NANYANG
THE INNOVATIVE POLYTECHNIC

Generative AI:

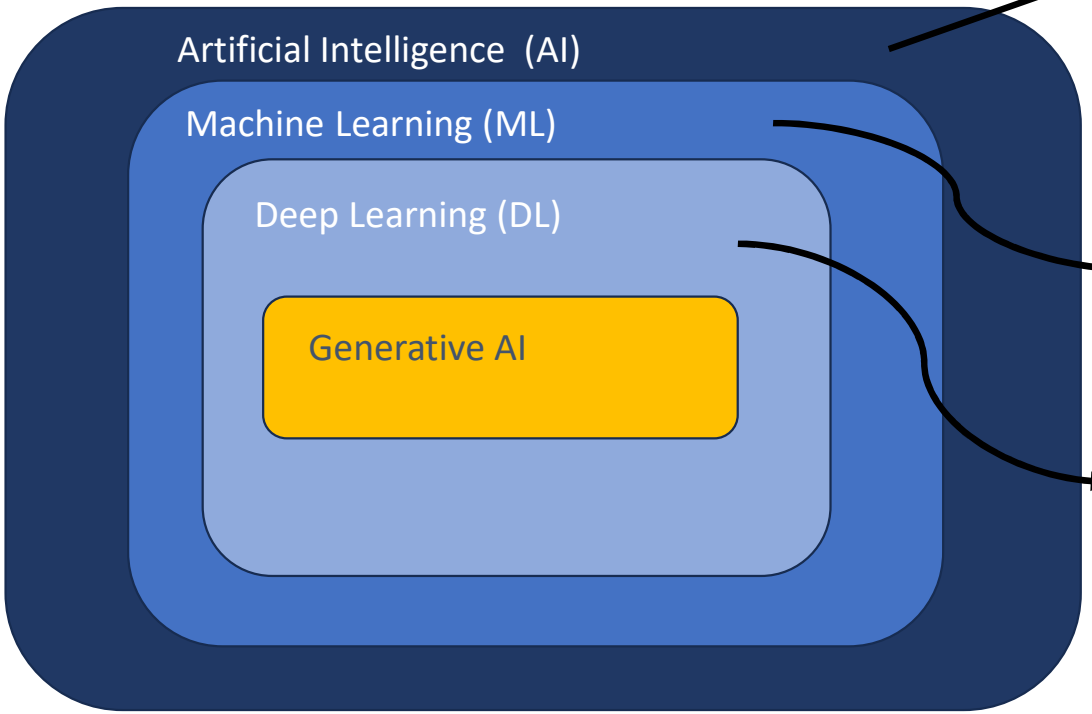
Introduction & Landscape

Learning Outcomes

Upon completion of this session, the learners should be able to:

- Explain the fundamentals of Generative AI and identify its key industry use cases.
- Describe Large Language Model (LLM) applications and evaluate real-world use cases across different domains.

What is Generative AI?

