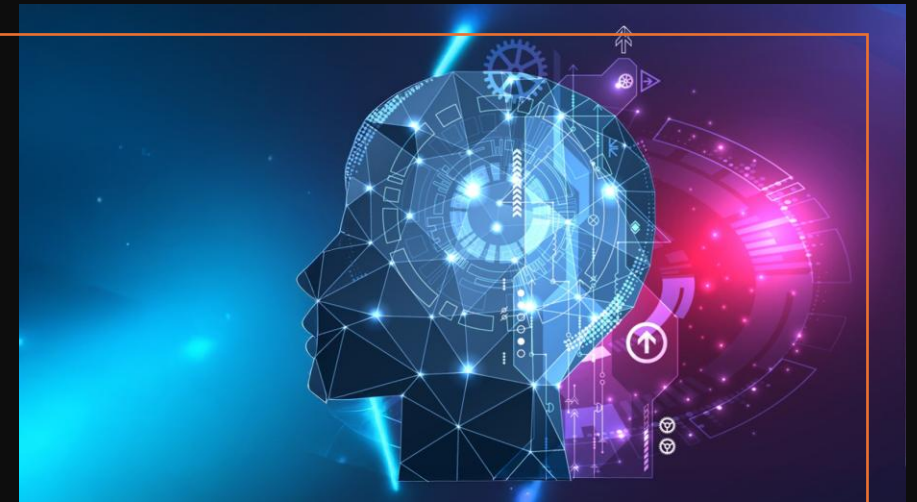


AI and Large-Scale AI: the transformative technologies of our time

A/Prof. Quan Bai, Dr. Wenli Yang and Prof. Kristy de Salas

School of ICT

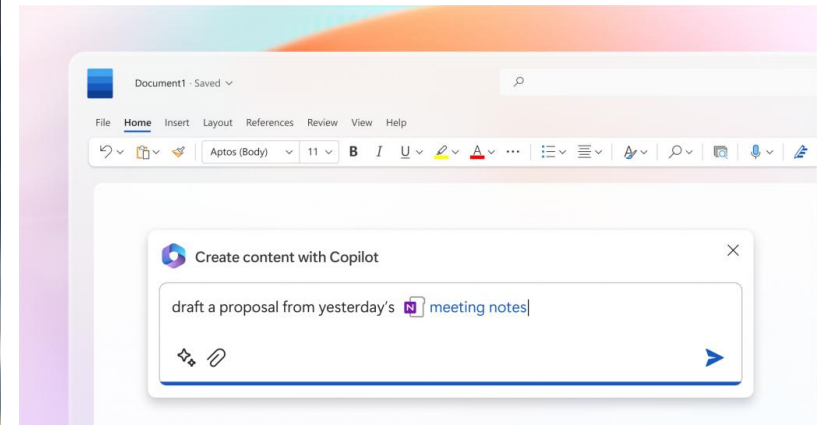
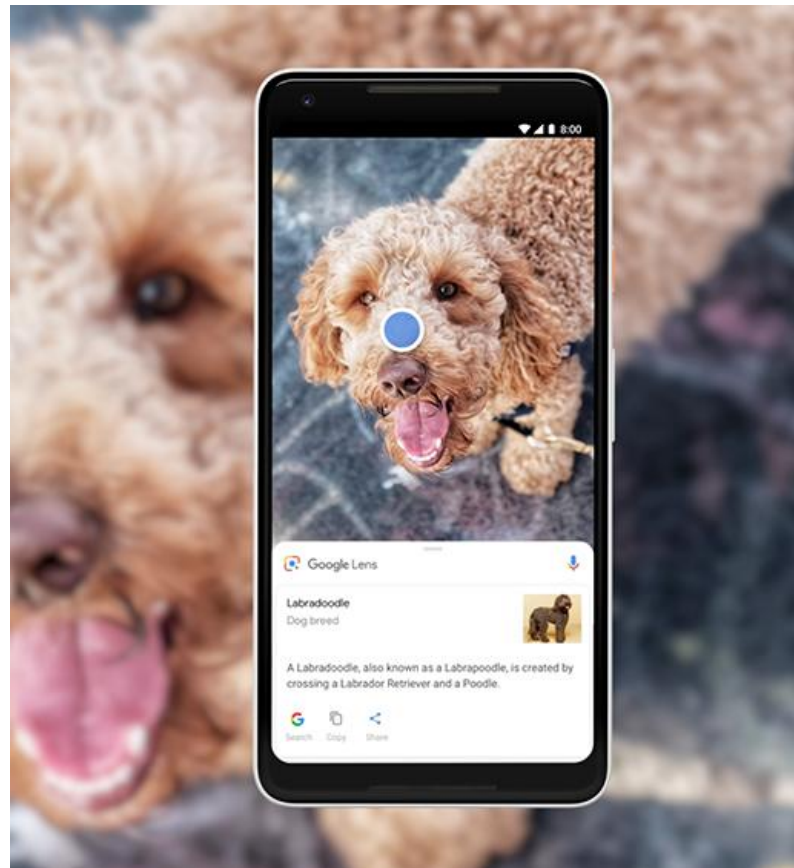
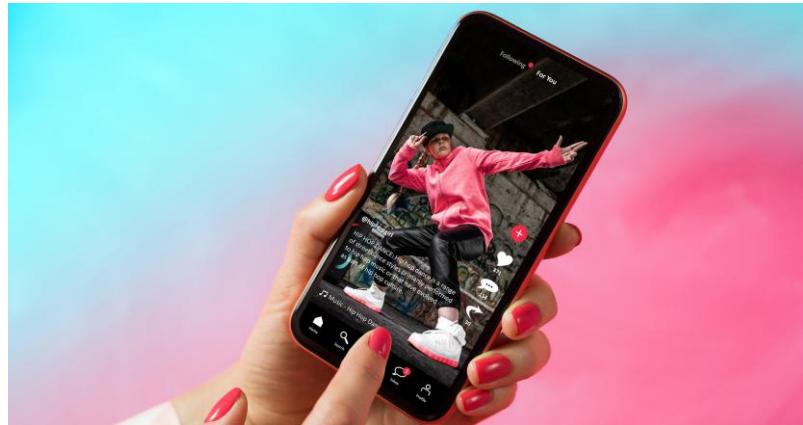


