AN AI

PRESENTATION BZ ZH

MANAGEMENT

PERFORMANCEHUB

AN AI PRESENTATION

TODAY'S SUBJECT:

PRACTICAL IMPLEMENTATION OF AI

"AI AS A TOOL"

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WILL AI TAKE ALL OF OUR JOBS?

NO, BUT IT WILL HEAVILY AUGMENT THEM WHILE CREATING NEW OPPORTUNITIES

YOU ARE, WHERE YOU ARE. DON'T FEEL BAD OR LEFT BEHIND.

Fear and Anxiety

Optimism and Excitement

AI IS REALLY JUST BEGINNING

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CURRENT AI ERA:

IT CAN BUILD BUT DOESN'T REALLY KNOW WHAT TO BUILD

WHAT WE ARE GOING TO TALK ABOUT TODAY

- AI Core Concepts
- Some Practical Applications and Prompt Building
- “AI Mindset”-
  - How it changes the way we think about our current challenges
- Current AI Building Blocks

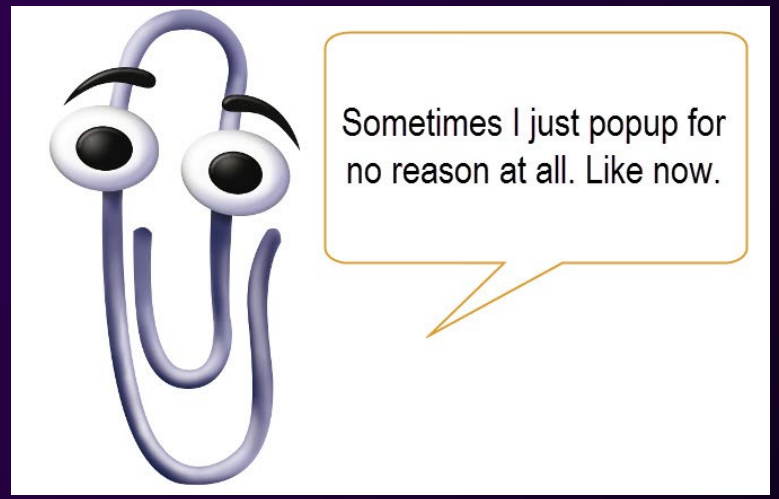
WHAT WE ARE NOT GOING TO COVER

- Individual AI platforms and IOT services in detail
- AI Buttonology
- State AI Assessment and Governance Procedures
- AI Security, Rules, and Risks