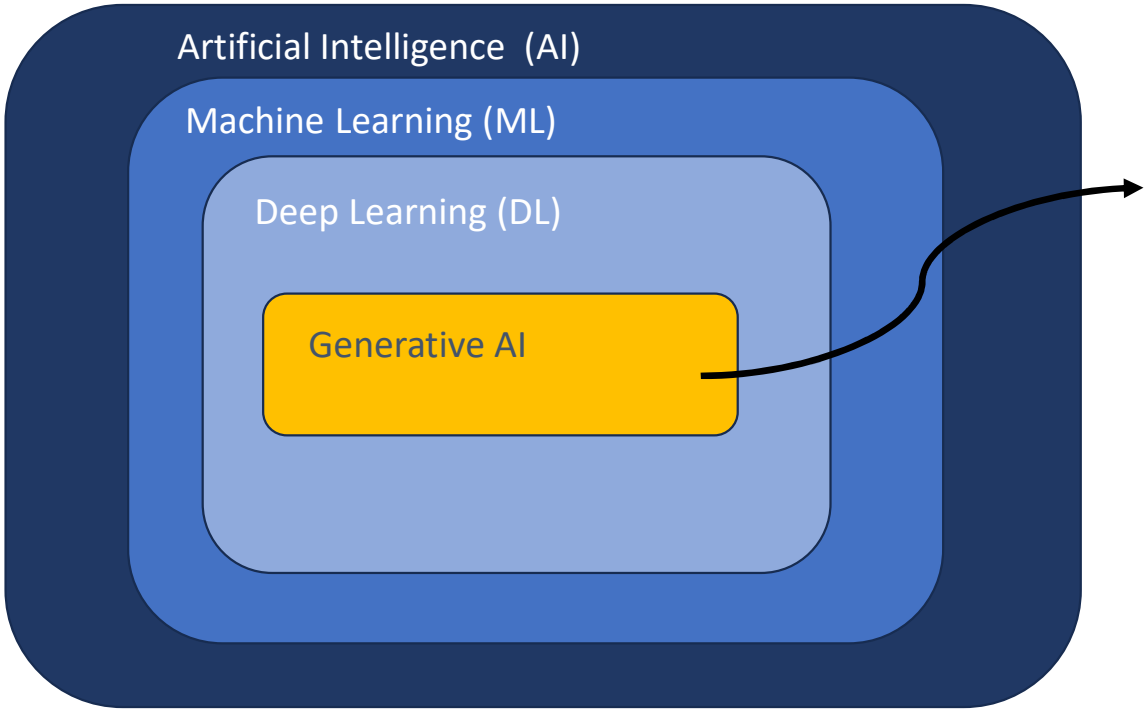


Artificial Intelligence:
A multidisciplinary field of computer science
That aims to create system capable of emulating
And surpassing human-level intelligence

Machine Learning:
Learn from existing data and make predictions/
Prediction without being explicitly programmed

Deep Learning:
Uses “artificial neural networks” to learn from data

What is Generative AI?



Generative Artificial Intelligence:
Sub-field of AI that focuses on Generating new content such as:

- Images
- Text
- Audio/music
- Code
- 3D objects
- Synthetic data

Generative AI models

Generative AI is a type of artificial intelligence that creates new content—such as text, images, audio, or video—based on the data it has learned from.

