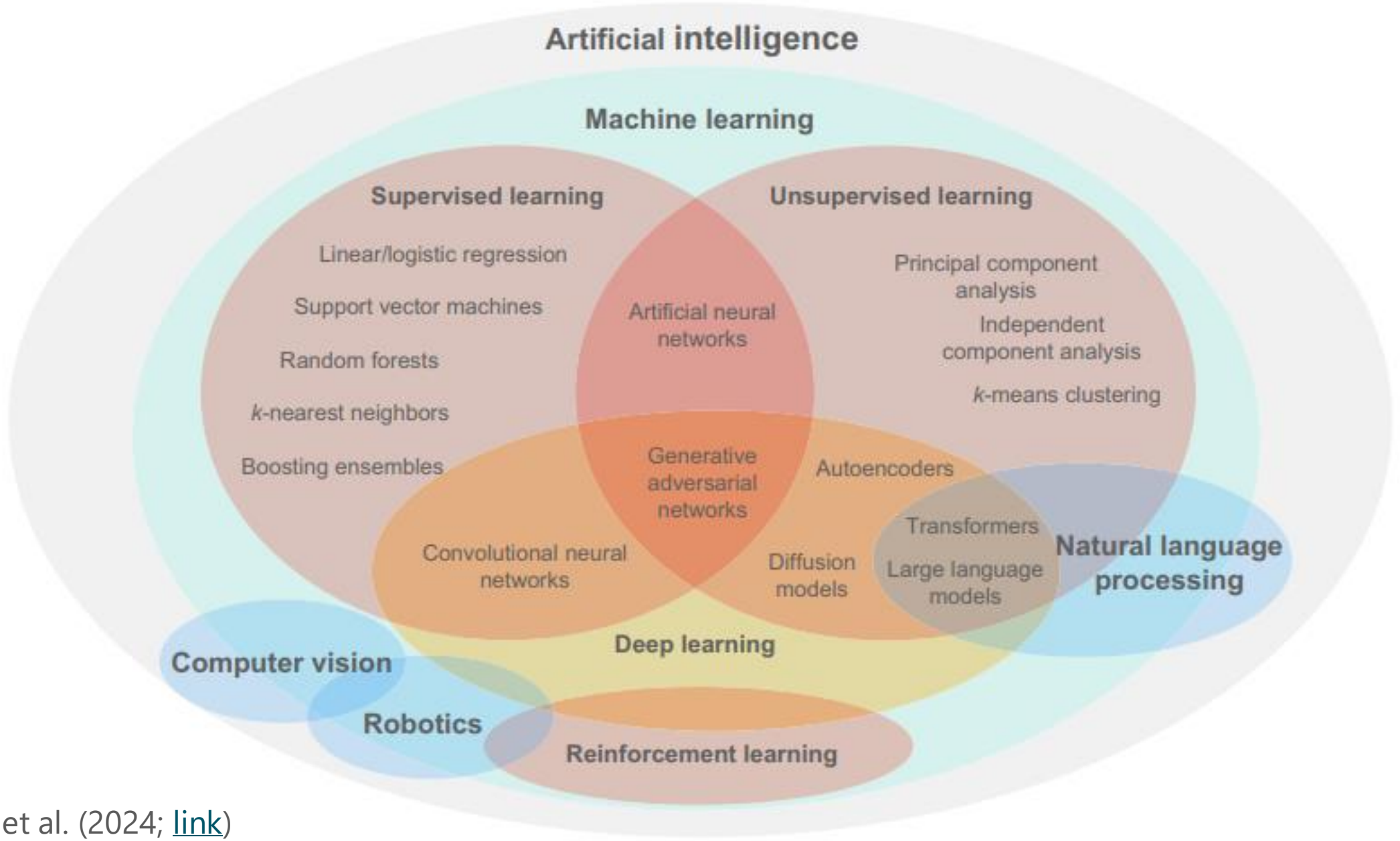
What Do I Mean When I Say “AI”?