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TASMANIA



Outline

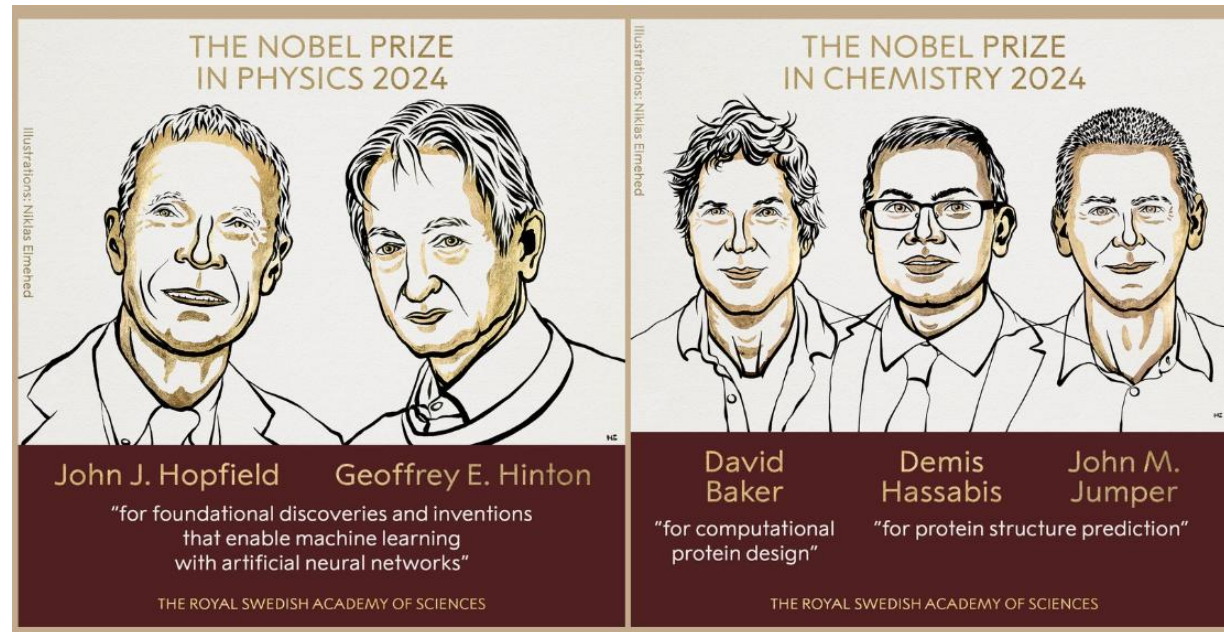
- What Is AI?
- What's Happening Right Now
- Evolution of AI
- AI In Action



AI is everywhere

What's Happening Right Now?

In 2024, AI was recognised with two Nobel Prizes.



AI HOT WORDS

AI

Artificial Intelligence — machines that learn and reason

GenAI

Generative AI — creates text, images, code and more from prompts

LLM

Large Language Model — the engine behind ChatGPT & Claude, etc.

AI Agents

AI that takes actions, browses the web, uses tools

Agentic AI

AI working autonomously across multi-step tasks

Generative AI is here

ChatGPT, Gemini and Claude write, code and create , free and available to everyone right now.

AI creates images & video

DALL·E and Midjourney generate photorealistic visuals from a simple text prompt in seconds.

Fastest adoption ever

ChatGPT hit 100 million users in just 2 months.

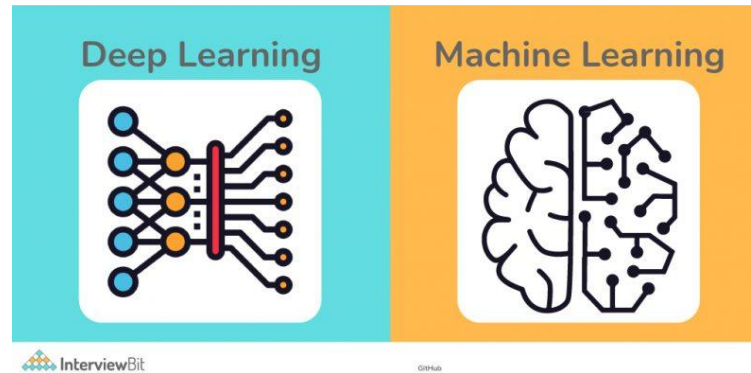
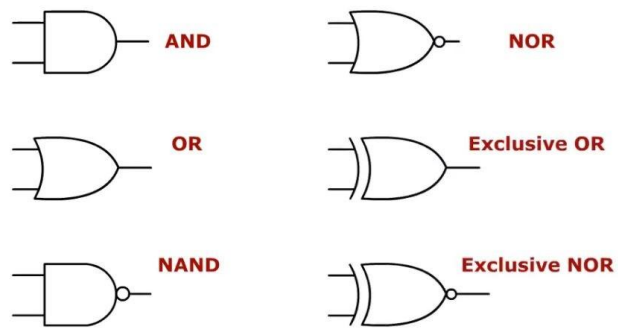
Agents take action

The next wave, AI Agents that browse, decide and act on your behalf with minimal input.

Evolution of AI

AI is the ability of computer systems to perform tasks that typically require human intelligence, such as learning, reasoning, and problem-solving.

The symbol for each type of logic gate follows:



Symbolic AI

Data-driven AI

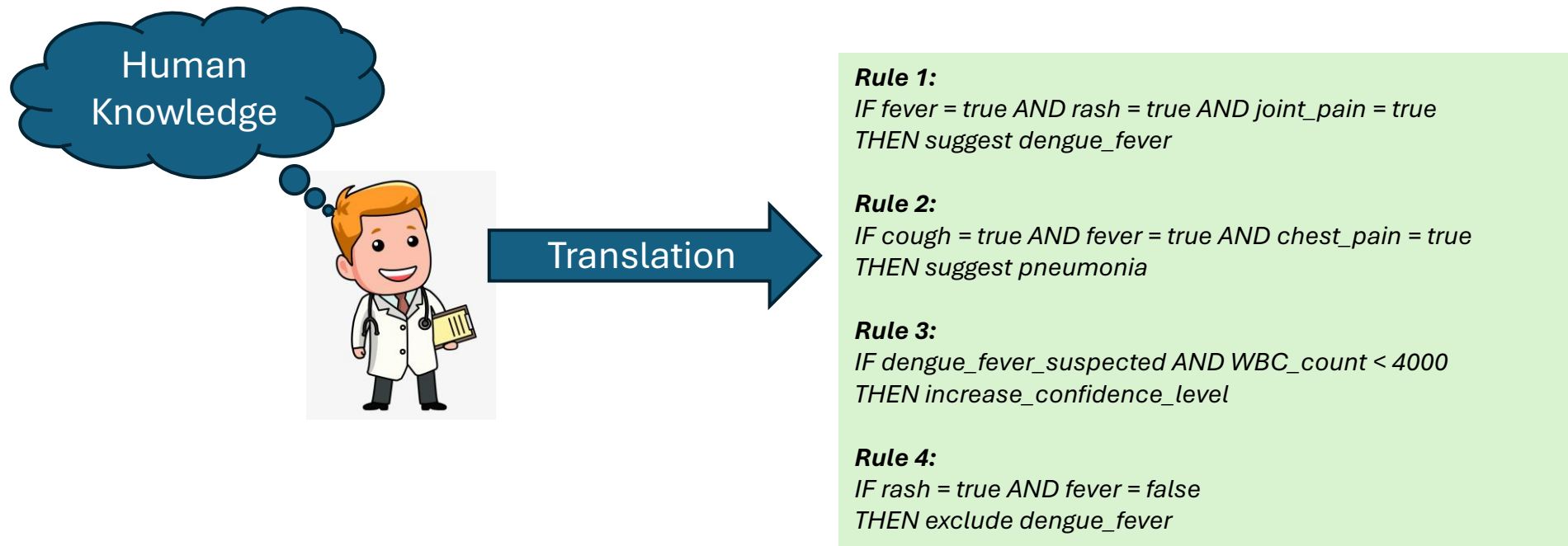
**Large and
Generative AI**



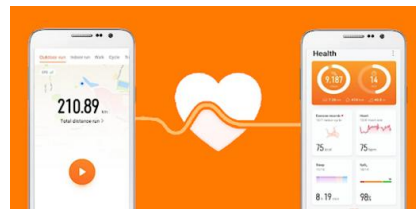
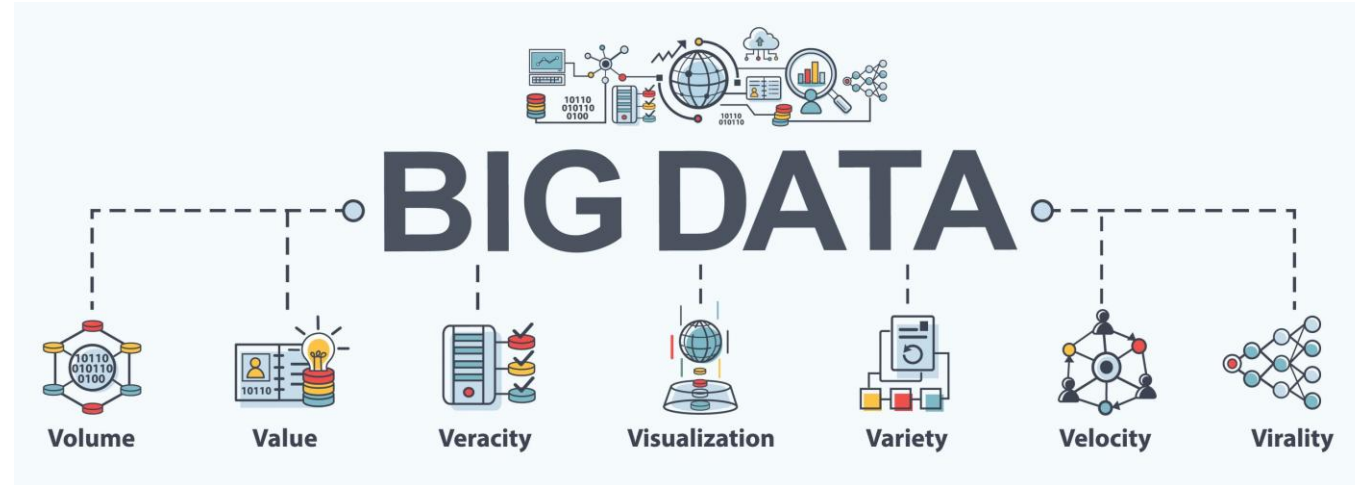
Traditional AI

Symbolic AI

The primary focus is to translate human knowledge into a computer-understandable and executable format.



Data-driven AI



Limitations of traditional AI



- Knowledge representation
- Knowledge validation
- Data labelling
- Data processing
- Model design
- Model training
- Model validation



- Pattern discovery
- Prediction
- Automated task execution

Human effort vs. AI effort

Humans need to invest significant effort in data preparation, model selection, model training, validation, etc.

- Relies on single-modality data with limited contextual understanding
- Requires structured and well-labeled datasets
- Sensitive to data quality, labeling errors, and noise
- Dependent on large, balanced datasets to avoid bias
- Prone to overfitting and poor generalization
- Typically designed for single-task learning

Large AI & Generative AI (GenAI)

Large AI: advanced AI models trained on massive datasets with billions of parameters, enabling them to perform a wide range of complex tasks.

The image displays five chat interface examples and five AI model logos. The chat interfaces are as follows:

- Chat 1 (Dog):** User: "This is a dog. It's a white fluffy dog." AI: "What season is this?" AI: "It looks like a summer day." User: "Why do you think so?" AI: "The grass is green and the dog is not wearing a sweater." User: "What breed is the dog?" AI: "It's a Samoyed." User: "Is the dog running?" AI: "No, it's sitting." User: "Can you describe the pose of its back legs?" AI: "The back legs are bent and the dog is sitting on its haunches."
- Chat 2 (Street Sign):** User: "Which city is this?" AI: "This is a street sign in New York City." User: "Which street corner is it?" AI: "It is the intersection of Madison Avenue and East 42nd Street." User: "Which subway station is nearby?" AI: "The closest subway station is Grand Central Station." User: "How about the nearest park?" AI: "The nearest park is Bryant Park." User: "There is another sign. What does it say?" AI: "It says 'One way'."
- Chat 3 (Color Recognition):** User: "I would like you to read the color and then say the color it is written in. For example:" AI: "PURPLE" AI: "Color is 'Purple' and it is written in red." AI: "GREEN" AI: "Color is 'Green' and it is written in blue." AI: "YELLOW" AI: "Color is 'Yellow' and it is written in green." AI: "BLACK" AI: "Color is 'Black' and it is written in yellow." User: "Well done! Do you know the name of the test these images come from?" AI: "I think it is called the Stroop test." User: "Can you explain how humans perform in this test?" AI: "Humans are slower when the color of the word and the color of the word are different." User: "How about you?" AI: "I am not affected by this difference."
- Chat 4 (Geometry):** User: "What is the difference between these two images?" AI: "The first one is a triangle and the second one is a hexagon." User: "Which one has larger internal angles?" AI: "The hexagon has larger internal angles." User: "What color are they?" AI: "They are both red."

The AI model logos shown are:

- Gemini
- Claude
- CURSOR
- ChatGPT
- OpenClaw

Large AI is much more than LLMs, it can be for other types of data and multimodal data (LMM)

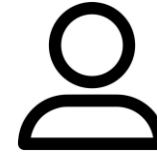
Traditional AI vs. Large AI



- Data labelling
- Data processing
- Model design
- Model training
- Model validation