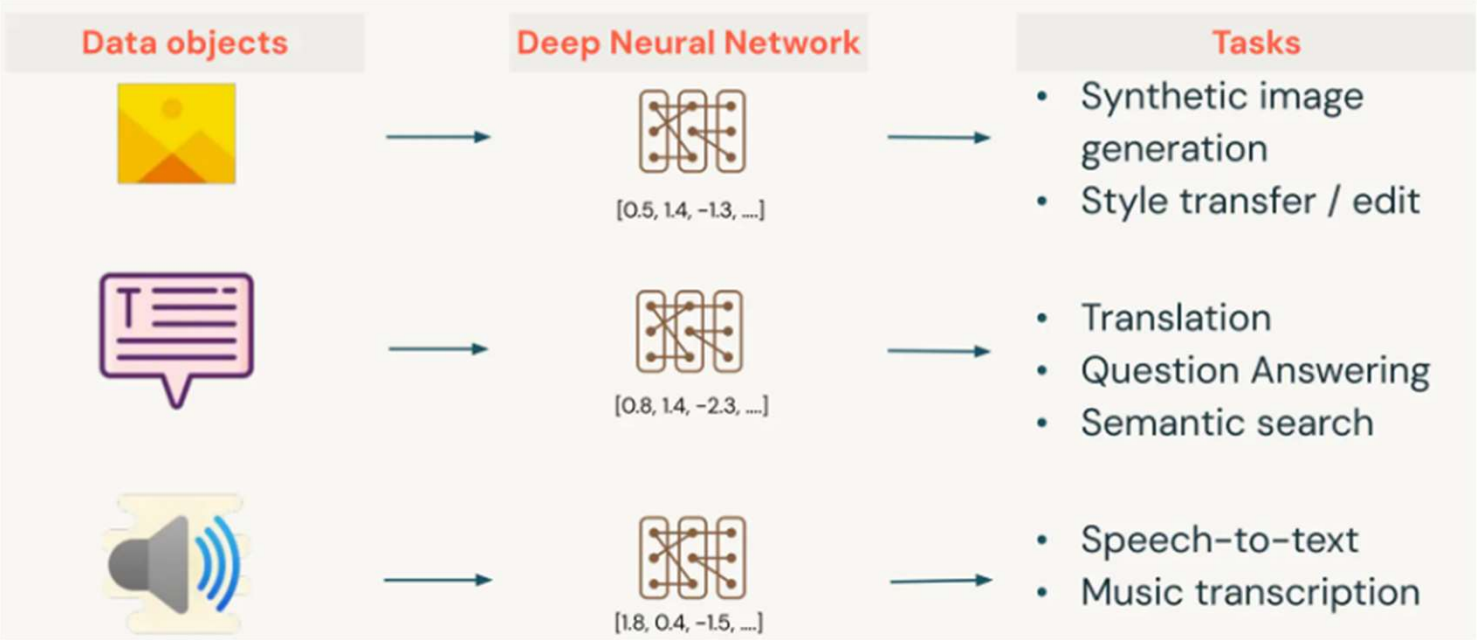
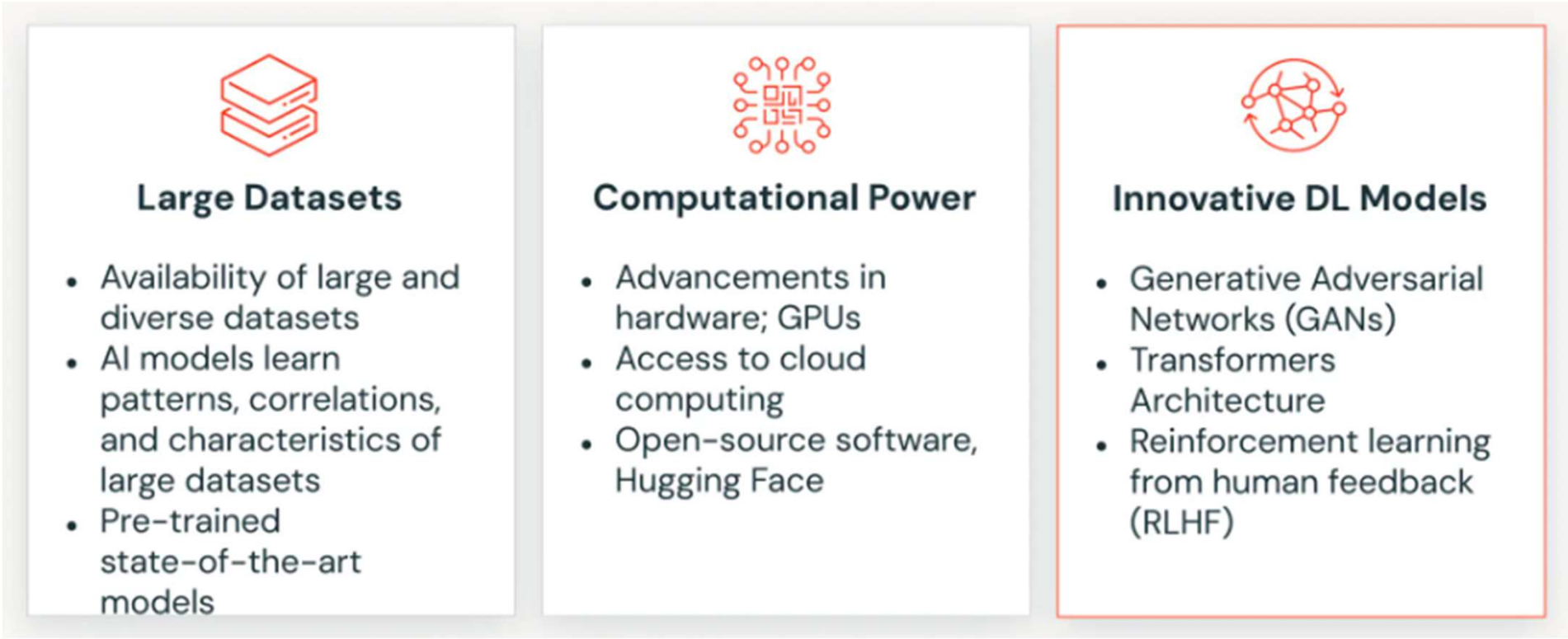


Image source: generated from manus.im

Factors making Generative AI possible



Why Should we care now?

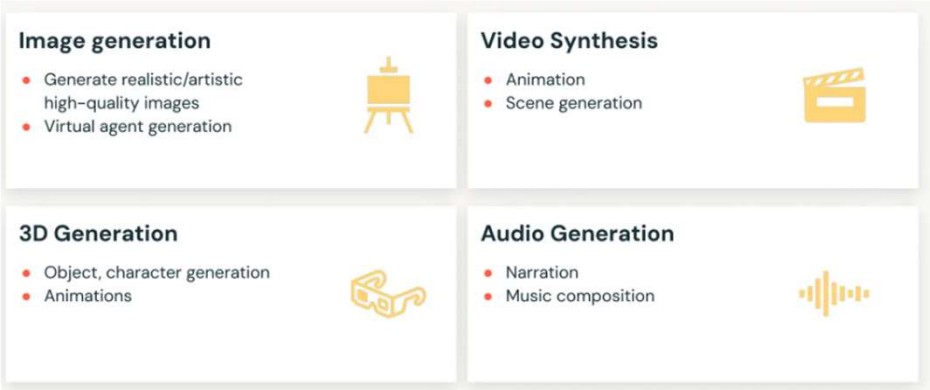
Generative AI has been around for a while, why it matters now

