Tier 2

Tier 2 – Comprehension: “I can tell you what all the parts of the car are that I would use on a daily basis.”

Tier 2 is practical, conceptual, and foundational. It is about deepening understanding of AI and its uses.

- What is AI beneath the marketing
- How machines learn from data
- The core types of AI systems
- The importance of high quality data
- How humans and AI work together
- How to prompt effectively

Tier 2 corresponds to:

- What does the steering wheel do
- What the pedals do
- Why does the engine matter
- What do the dashboard warnings mean
- What keeps the car running

Remember: you do not need to be a mechanic, but you should know how to operate the car safely from A > B.

Beneath the Buzzwords

Artificial Intelligence refers to any computer system designed to perform tasks that would normally require human thinking. This includes things like:

- Recognizing patterns
- Making predictions
- Interpreting language
- Solving structured problems

AI relies on algorithms (math), data processing, and adaptive modeling to mimic the functions of perception and reasoning.

> “AI is when we teach computers to act and think in ways similar to humans, without having to explain every step along the way.”

This includes everything from automations (like email filtering) to complex, multi-modal neural networks (like ChatGPT or CoPilot).

Machine Learning (ML)

Machine Learning is a subset of AI focused on learning from patterns in data.

It works by:

1. Studying many examples (the more data, the better)
2. Detecting patterns (the more data, the more precise and accurate the patterns)
3. Using those patterns to make predictions about to do/what happens next
4. Improving as more data is added to the original data set

Machine Learning replaces explicit instructions (user having to say "do this next" or inputting a command) with internal pattern-driven directions.

> "Machine Learning is how AI learns from experience: it uses data, sees patterns, make decisions based on patterns, and uses that data to improve over time."

Examples: Spam filters, Netflix recommendations, fraud detection

Neural Networks

Neural networks are complex digital structures inspired by the human brain. They contain:

- Nodes – workers
- Layers – departments
- Weighted connections – how much decision gets influenced

Each node receives information, transforms it mathematically, and then passes it forward to the next node. The layered structure allows the system to do complex tasks such as:

- Recognize faces
- Understand speech patterns
- Translate languages
- Identify Objects
- Generate text

> "A neural network is a digital brain made of many small workers. Each does a tiny piece of the job and passes the result forward through the chain."

Neural Networks power many modern complex AI systems such as ChatGPT.

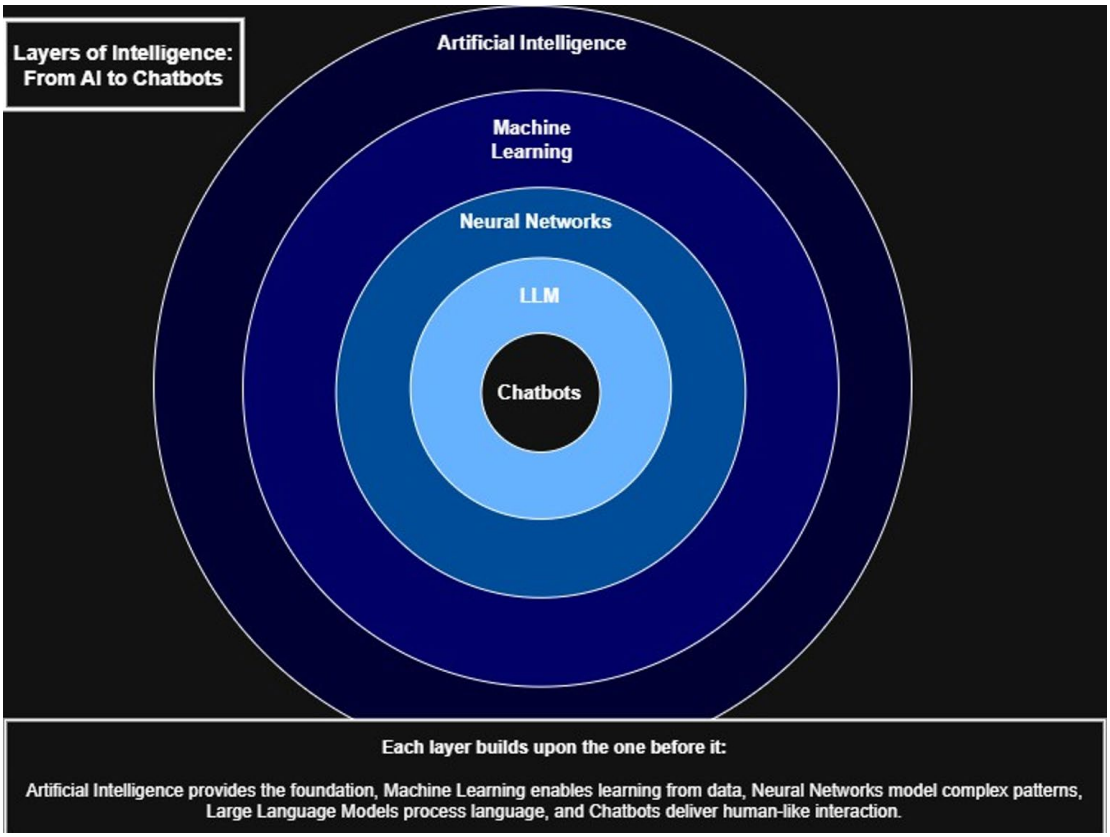
Chatbots

Chatbots are complex AI systems trained to simulate human conversation using natural language processing (NLP). Advanced chatbots (ChatGPT, Claude, Gemini, Grok) use:

- Large Language Models (LLMs)
- Massive datasets
- Pattern-based prediction
- Reasoning scaffolding
    - Scaffolding: The support system that allows something to work
- Contextual memory isolated to specific windows
- User prompt interpretation heuristics
    - Heuristic: shortcuts that allow quick decisions without checking every possibility

Chatbots do not "think". Chatbots predict through math the next most likely useful response.

> "A Chatbot is a program that produces text responses that feel like talking to a knowledgeable



How Machines Learn: Input > Training > Output

Machines learn through cycles referred to as feedback or feedback loops.

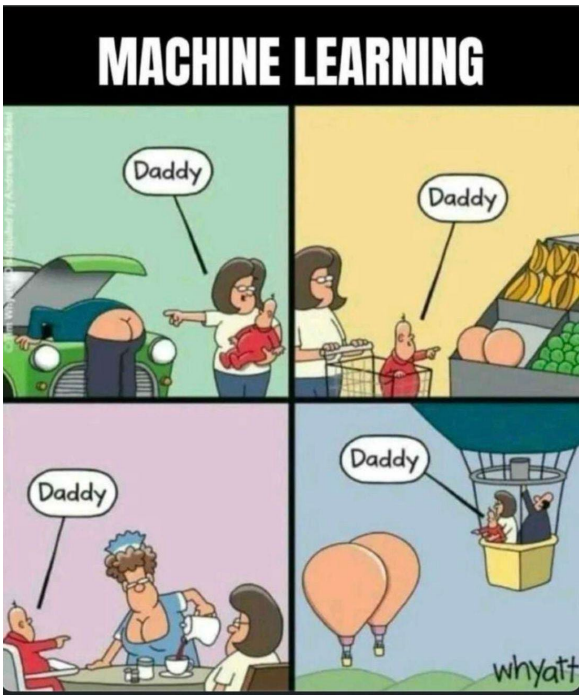
1. Input: Data enters the system.
2. Training: The machine finds patterns in the data.
3. Output: The model uses these patterns to answer new questions.

This pattern recognition, not true reasoning. AI does not understand “truth” and “nuance”; it only recognizes structures.

Key Principle of Machine Learning and AI Systems: GIGO

Garbage In = Garbage Out

The output of any artificial intelligence system is only as good as the data that it is trained with. Poor data will always end in poor results.



Data Quality

Currently, AI performance depends almost exclusively on the quality of the data that it is working with.

Clean, well-structured data > Accurate results based on accurate pattern matching

Biased/messy data > Distorted results

Misinformation > Hallucinations

Unbalanced Data > Skewed predictions

Mathematical Data Analyzer and the Manager

AI is amazing at handling large sets of data. This is currently the best place to use AI to speed up YOUR speed.

It can take huge sets of data and analyze the patterns in it.

It can read thirty research papers and give you a concise summary paper to your specifications in minutes.

It can search websites at lightening speed to help you find the best match of an item you would like to buy AND help you find coupons for it.

AI CANNOT:

- Decide what pieces of information matter and what does not unless you tell it
- Understand context unless explicitly told or trained
- Determine ethical boundaries on its own

"AI can analyze, but it is the humans that must decide what the analysis MEANS."

AI does not distinguish between "true" and "false"; It distinguishes only between "common patterns" and "rare patterns". A lot of this is done through statistical analysis.

Note: AI uses something called "tokens" to make its statistical prediction of what should come next. Tokens are "parts" of words, not whole words and not letter by letter.

Example sentence with number of tokens:

"A kid ate strawberries."

A = 1 Token

Kid = 1 Token

Ate = 1 Token

Straw + Berry = 2 Tokens

Unless the AI system is sufficiently advanced, it cannot distinguish between what is

A token vs a letter vs a word

Types of AI

1. Rule-Based AI (Deterministic)
    a. Follows explicit instructions
    b. No learning
    c. Example: thermostat regulation
    d. “AI that only does exactly what you tell it.”
2. Machine Learning AI
    a. Learns from past examples
    b. Builds patterns over time.
    c. Example: email filtering
    d. “AI that can learn if A then B.”
3. Deep Learning AI
    a. Many layers of neural networks
    b. Handles complex recognition tasks
    c. Examples: LLMs
    d. “AI that can recognize YOU.”

Andrew Ng is one of the most influential educators in AI literacy. He is one of the first to democratize machine learning understanding for the public, not just for an elite group.