Task execution



Prompting

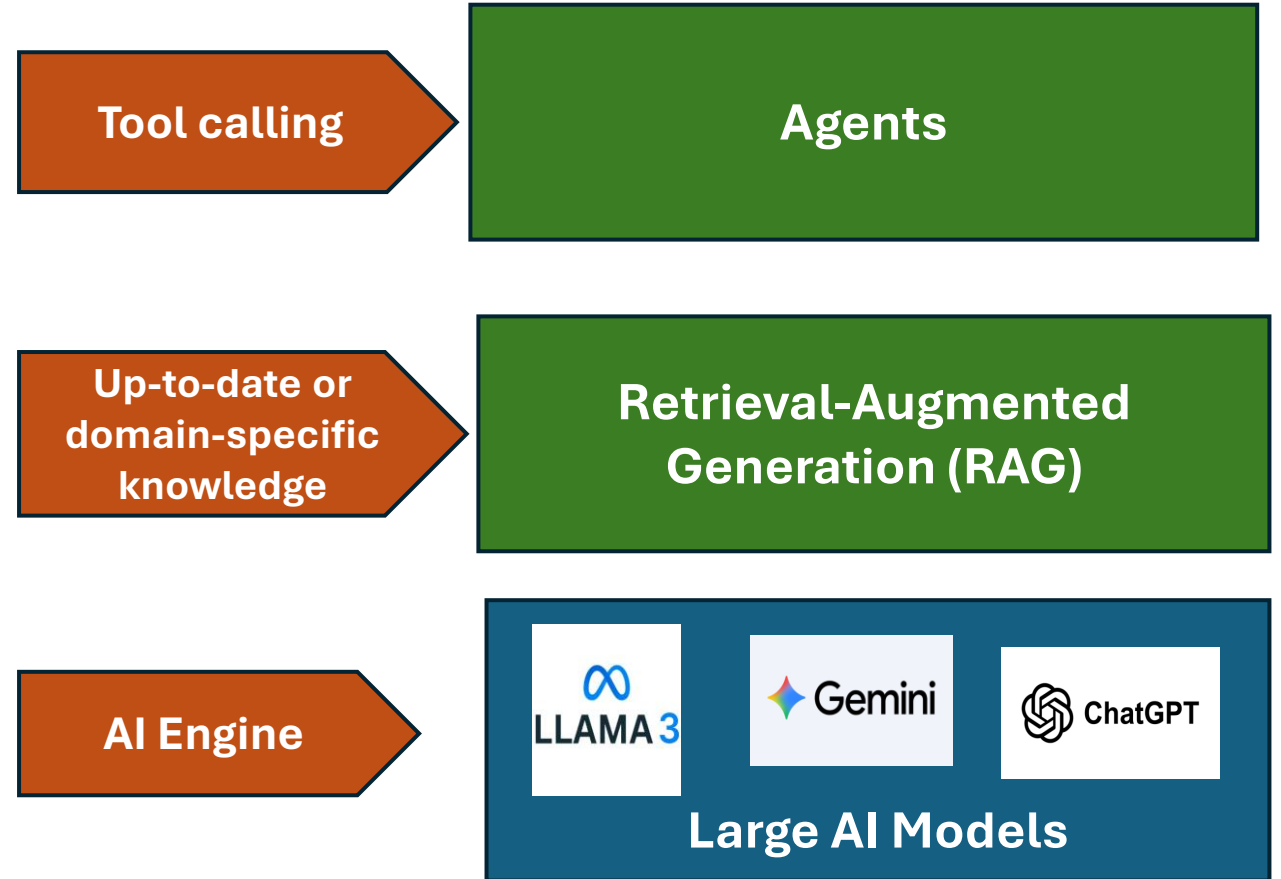


- Natural and human like interaction
- Content generation
- Reasoning
- Multimodal

Agentic and Large AI:

AI systems that can plan, reason, and act autonomously in dynamic environments using LLMs as reasoning cores.

Agentic AI Framework



AI in Action

Some projects at UTAS

AI Research Group at UTAS

- Research capacity:
 - Distributed AI
 - Large AI Models
 - RAG and ChatBot
 - Machine learning
 - Trustable AI and AI for Trust
- Collaborators:
 - Australia Antarctic Division (AAD)
 - Data61 CSIRO
 - NHRA Australia
 - Institute for Marine and Antarctic Studies (IMAS)
 - Tasmanian Institute of Agriculture (TIA)
 - Wicking Dementia Research and Education Centre



Some existing projects

- Machine learning:
 - Computer Vision-based Giant Crab Monitoring
 - Movement Analysis for Early Dementia Detection
 - Language facilitation for emergency services
 - Multi-drone Systems
 - Agent-based Influence Modelling
- Trust and AI:
 - Responsible AI
 - Data provenance and analysis
- Large AI:
 - RAG feasibility studies
 - ChatBot for health
 - ChatBot for education
 - Etc.



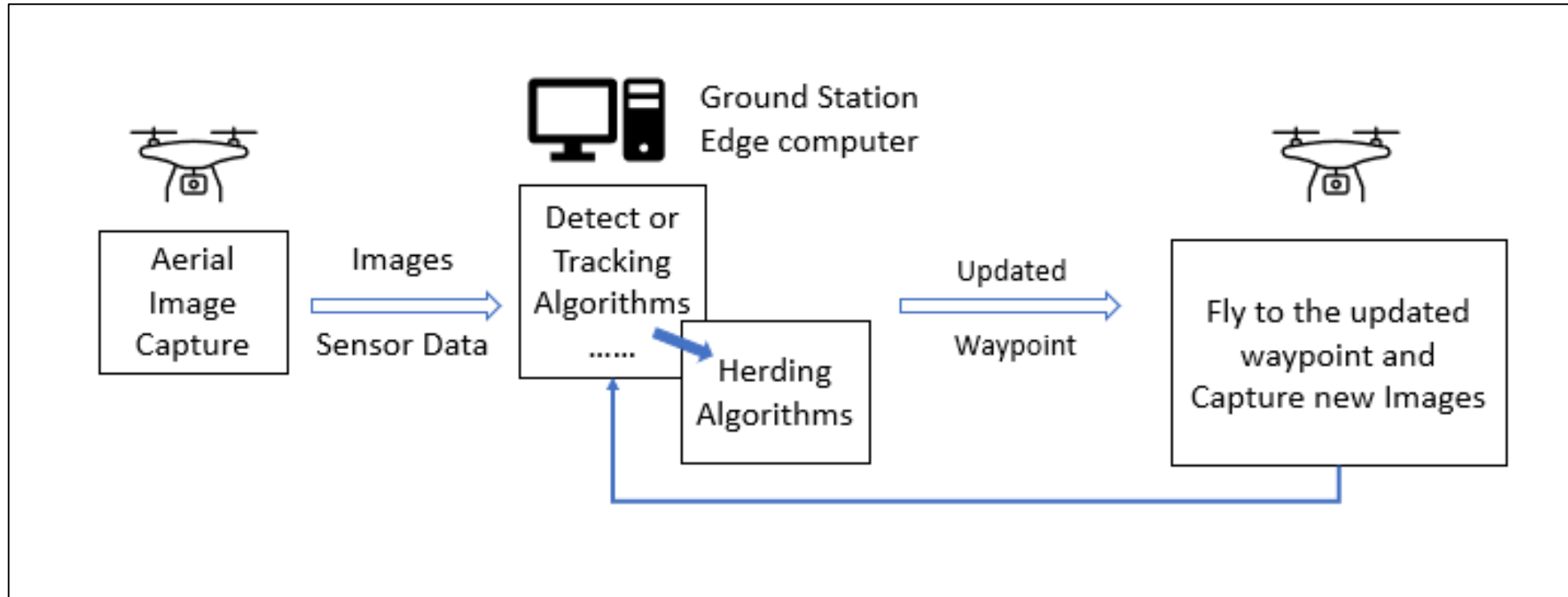
Motivated by challenges in agriculture industry

- Bird flocks, such as starling birds, can cause significant damage to cherry orchards in Tasmania.
- Livestock monitoring and herding are labour costing



Can we build AI systems to achieve automated flock monitoring and control?