- Generative AI modes' accuracy and effectiveness have hit a tipping point
  - Powerful enough to enable use cases not feasible even a year ago
  - Economical enough for use even by non-technical business users
- Generative AI models and tooling are readily
  - Many models are open source and customizable
  - Requires powerful GPUS, but are available in the cloud

Generative AI Task

Intelligent conversations, creative text creation, code generation

- Content generation
- Question/answers
- Virtual assistances
- Content personalization
- Language/image style transfer
- Story telling, poetry , creative writing
- Translation
- Code generation/auto-completion



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Generative AI Use Cases

Synthetic data generation

- Synthetic dataset generation
  - Increase size, diversity of dataset
  - Privacy protection
  - Simulate scenarios
- Synthetic data for computer vision(e.g. autonomous cars)
  - Object detection
  - Adversarial scenarios(weather, road condition)
- Synthetic text for natural language processing

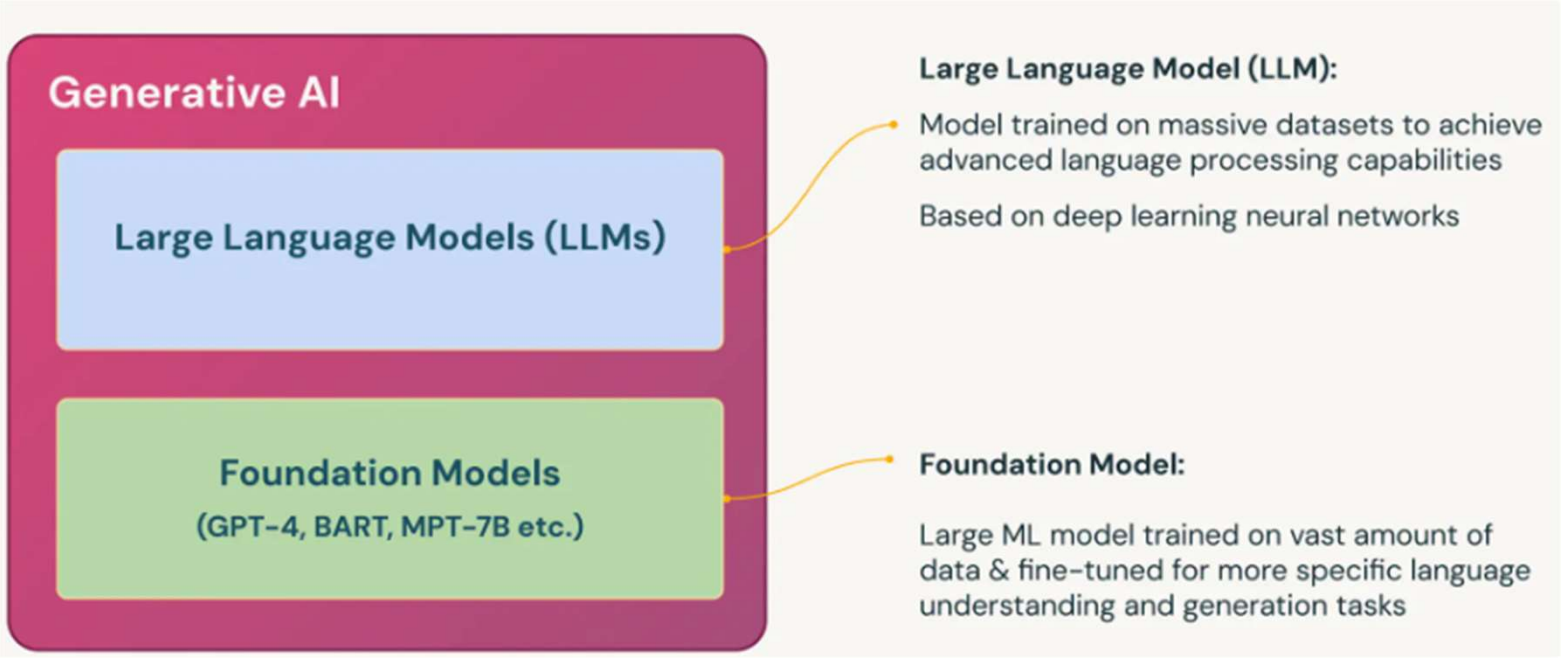
Generative AI Use Cases

Generative design: Discover drugs, design unique systems

- Drug discovery
- Product and material design
- Chip design
- Architectural design and urban planning

What is LLM?

An LLM (Large Language Model) is a type of generative AI specialized in understanding and generating human-like text, making it one of the core technologies behind tools like ChatGPT.