Definitions

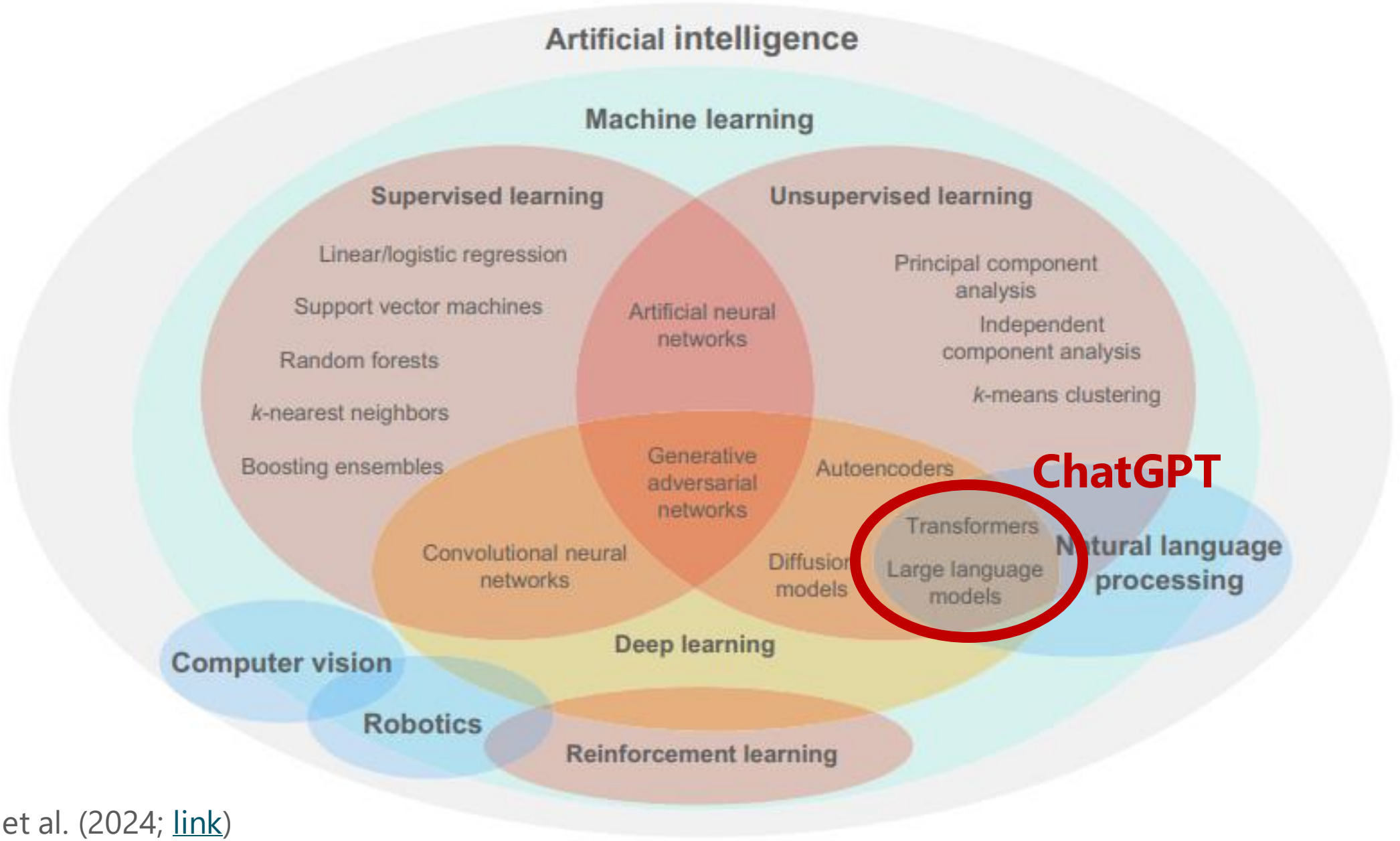
Artificial Intelligence

The capability or application of computer systems to perform tasks or produce outputs that would normally require human intelligence