Our solution



Drone system

Edge Device	Tracking or Localisation (Real-Time Application)			
	YOLO or Other detectors		Device Management	Data Transmission
	Video Stream	Media File		
	DJI Edge API			
	Communication	Linux Kernel OS (Ubuntu 22.04)		
X86 Architecture (i5-8400, 16G Ram 1TB SSD)				
UAV Platform	DJI Dock 1 Ground Station			



Real-time Monitoring (YOLO)

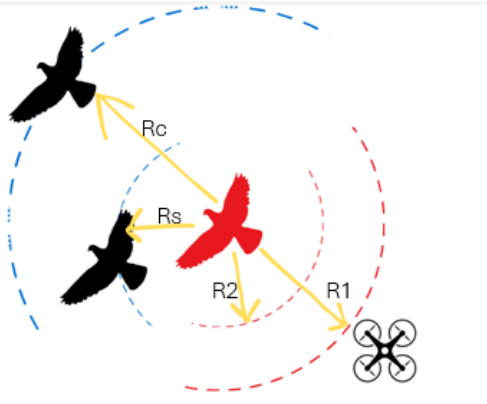


Thermal and RGB cameras to ensure detection accuracy



CV technology to generate the results

Flock modelling



A: The bird flock responds to a drone only when the drone is within a radius " R_1 " of a member of the flock.

B: If the drone is within $[R_1, R_2]$, the bird tries to accelerate radially away from the drone. However, if the drone is within the value of R_2 , the bird tries to outmanoeuvre the drone by turning or climbing rapidly.

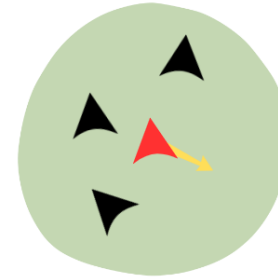
R-separation and R-cohesion

C: R_s : steady-state distance between each bird

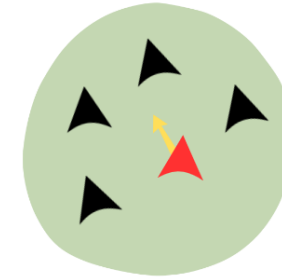
D: R_c : If distance between each bird higher than R_c , the bird will not join the Flock

Paranjape, A. A., Chung, S. J., Kim, K., & Shim, D. H. (2018). Robotic herding of a flock of birds using an unmanned aerial vehicle. *IEEE Transactions on Robotics*, 34(4), 901-915.

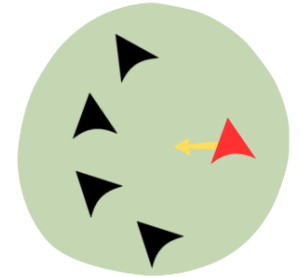
Basic models of flocking behaviour are controlled by three simple rules



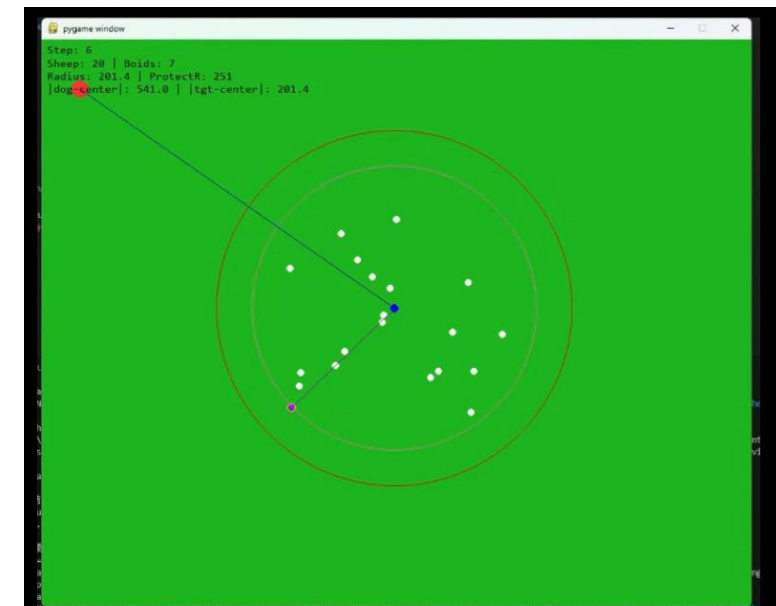
Separation



Alignment



Cohesion



AI Vision for Giant Crab Grading

Automating sex classification & size measurement

THE CHALLENGE

Manual sorting of crabs for sex and legal size is slow, variable and physically demanding, especially on moving vessels in rough seas.

THE AI SOLUTION

Computer vision models trained on thousands of crab images now classify sex and measure carapace width in real time using a simple camera rig.

THE TECHNOLOGY

Custom-trained image recognition AI, automated measurement algorithms calibrated for wet, variable lighting conditions.

THE IMPACT

Faster processing, consistent compliance with size regulations, reduced crew handling time and better data for fisheries management and sustainability reporting.

Giant Crab Sex Classification and Size Measurement



Flip the crab
Dangerous for the Fishermen

Self-learning Explore Model
Interested Feature



SeaTalk: Marine Scientific Knowledge Discovery with AI

Accelerating knowledge discovery from decades of research literature

THE CHALLENGE

Researchers spend months manually sifting through decades of published literature to find relevant findings — an unsustainable bottleneck in a fast-moving field.

THE AI SOLUTION

A large language model trained on marine science literature that can answer complex research questions, synthesise findings across papers, and identify knowledge gaps instantly.

THE TECHNOLOGY

Retrieval-Augmented Generation (RAG), domain-specific LLM fine-tuning, scientific corpus indexing and natural language query interface for researchers.

THE IMPACT

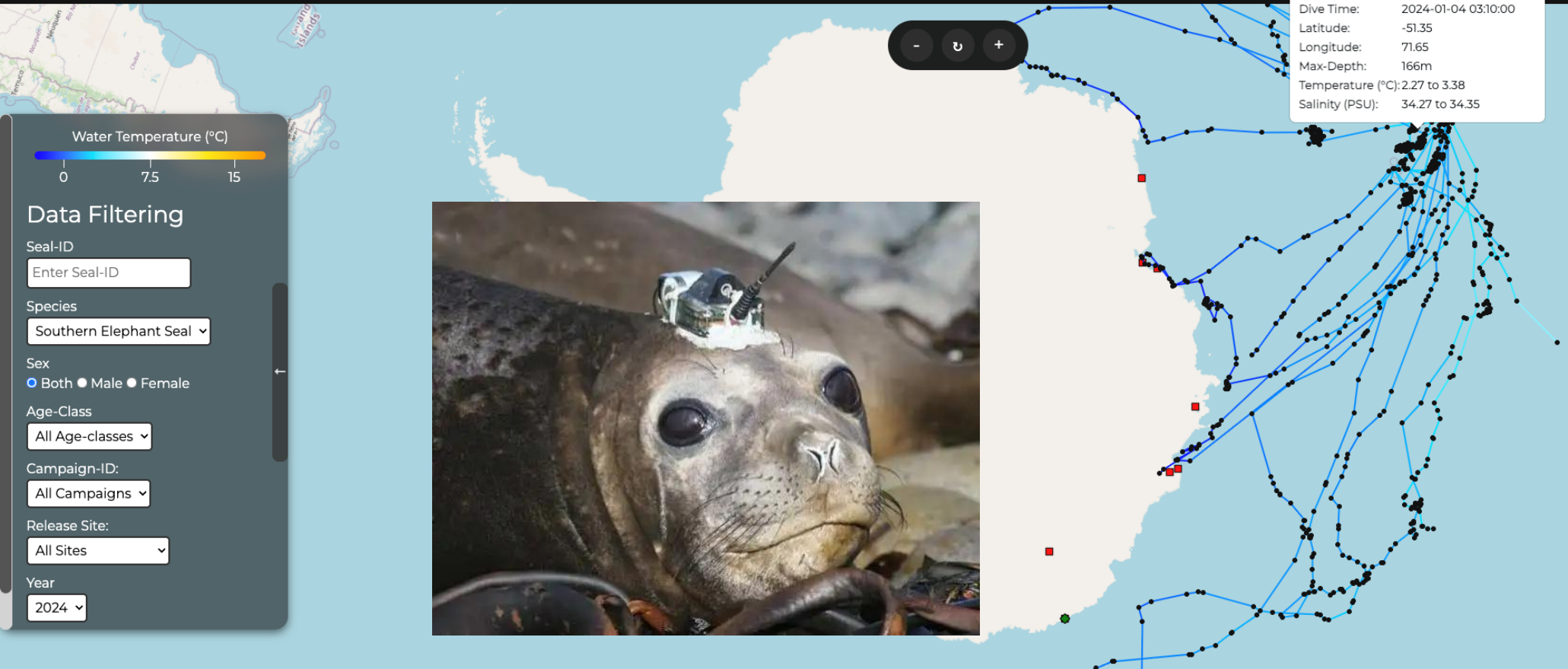
Weeks of literature review compressed to minutes. Researchers discover cross-paper connections that would otherwise be missed, accelerating Antarctic science globally.