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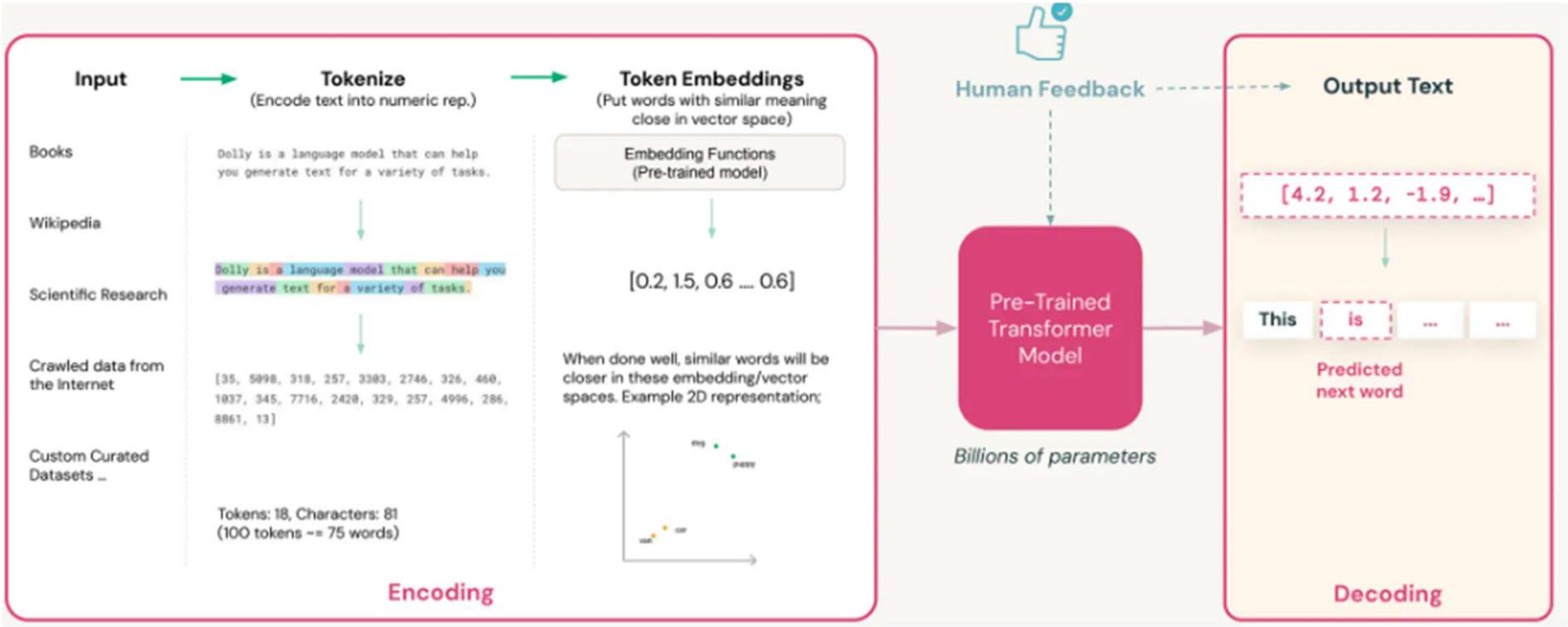
How Do LLMs work?