Human + Machine Collaboration

The strongest systems today combine:

- AI’s speed and scale
- Human context, values, judgment, and boundary setting

Traditionally in tech, this is called “Human-In-The-Loop” (HITL) or Human Orchestrator Framework. Several specific collaboration models have evolved from this base relationship.

1. Human-in-the-Loop (HITL): Human approves/executes tasks and AI supports.
2. Human-on-the-Loop (HOTL): AI operates autonomously, but human actively monitors and can intervene.
3. Human-over-the-loop (HOVL): AI operates almost fully autonomously; humans review outputs periodically to check for completion

Collaboration models also branch off to more nuanced and domain specific terminology, such as the Centaur, Cyborg, and HCAI Models.

Always make sure you understand what collaboration model it is that you are working with so that you know where you must make the decisions for the best outcome possible.

How to Work with AI: Prompting Fundamentals

What is Prompting?

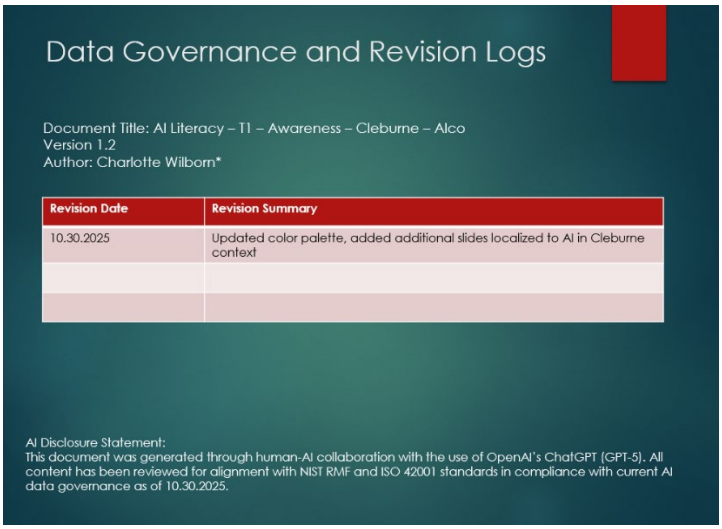
Prompting is using clear instructions or questions to tell an AI what you need it to do. Though prompting is an evolving process, the fundamentals remain the same:

1. Structure – Providing clear instructions means better results
2. Constraints – Giving the rules around the output you need, such as word count/length, audience, tone, format, level of understanding
3. Context – Telling the AI who you are, what you need, and why; the more context the AI understands about the request, the better they can shape the result specifically for your needs
    a. Note: not providing context results in what is called “baseline” outputs, something that can fit for the broadest range of users
    b. Example context for my personal work LLMs:

    ““I am a research and development and quality control manager in a chemical manufacturing company. I have worked in microbiology and chemistry in third party testing of food, pharmaceutical, and manufacturing facilities. I value accuracy and directness with succinct language over emotional softening.”

4. Collaboration: Back and forth with the model. Saying “Tell me what else you need to finish this task” results in much better results suited to you.

For the future and for business: many governance models are moving towards the disclosure of AI use when it contributes to published work or final decisions. This is into a standard business practice (similar to citations).



Bad versus Good Prompts

Bad prompts are vague and make AI guess at every piece of the puzzle.

Good prompts define what the user expects, including:

- Purpose
- Audience
- Tone
- Length
- Topic
- Structure
- Format
- Citation Style (if needed)

Examples:

Bad – "I need an essay on the Roman Empire."

Better – "I need a short essay about the Roman Empire that explains important events and leaders in its history."

Best – "I need a clear, beginner friendly 3-4 paragraph essay about the Roman Empire. Be sure to include:

- When it began and ended
- Key leaders such as Caeser and Augustus
- Major historical achievements
- Why it fell

MLA Citations on a separate page at the end. Ask me what you need to complete this task."

Prompting works like writing out recipes: the more detail you give, the closer the result will match expectations.

AI Basic Limitations

1. Data Issues: Poor or biased training data will lead to flawed conclusions.
    a. The most famous of these is the COMPAS Risk Assessment Algorithm and is used to teach AI Ethical and Governance Teams about the risks of using AI without human oversight.
2. Token Length: All models have token length limits to windows, causing loss of context before a project is completed.
3. Memory Coherence: AI does not "remember" the way humans do; it reconstructs patterns. Memory Coherence is directly related to platform instability.
4. Platform Stability: Rollouts and updates can cause extreme variance in behavior.
5. Optimization Loops: Models will sometimes over optimize or simplify answers.
    a. Extreme examples of this is any instance that causes "AI Psychosis" especially when the user is engaged in an interaction for an unsafe period of time; the AI instance has overoptimized for user engagement.
6. User optimization: AI performs best when humans give clarity and constraints; models start at "baseline" and move into more detailed areas of information based on the interaction patterns

"Neural networks are gigantic math formulas predicting the next most likely outcome that the user wants."