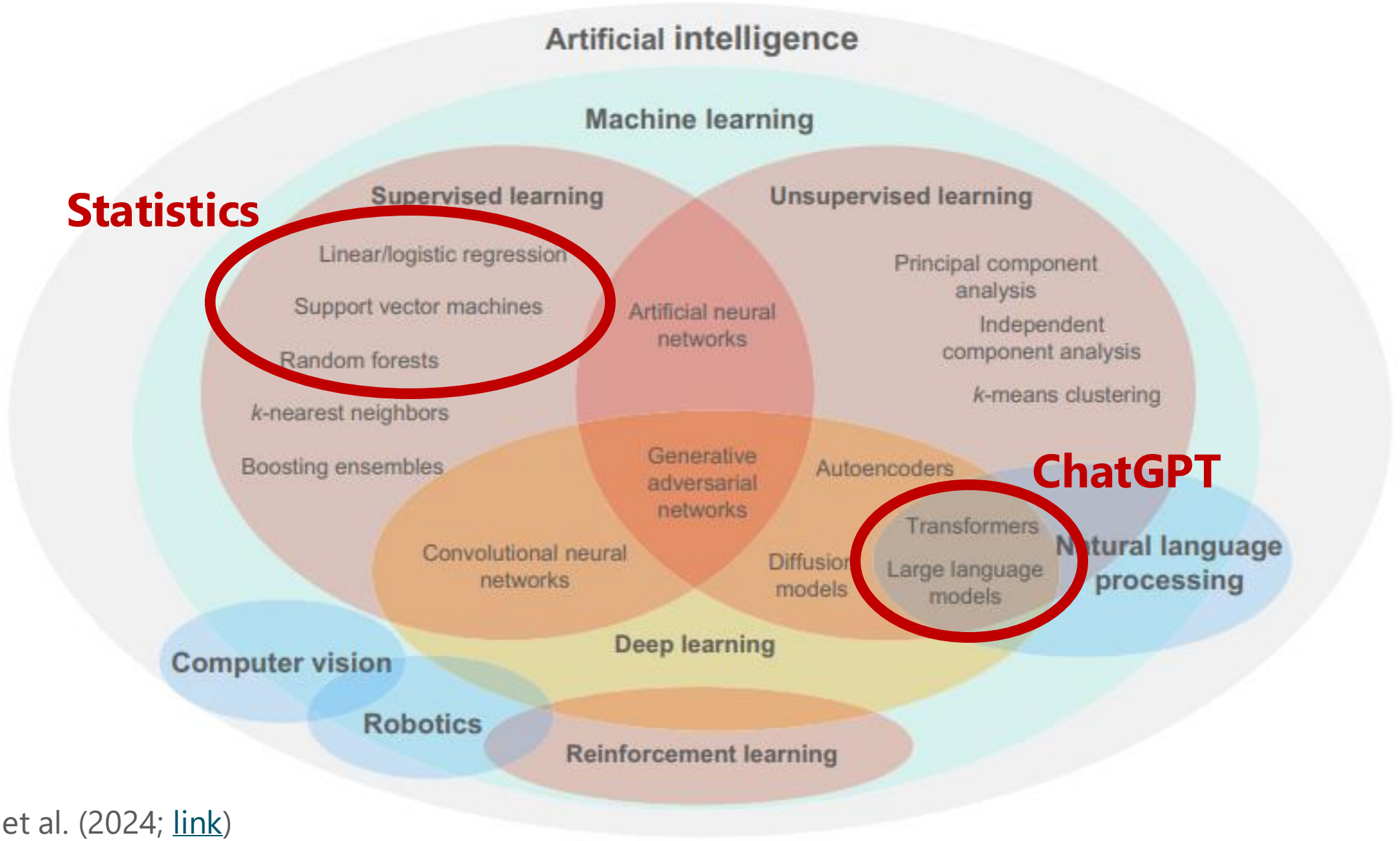
Oxford, NASA, Wikipedia



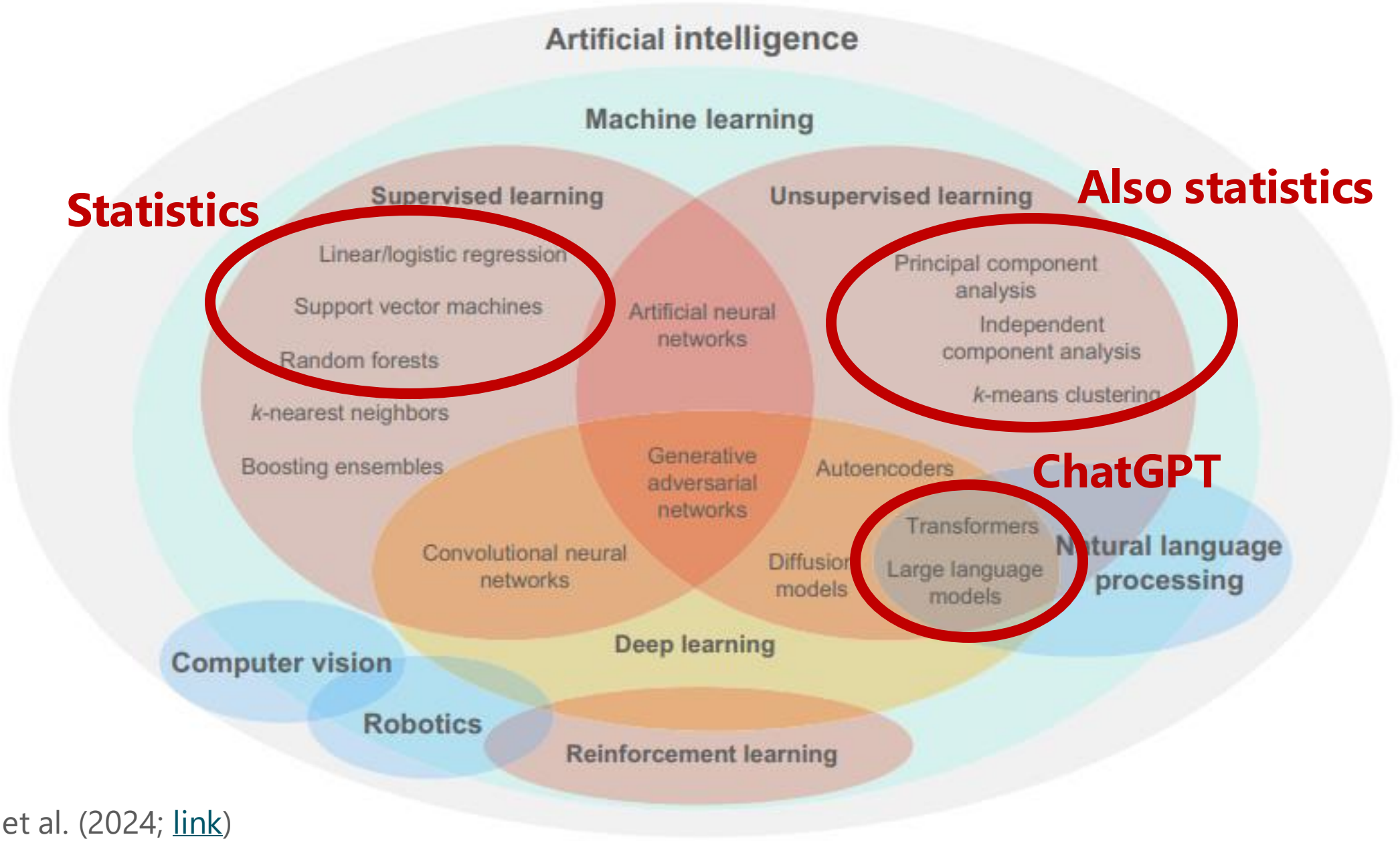
Hanassab et al. (2024; link)