A simplified version of LLM training process



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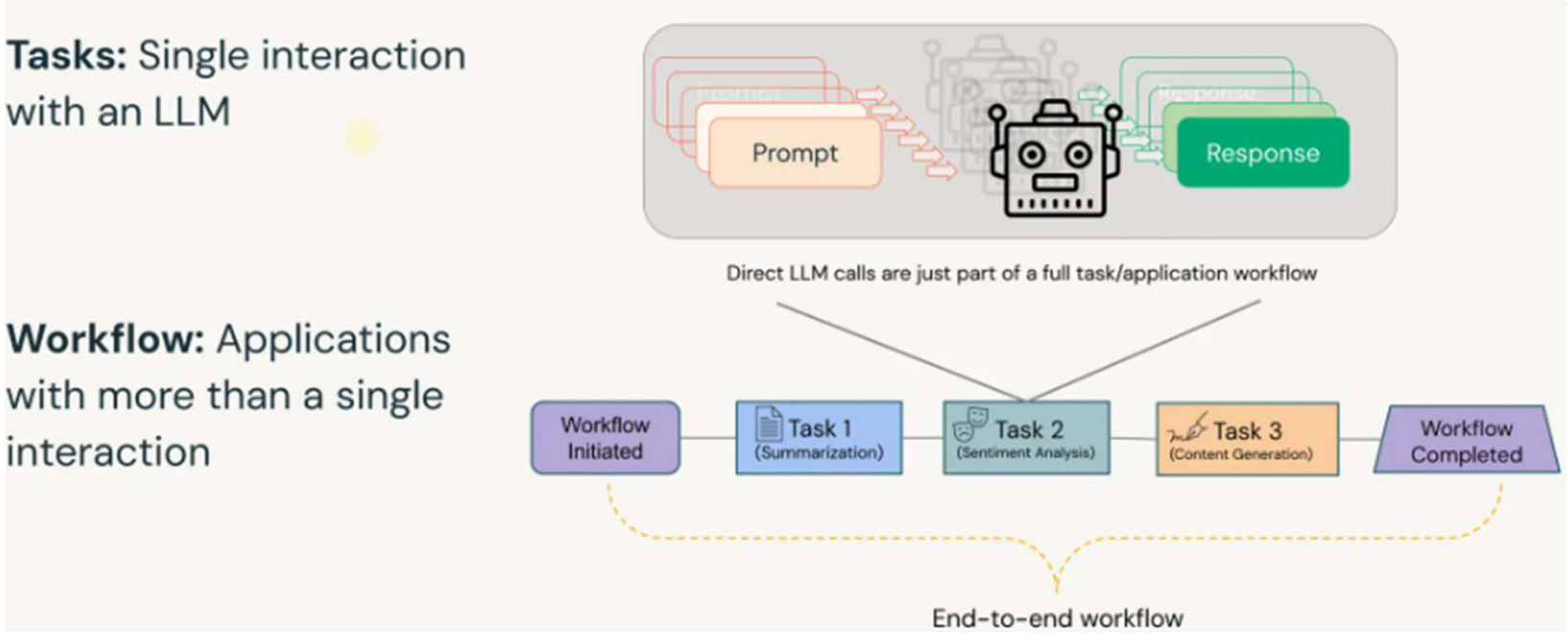
Common LLM tasks

Content Creation and Augmentation	Generating coherent and contextually relevant text. LLMs excel at tasks like text completion, creative writing, story generation, and dialogue generation.
Summarization	Summarizing long documents or articles into concise summaries. LLMs provide an efficient way to extract key information from large volumes of text.
Question Answering	Comprehend questions and provide relevant answers by extracting information from their pre-trained knowledge.
Machine Translation	Automatically converting a text from one language to another. LLMs are also capable to explain language structure such as grammatical rules.
Classification	Categorizing text into predefined classes or topics. LLMs are useful for tasks like topic classification, spam detection, or sentiment analysis.
Named Entity Recognition (NER)	Identifying and extracting named entities like names of persons, organizations, locations, dates, and more from text.
Tone / Level of content	Adjusting the text's tone (professional, humorous, etc.) or complexity level (e.g., fourth-grade level).
Code generation	Generating code in a specified programming language or converting code from one language to another.