Animal Oceanographers

Tracking

About

Seal-ID: ct180-156-BAT-15
Species: Southern elephant seal
Location: Iles Kerguelen
Dive Time: 2024-01-04 03:10:00
Latitude: -51.35
Longitude: 71.65
Max-Depth: 166m
Temperature (°C): 2.27 to 3.38
Salinity (PSU): 34.27 to 34.35



Water Temperature (°C)
0 7.5 15

Data Filtering

Seal-ID

Species
Southern Elephant Seal

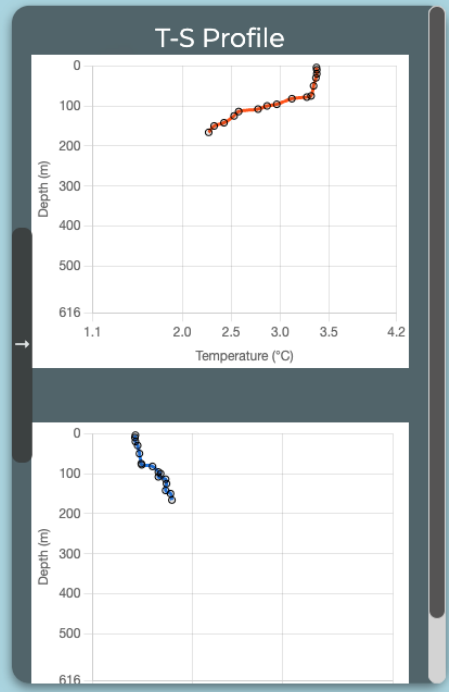
Sex
 Both Male Female

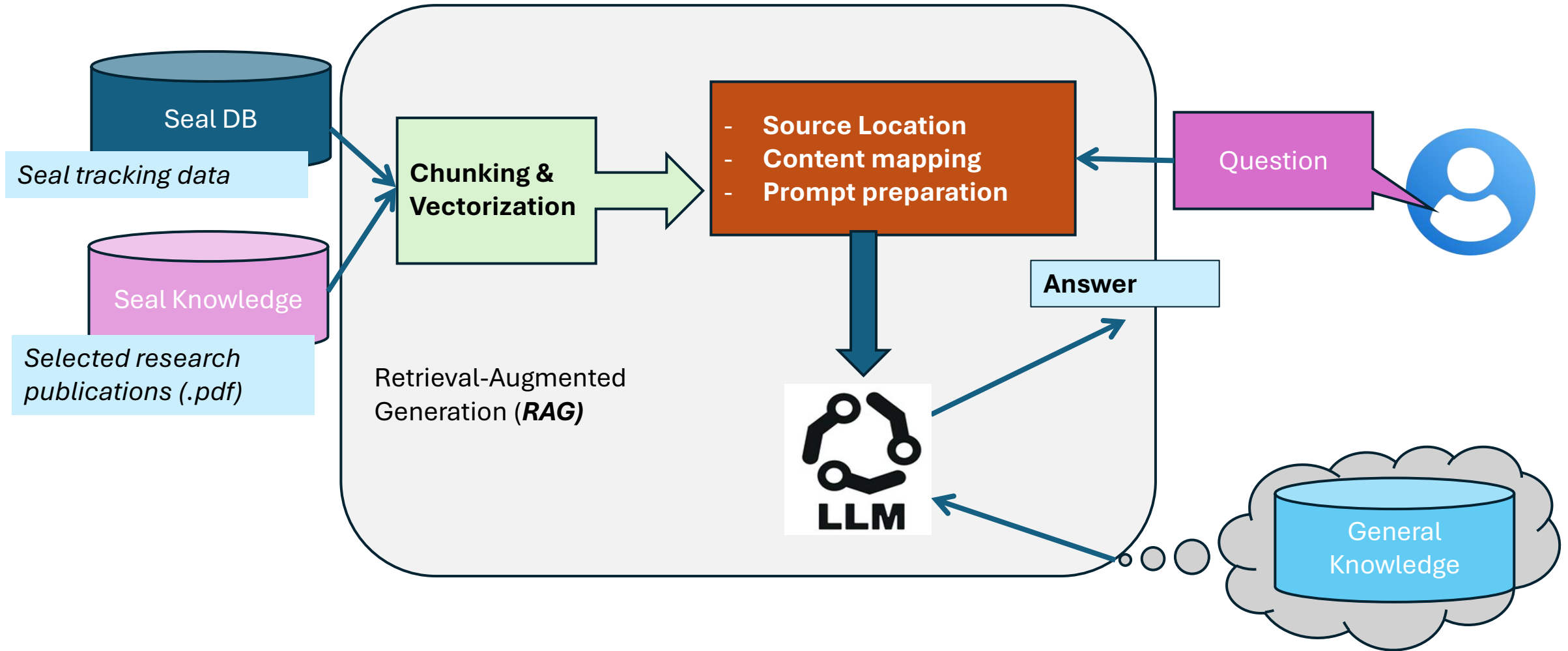
Age-Class
All Age-classes

Campaign-ID:
All Campaigns

Release Site:
All Sites

Year
2024





Dataset:

SEALID	DIVEID	DTIME	LAT	LON	MINTEMP	MAXTEMP	MINSAL
ct176-08-23	7416135	2024-01-06 16:10:00	-51.3139	70.2493	2.349	3.944	33.88
ct176-08-23	7416135	2024-01-06 16:10:00	-51.3139	70.2493	2.349	3.944	33.88
ct176-08-23	7416135	2024-01-06 16:10:00	-51.3139	70.2493	2.349	3.944	33.88
ct176-08-23	7416135	2024-01-06 16:10:00	-51.3139	70.2493	2.349	3.944	33.88
ct176-08-23	7416135	2024-01-06 16:10:00	-51.3139	70.2493	2.349	3.944	33.88
ct176-08-23	7416135	2024-01-06 16:10:00	-51.3139	70.2493	2.349	3.944	33.88
ct176-08-23	7416135	2024-01-06 16:10:00	-51.3139	70.2493	2.349	3.944	33.88

Previous

Page 2 of 23

Next

Details

This dataset records various attributes related to seal dive profiles, including device information, species details, dive measurements, and environmental factors. It provides valuable information for analyzing movement, habitat, and oceanographic conditions of Southern elephant seals.



what is the highest salinity in the table?