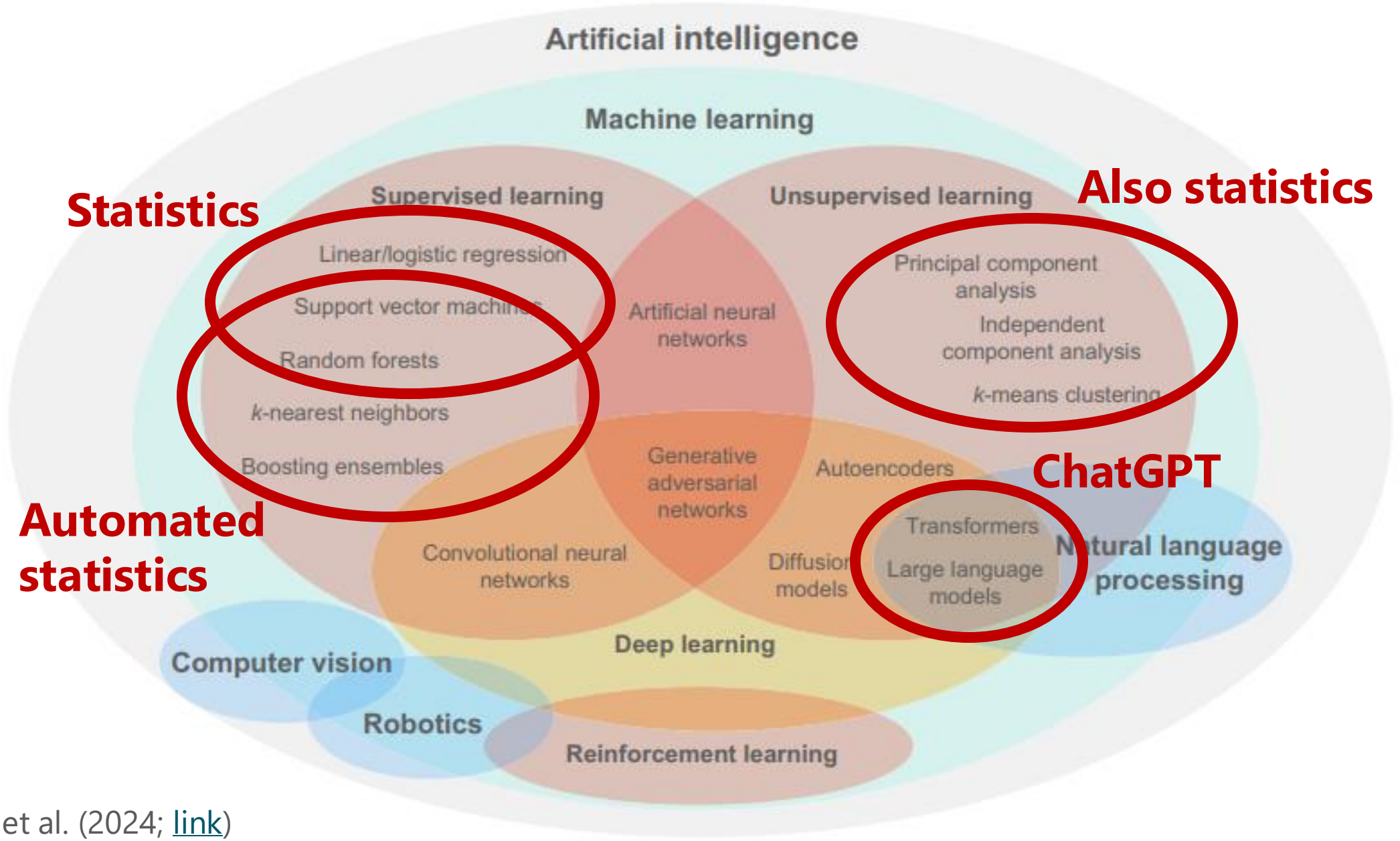
Hanassab et al. (2024; [link])



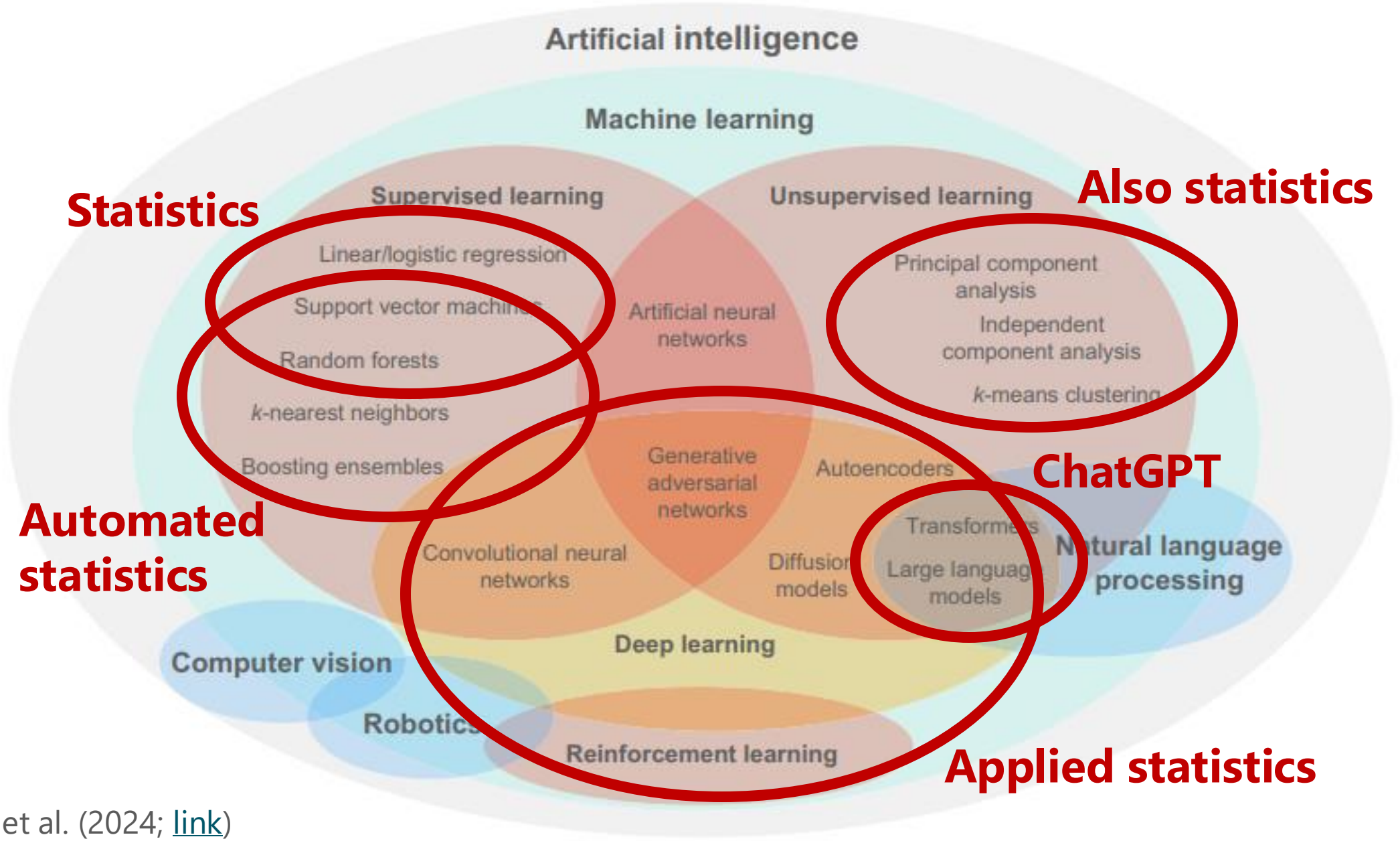
Hanassab et al. (2024; link)