LLM Application – mix LLM tasks in a workflow

Typical applications are more than just a prompt-response system



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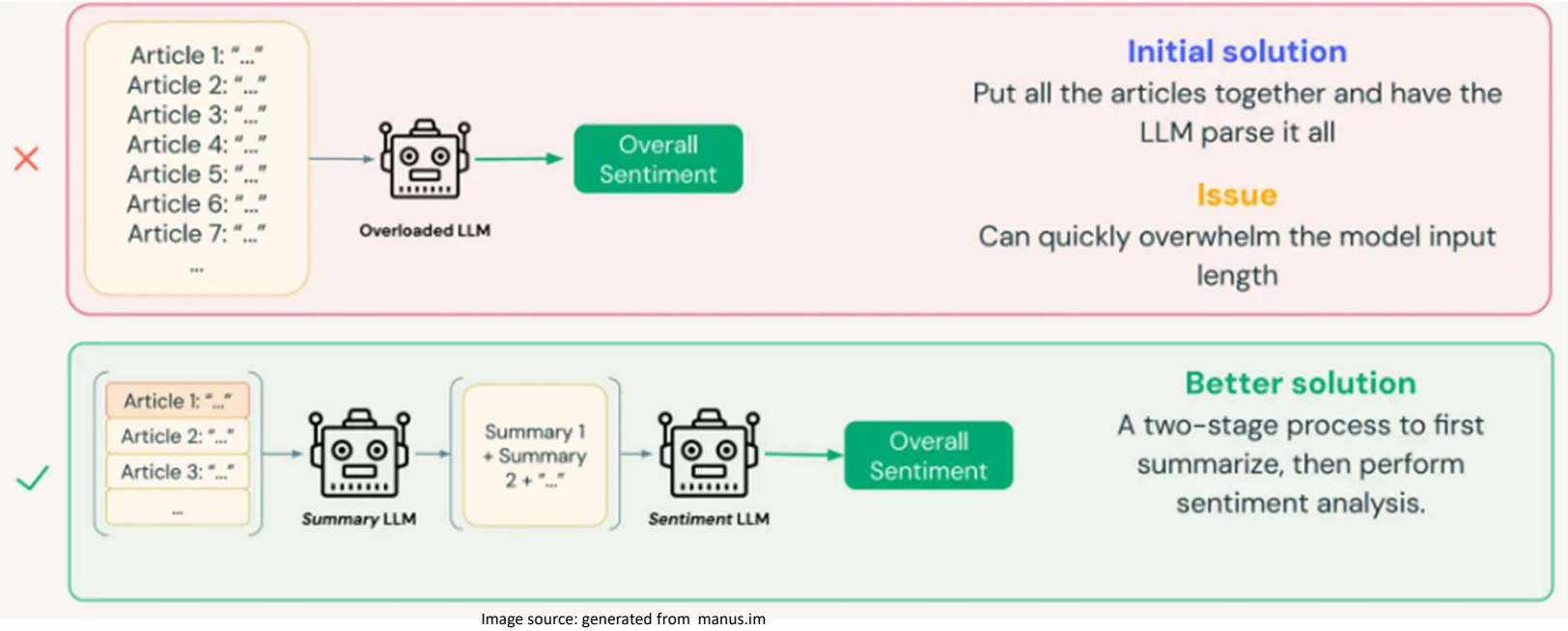
LLM Application – mix LLM tasks in a workflow

Example multi-LLM problem: get the sentiment of many articles on topics



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LLMs Business Use Cases

Customer Engagement

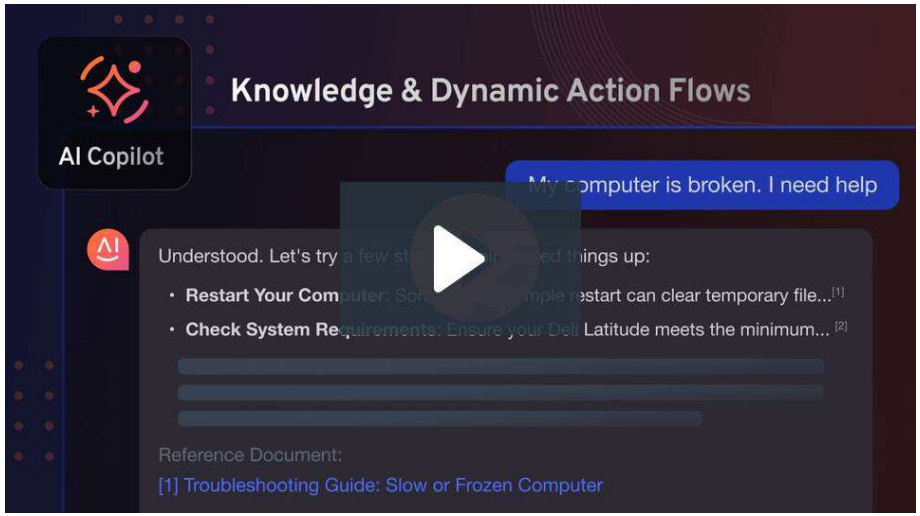
- Personalization and customer segmentation:
  - Provide personalized product/content recommendation based on customer behavior and preferences
- Feedback Analysis
- Virtual assistances

https://www.datamatics.com/resources/demos/generative-ai
https://aws.amazon.com/ai/generative-ai/use-cases/

LLMs Business Use Cases

Process automation and efficiency

- Customer support augmentation and automated question answering
- Automated customer response
  - Email
  - Social media, product reviews
- Sentiment analysis, prioritization



Agentic AI Copilot - Knowledge & Dynamic Action Flows

LLMs Business Use Cases

Code generation and developer productivity

- Code completion, Boilerplate code generation
- Error detection and debugging
- Convert code between languages
- Write code documentation
- Automated testing
- Natural language to code generation
- Virtual code assistance for learning to code

Potential Risks and Challenges

Generative AI brings new risks and challenges for business and society

- Legal issues
  - Privacy
  - Security
  - Intellectual property protection
- Ethical issue
  - Bias
  - Misinformation
- Social/Environmental issues
  - Impact on workforce
  - Impact on the environment