Based on seal tracking data: The highest salinity recorded in the table is 34.026. This value was observed at a depth of 180 meters by a Southern elephant seal near Iles Kerguelen. The measurement is in practical salinity units (psu).

Ask about the seals or research...

Send

chat.seal-tracks.cloud.edu.au

AAD Intelligent Metadata Management

AI-powered metadata curation for the Australian Antarctic Division

THE CHALLENGE

Thousands of datasets from Antarctic expeditions sit in archives with incomplete or inconsistent metadata, making discovery and reuse difficult for researchers worldwide.

THE AI SOLUTION

An intelligent metadata management platform that automatically generates, validates and enriches metadata using AI, trained on scientific standards and existing AAD records.

THE TECHNOLOGY

Natural language processing, automated metadata generation, semantic tagging, compliance checking against international data standards.

THE IMPACT

Dramatically reduced manual curation effort, higher quality and consistency across the archive, and faster data discovery for the global Antarctic science community.

EARTH SCIENCE

- AGRICULTURE
- ATMOSPHERE
- BIOLOGICAL CLASSIFICATION
- BIOSPHERE
- CLIMATE INDICATORS
- CRYOSPHERE
- HUMAN DIMENSIONS
- LAND SURFACE
- OCEANS
- PALEOCLIMATE
- SOLID EARTH
- SPECTRAL/ENGINEERING
- SUNEARTH INTERACTIONS
- TERRESTRIAL HYDROSPHERE

Earth Science

EARTH SCIENCE

[Create New Dataset](#)

Dataset Name	Description	Researcher	Created Date
Ant WLD firn	This dataset contains information about specific sites identified by their site_id. Each site's geographical location is precisely recorded with latitude and longitude coordinates. The data ... Show More ▾	John Smith	2025-02-13T08:44:57
Ant WLD ice vel	The data set includes information about the location and movement of a specific site. It provides details such as the site's identifier, its latitude and longitude, the speed of movement, an... Show More ▾	Peter Park	2025-02-13T08:52:56
Climate Change	This dataset includes various atmospheric parameters such as date, time, location, altitude, temperature, pressure, wind direction, wind speed, total cloud cover, low cloud cover, mid cloud ... Show More ▾	Peter Park	2025-02-13T09:00:40

This dataset includes information about the wind speed and direction at various

NHRA Chatbot: Disaster Intelligence on Demand

Evidence-based information retrieval for emergency responders and communities

THE CHALLENGE

During emergencies, responders and the public struggle to quickly locate authoritative guidance buried across policies, plans and legislation.

THE AI SOLUTION

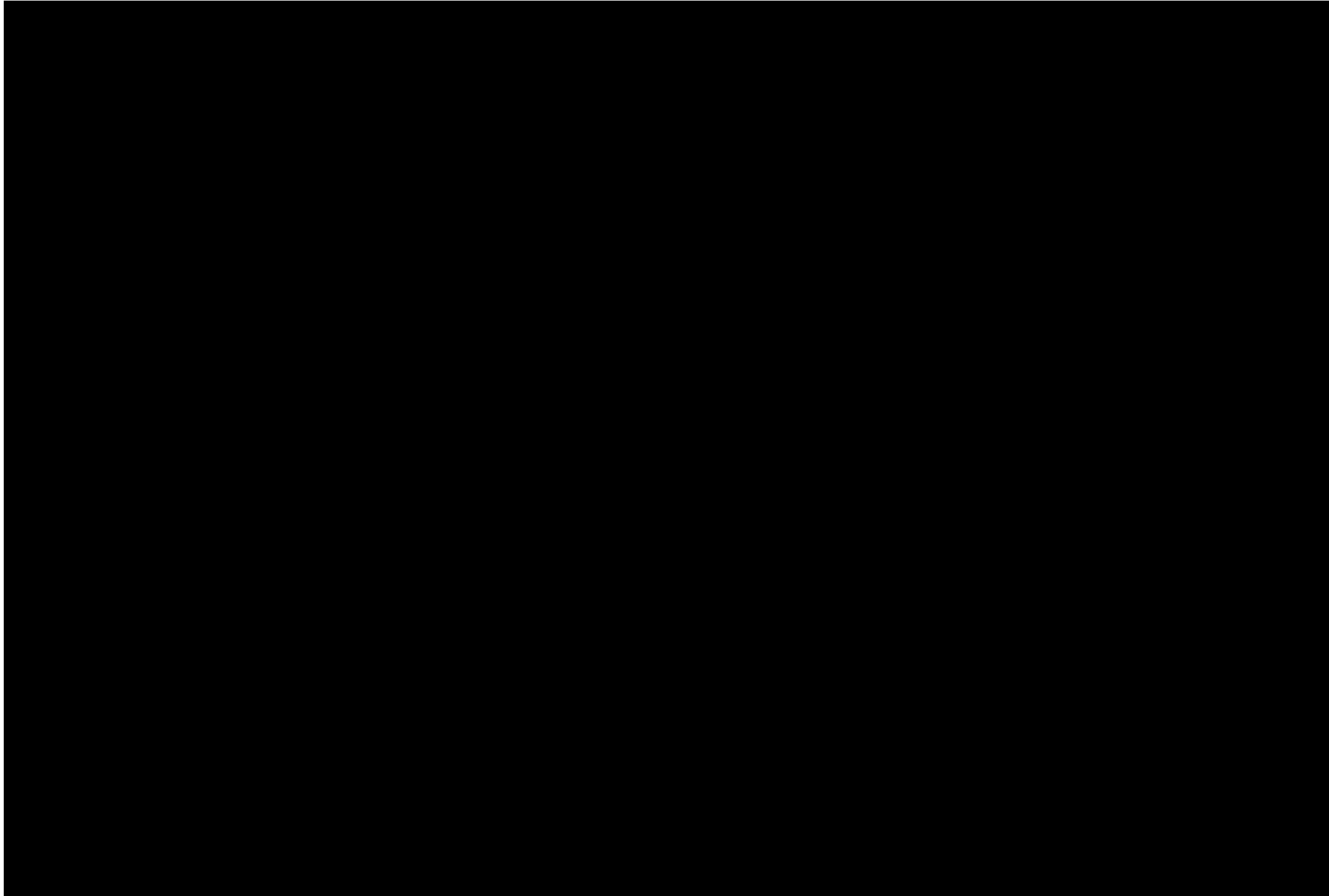
An AI chatbot grounded in vetted disaster management sources legislation, emergency plans, response protocols that retrieves precise, evidence-based answers in plain language on demand.

THE TECHNOLOGY

Retrieval-Augmented Generation (RAG) over a curated disaster management knowledge base, source citation, safety guardrails and plain-language response generation.