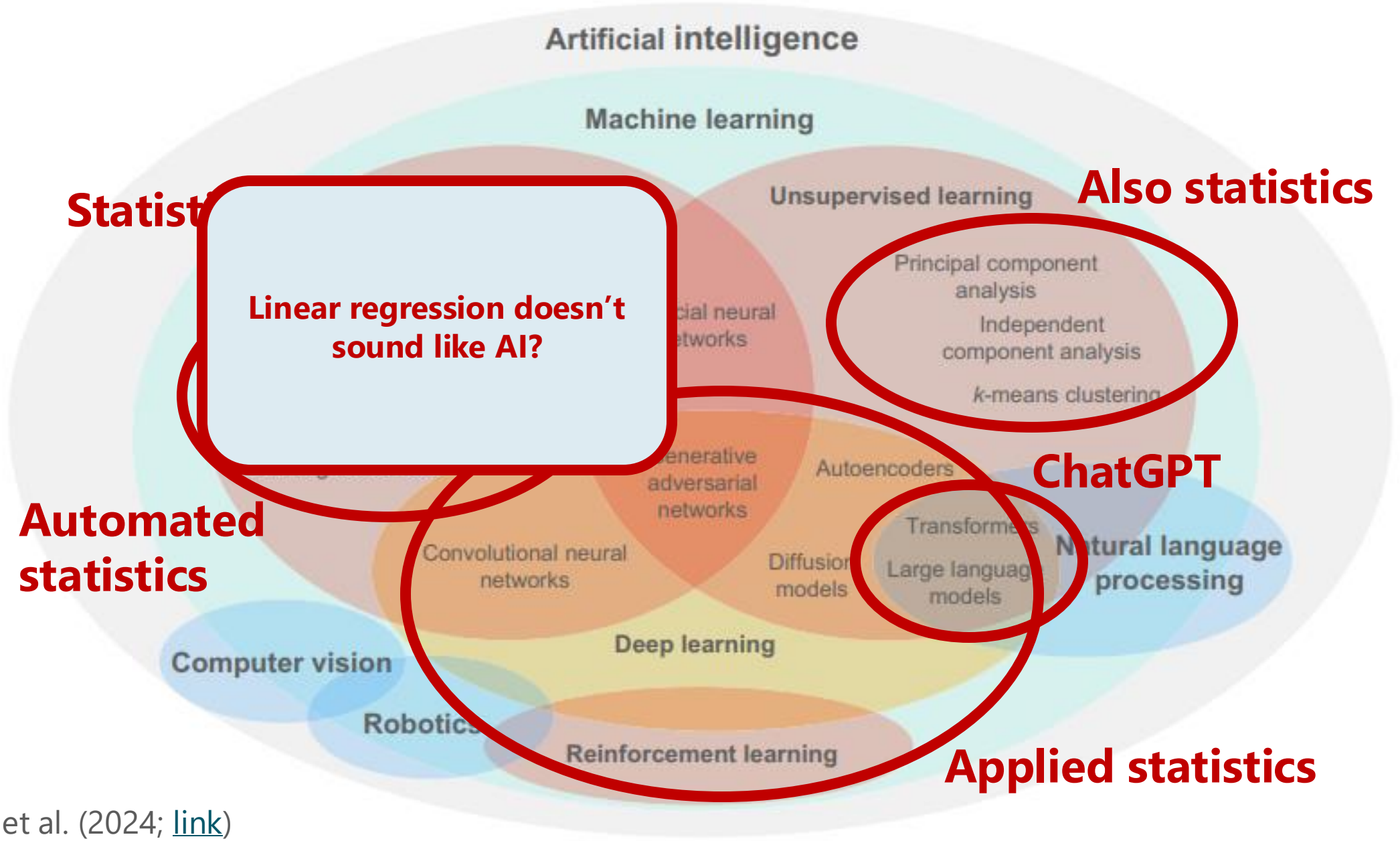
Hanassab et al. (2024; [link])



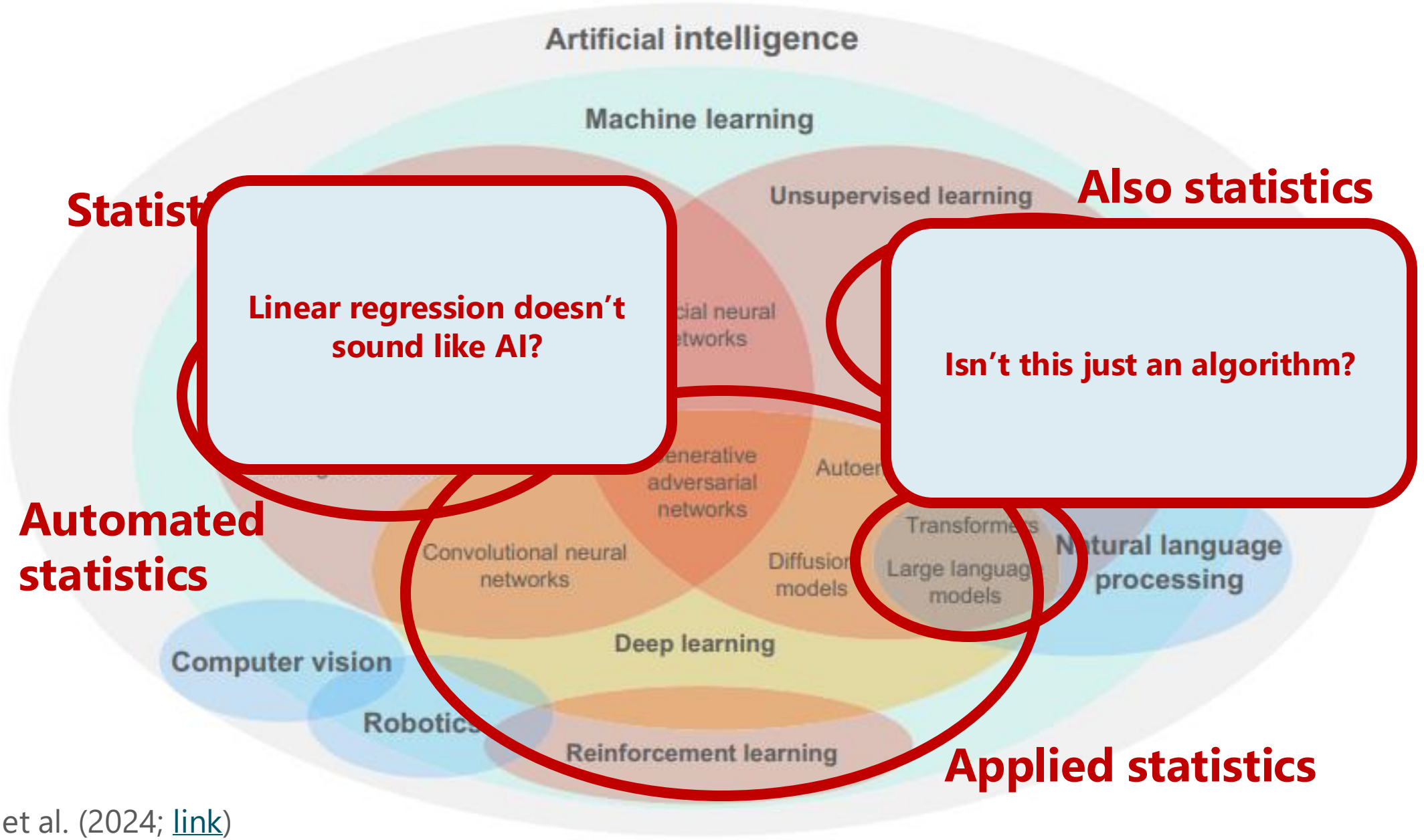
Hanassab et al. (2024; link)