Use Cases Discuss

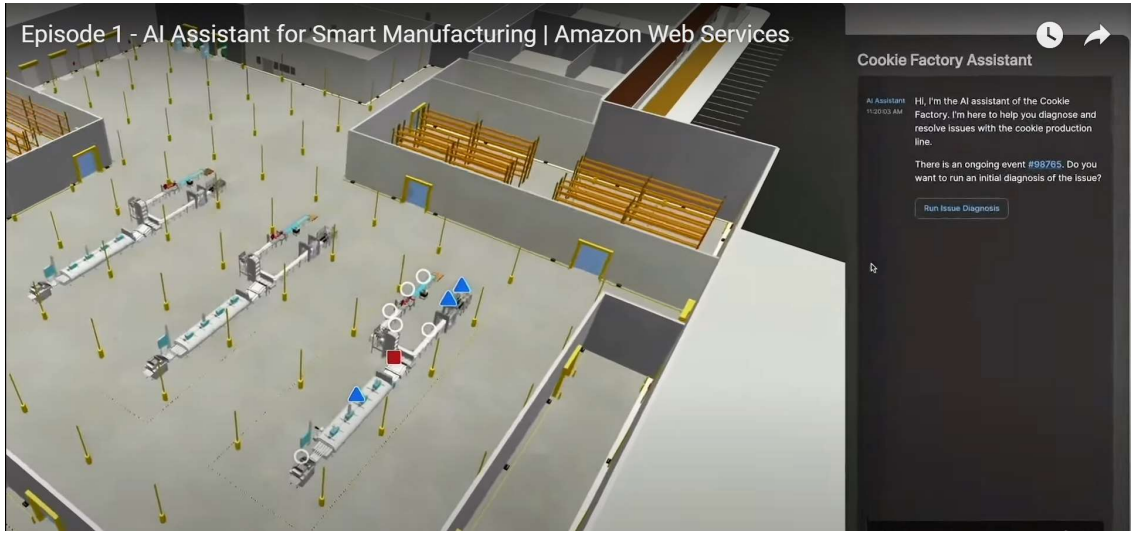
Use Cases Discuss

- Go through the 2 use cases in the next 2 slides
- Answer the following questions. Present some points to present.
  - Identify what are the problem described in the video related the industry?
  - What is the Generative AI solution proposed in the video?
  - Why the Generative AI solution is preferred than others?
  - What are the common problem in both use cases that are resolved using generative AI?

Where is the LLM Application?

Use Case 1

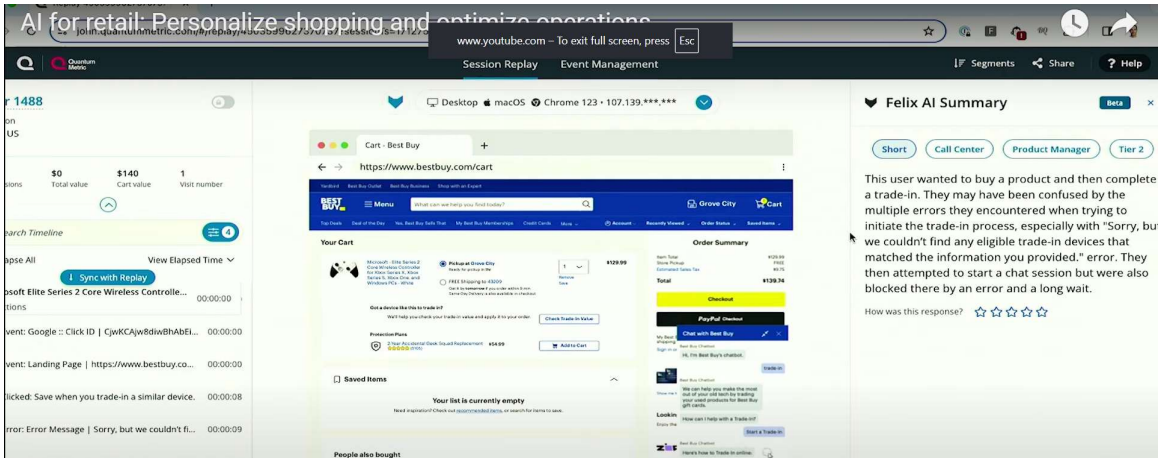
- https://www.youtube.com/watch?v=_HOE3qAUfLA&t=426s
- Watch video from 7.05mins



Share your thought why the Factory Assistant is an LLM application?

Where is the LLM Application?

- Use Case 2
- https://www.youtube.com/watch?v=0S4vtzILSCQ&t=1117s
- Watch video from18.37mins – 24.45mins



Share your thought, how they use LLM to engage the customer?

References

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