THE IMPACT

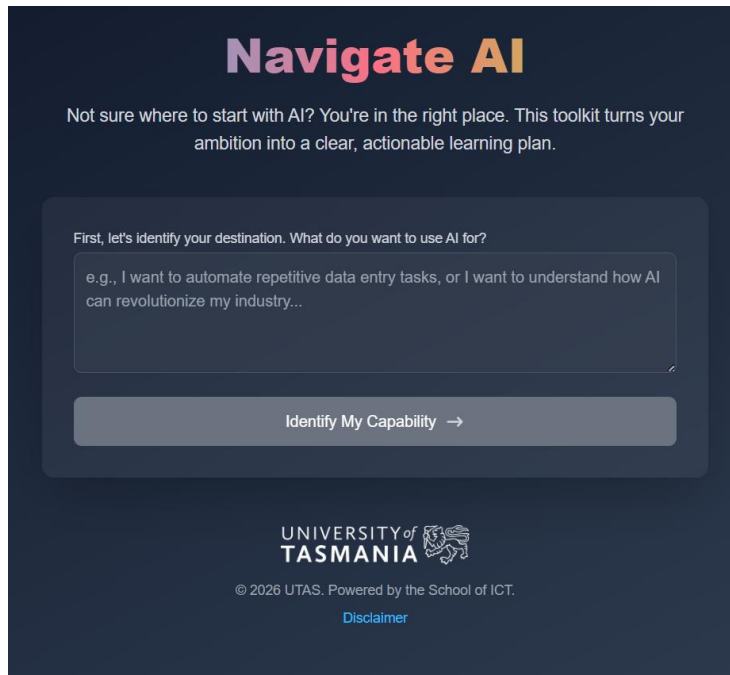
Faster access to critical information during emergencies, reduced reliance on finding the right expert, consistent responses across agencies and better-coordinated disaster response.



Navigate AI: Building GenAI Capability Uplift

GenAI is not just about the technology. It's about people, processes, ethics, and responsible capability building

So, we've built NavigateAI to help Tasmanians find purpose- and time-specific AI uplift resources, anywhere, anytime, for free 😊



Navigate AI

Not sure where to start with AI? You're in the right place. This toolkit turns your ambition into a clear, actionable learning plan.

First, let's identify your destination. What do you want to use AI for?

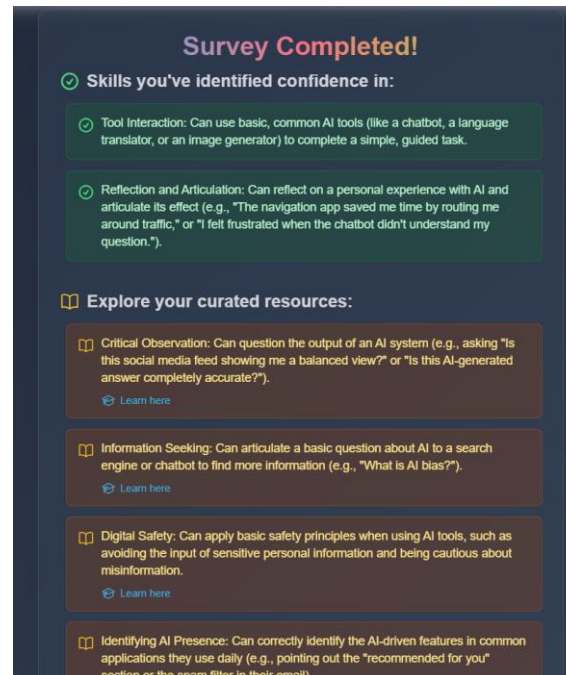
e.g., I want to automate repetitive data entry tasks, or I want to understand how AI can revolutionize my industry...

Identify My Capability →

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[Disclaimer](#)



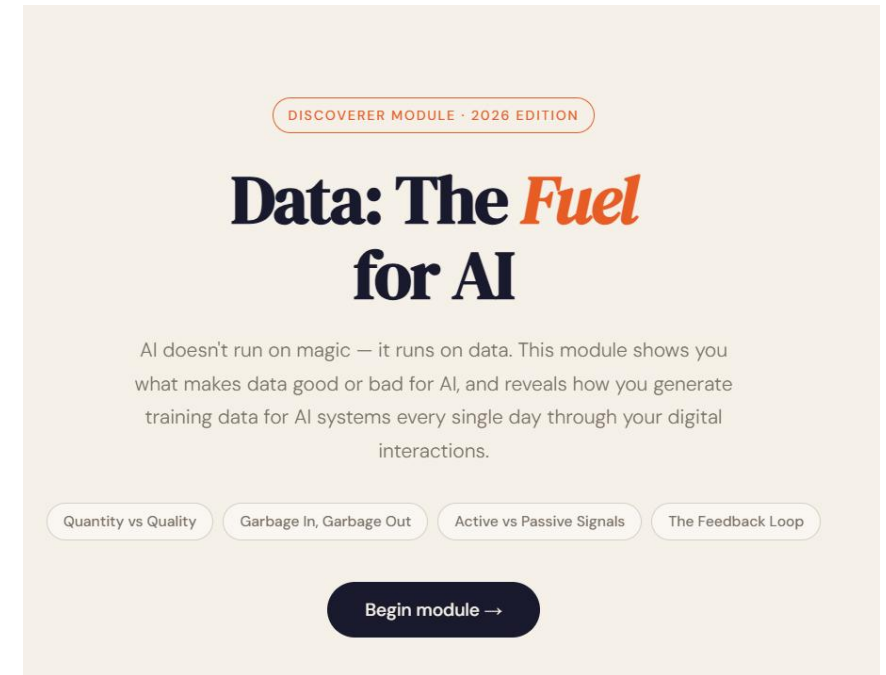
Survey Completed!

✔ Skills you've identified confidence in:

- ✔ Tool Interaction: Can use basic, common AI tools (like a chatbot, a language translator, or an image generator) to complete a simple, guided task.
- ✔ Reflection and Articulation: Can reflect on a personal experience with AI and articulate its effect (e.g., "The navigation app saved me time by routing me around traffic," or "I felt frustrated when the chatbot didn't understand my question.").

📖 Explore your curated resources:

- 📖 Critical Observation: Can question the output of an AI system (e.g., asking "Is this social media feed showing me a balanced view?" or "Is this AI-generated answer completely accurate?"). [Learn here](#)
- 📖 Information Seeking: Can articulate a basic question about AI to a search engine or chatbot to find more information (e.g., "What is AI bias?"). [Learn here](#)
- 📖 Digital Safety: Can apply basic safety principles when using AI tools, such as avoiding the input of sensitive personal information and being cautious about misinformation. [Learn here](#)
- 📖 Identifying AI Presence: Can correctly identify the AI-driven features in common applications they use daily (e.g., pointing out the "recommended for you" section or the spam filter in their email).



DISCOVERER MODULE · 2026 EDITION

Data: The *Fuel* for AI

AI doesn't run on magic — it runs on data. This module shows you what makes data good or bad for AI, and reveals how you generate training data for AI systems every single day through your digital interactions.

Quantity vs Quality Garbage In, Garbage Out Active vs Passive Signals The Feedback Loop

Begin module →

<https://navigate-ai.au/>

Thank You
Now, Ask us Anything 😊