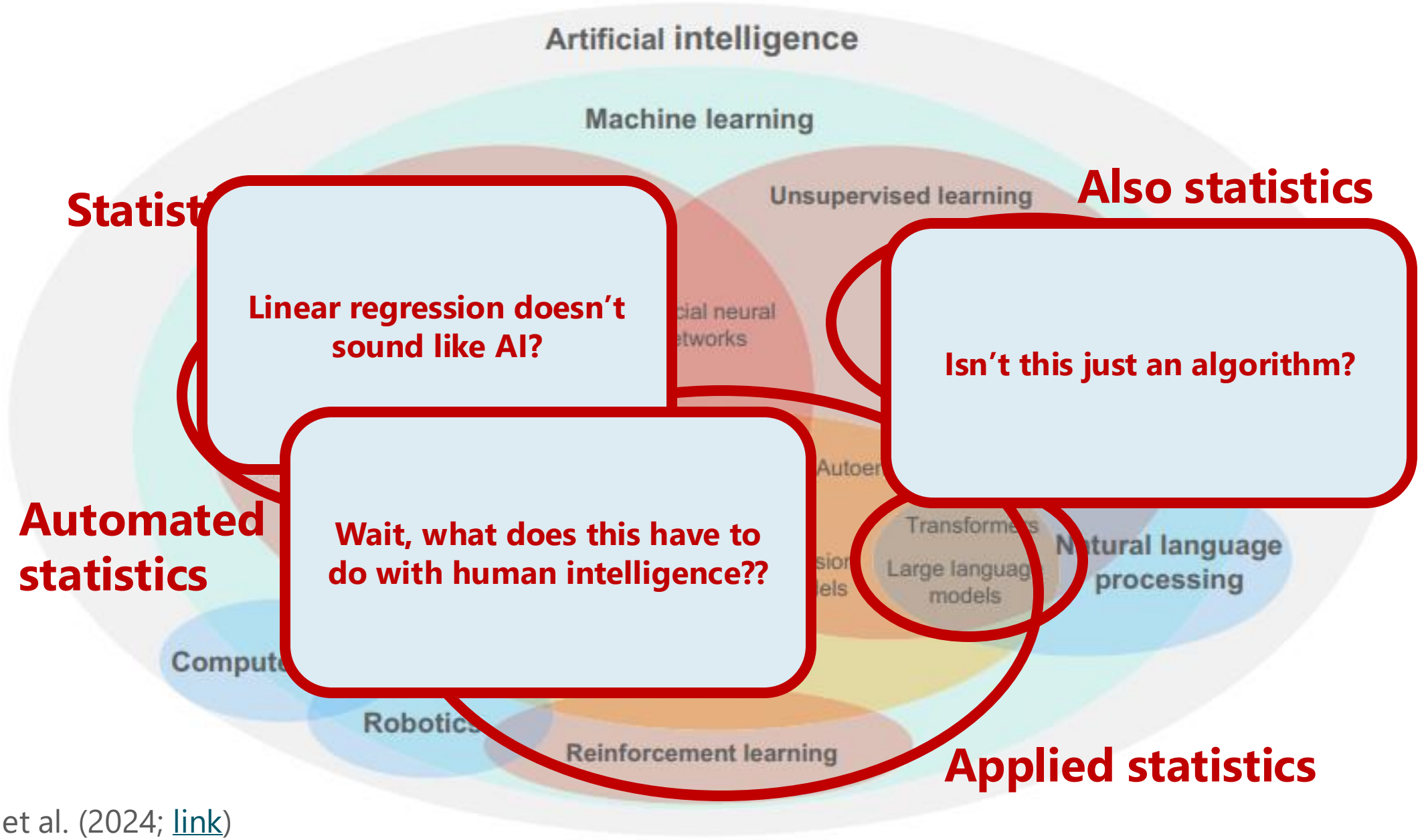
Hanassab et al. (2024; link)



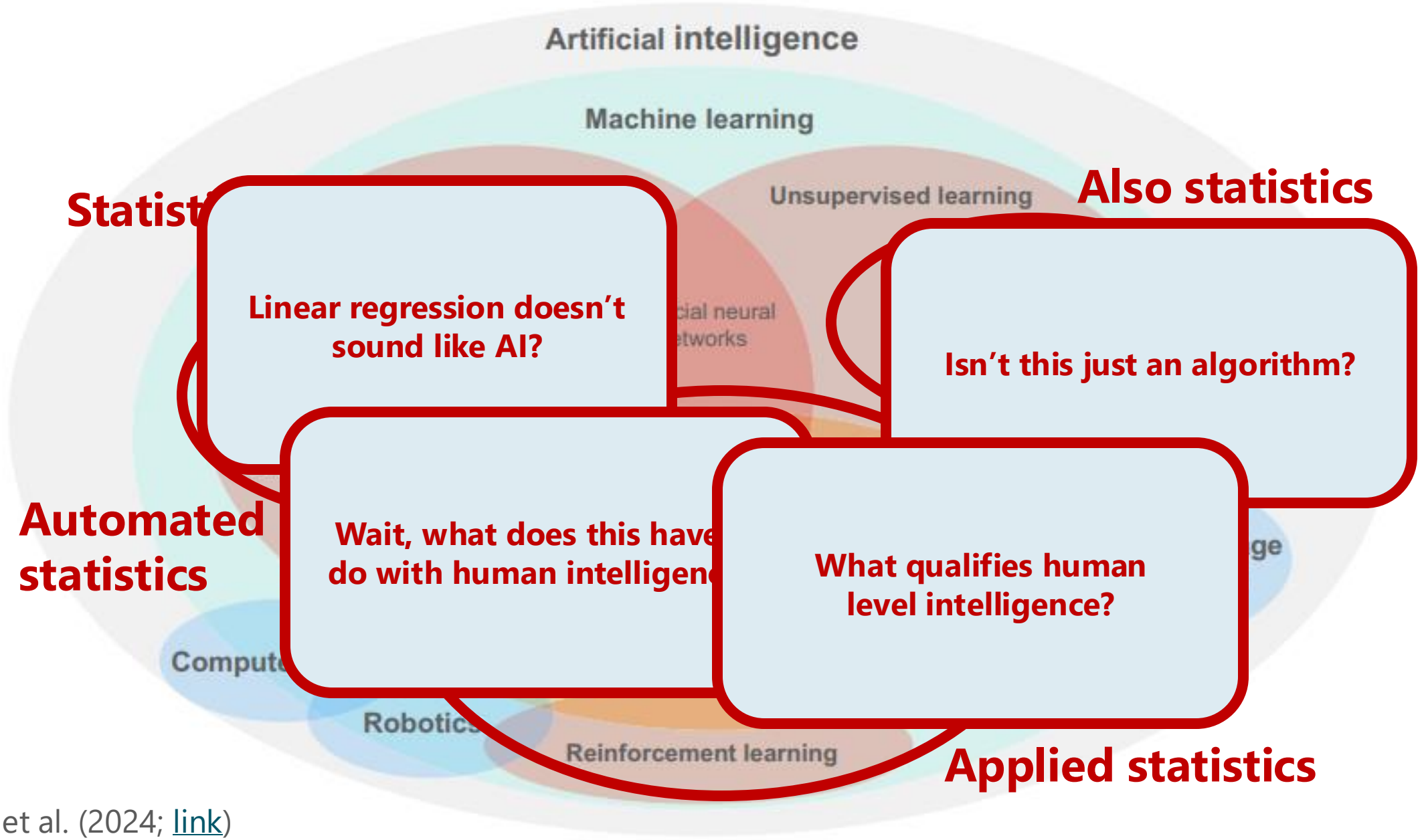
Hanassab et al. (2024; link)



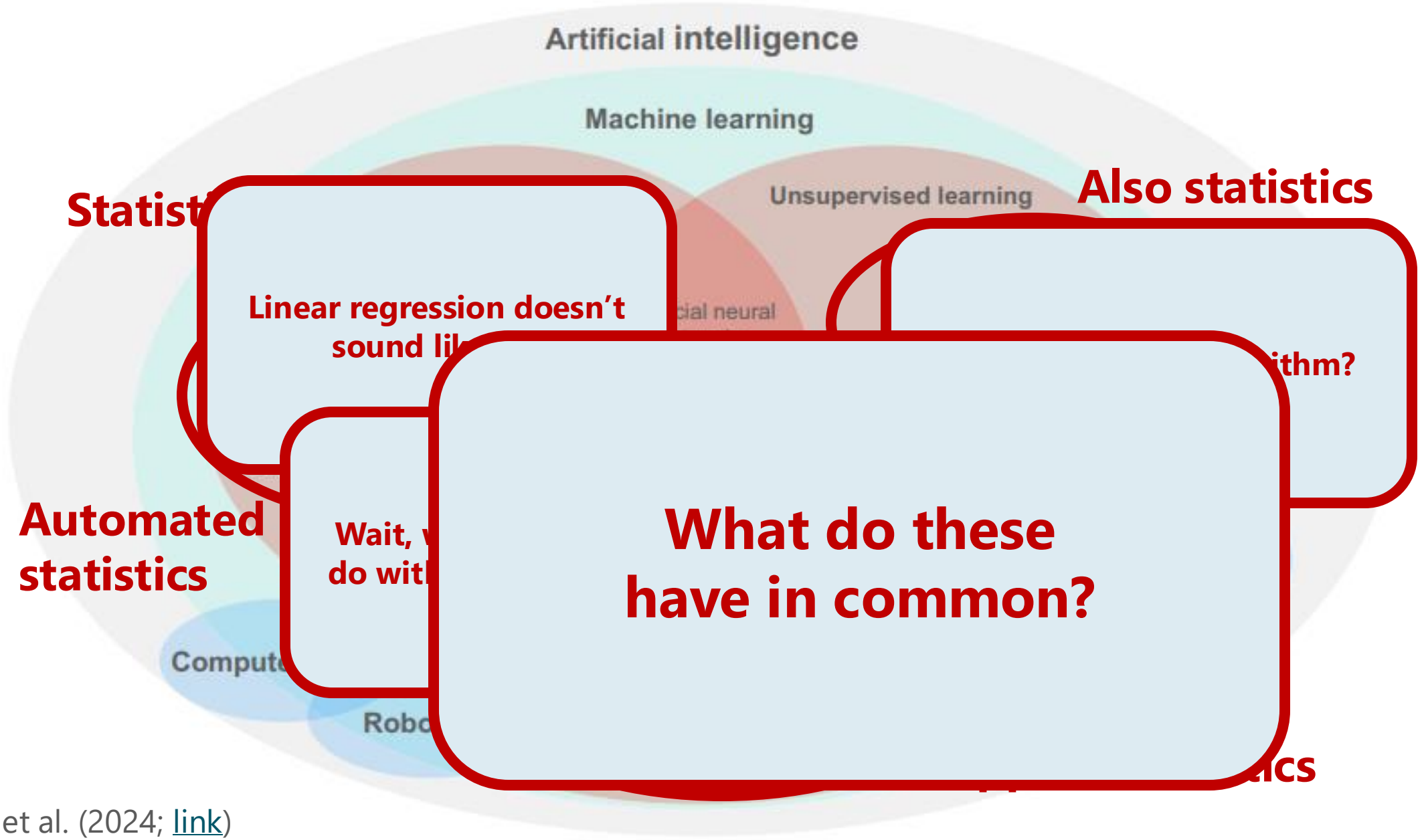
Hanassab et al. (2024; link)



Hanassab et al. (2024; link)



Hanassab et al. (2024; link)



Hanassab et al. (2024; link)

Artificial Intelligence

The capability or application of computer systems to perform tasks or produce outputs that would normally require human intelligence

Oxford, NASA, Wikipedia

Artificial Intelligence

~~The capability or application of computer systems to perform tasks or produce outputs that would normally require human intelligence~~

~~*Oxford, NASA, Wikipedia*~~

Computational systems that generate predictions, classifications, or autonomous decisions

Gunnar, ChatGPT

Additional Reading:
Sociotechnical Definition of AI (Dahlke, 2024; link)
The AI Effect (Stanford AI100; link)
Properties of AI (OpenLearn; link)

Artificial Intelligence

Building blocks ← → Platforms

Prediction

Time series regression to forecast fisheries trends

Neural net enhanced atmospheric forecast

Classification

PFAS forensics (PCA and NMF)

Bird ID app (deep learning)

Automation

Compliance screening in Excel (decision tree)

ChatGPT code or writing

Field event planning agent

AI Can’t Solve Everything, And That’s Okay

The AI Accountability Paradox

The AI Accountability Paradox

- Most AI applications aren't focused on the "why"
  - You generally take a linear regression result at face value
  - You don't know why your Bird ID app picked "Stellar's Jay"
  - You don't know why ChatGPT picks a specific recommendation
- The lack of "why" is at odds with defensible management decisions

The AI Accountability Paradox

The tension that arises when experts hand decisions to opaque AI systems but remain responsible for understanding and defending how those decisions are made.

Gunnar, ChatGPT

Three Strategies for AI Implementation in Environmental Workflows

Overcoming The AI Accountability Paradox

AI Accountability Strategy 1:
Multiple Lines of Evidence

- Compare your AI predictions to empirical models
- Validate results using visualization, expertise, and conceptual models
  - Alternately, use AI to validate known data
  - Don’t use AI to validate AI
- Manually check the first, last, and any unusual cases

AI Accountability Strategy 1:
Multiple Lines of Evidence

Text Summary Example

- In May, we sent out a survey to collect feedback on our Python onboarding process
- An LLM was used to summarize the feedback, but only after verifying:
  - First, last, and 5% of comments matched the balance in tone
  - Especially passionate or feedback quoted in the summary

AI Accountability Strategy 2:
Elevate Your Statistics Pipeline

- Follow the same process you would for a *t*-test or ANOVA:
  - Start with a question or hypothesis
  - Identify which tool in your AI toolbox can answer your question
  - Follow best practices as you apply the AI tool
  - Validate your results with subject matter expertise and visualization
- Your statistics experts are already doing AI; the easiest way to boost AI is to boost their work

AI Accountability Strategy 2:
Elevate Your Statistics Pipeline

Groundwater Prediction AI Example

- [confidential client] didn't see the anticipated level of natural recovery for some COCs in groundwater performance monitoring
- Simple statistics failed to predict trends
- Using an equivalent but more powerful AI tool (time series regression -> RNN) predicted recovery with **96% accuracy**

AI Accountability Strategy 3:
Something Is Better Than Nothing

- Some datasets are too large and complex to understand without AI
- Preliminary research or data exploration
- Anomaly detection for human review
- “Smart fill” missing information

AI Accountability Strategy 3:
Something Is Better Than Nothing

Species Image Recognition Example

- Image recognition augments human reviewers for:
  - Fish and bird identification
  - Community composition analysis
- Easy to validate against human observations
- Easy to flag anomalous data for human review

We Are The Future of AI

What Comes Next

Where To Start

- Learn the basics of automation, statistics, and classical ML
- Partner with AI experts who can leverage your domain knowledge
- Ask ChatGPT whether your current problem needs AI
- Know that you're accountable for AI decision making
  - Worth it: mitigate the risk
  - Not worth it: AI can't solve every problem, and that's okay

AI Trends in 2026 and Beyond

- AI will become less of a black box with **explainable AI**
- Specialized knowledge and simulation modeling will be incorporated into AI with **domain driven design**
- **Next gen agents**, including
  - Chatbots that can access your data (e.g., RAG)
  - Chatbots that can operate your software (e.g., MCP)
  - Local models that can more safely access confidential and sensitive data