This is a practical guide to help you navigate AI on your journey

AI

HAS GROWN UP



Watson AI Fails to Destroy Humans in First Round of Jeopardy

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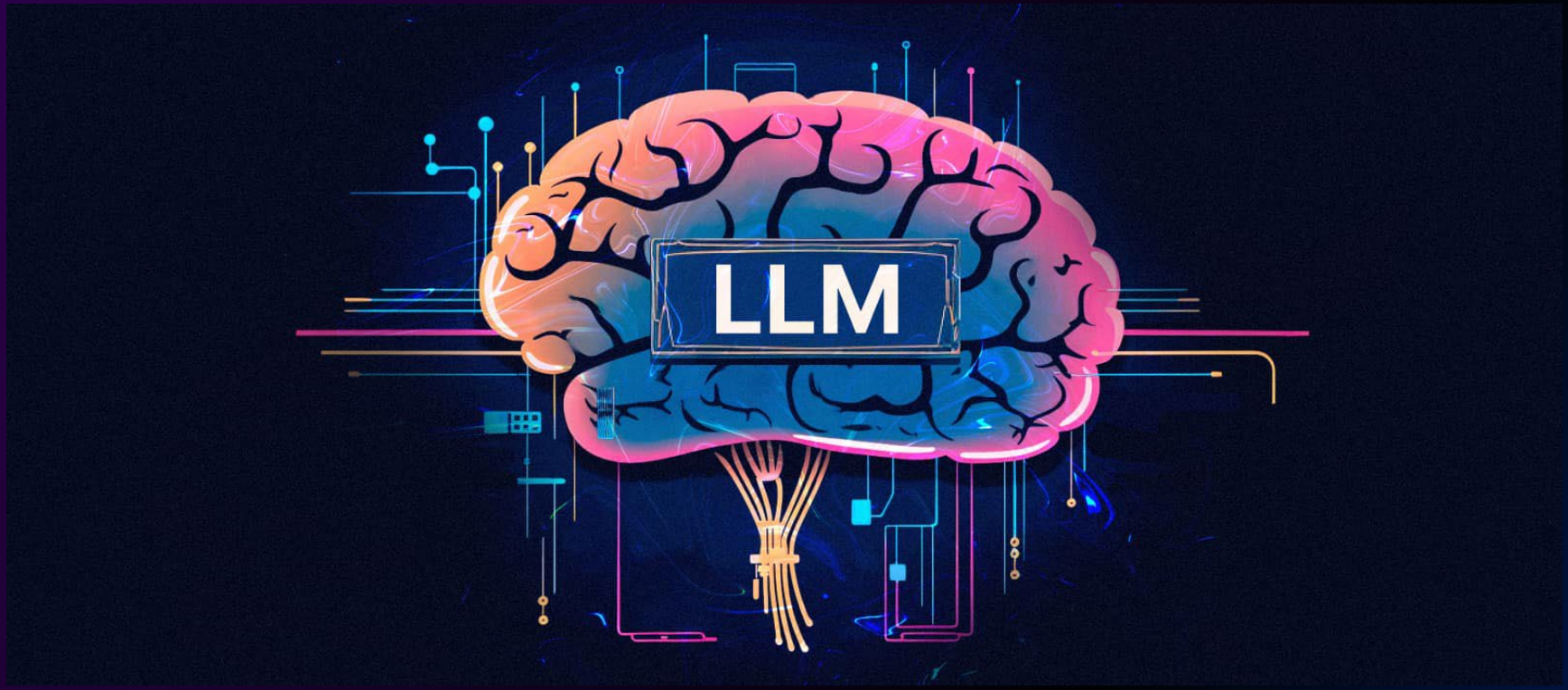
AI

WHERE ARE WE TODAY?



A Digital Brain Capable of Handling Complex Tasks

ZEBRA PUZZLE

There are 5 houses:

- *Number:* 1, 2, 3, 4, 5 (left-to-right)
- *Names:* Alice, Bob, Arnold, Peter, Eric
- *Sports:* Tennis, Baseball, Soccer, Basketball, Swimming

Who lives in house 4 and 5? What sport does each person play?

Clues:

- The person who plays tennis is not in the fifth house
- The person who swims and Alice are next to each other
- The person who swims is directly left of the person who plays tennis
- Eric plays soccer
- Eric is in the first house
- Arnold is in the second house
- Peter plays baseball
- Alice is not in the third house

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- *HuggingFace.co, ZebraLogic test no.5x2-15*

ZEBRA PUZZLE – AI SOLUTION

Step-by-Step Solution

1. From clues 5 and 4, Eric lives in house 1 and plays soccer.
2. From clue 6, Arnold lives in house 2.
3. From clue 7, Peter plays baseball.
4. From clue 3, the swimmer is directly left of the tennis player.

   This means they must be in adjacent houses.
5. From clue 1, the tennis player is not in house 5. Combined with step 4,

   the swimmer-tennis pair must be in houses 1-2, 2-3, or 3-4 (not 4-5).
6. From clue 8, Alice is not in house 3.
7. From clue 2, the swimmer and Alice are next to each other. This is a crucial constraint.
8. Let's analyze the possible positions for the swimmer and tennis player:
   - If the swimmer is in house 1 (Eric), the tennis player would be in house 2 (Arnold).
   - If the swimmer is in house 2 (Arnold), the tennis player would be in house 3.
   - If the swimmer is in house 3, the tennis player would be in house 4.
   - If the swimmer is in house 4, the tennis player would be in house 5 (impossible by clue 1).
9. We know Eric plays soccer, so he can't be the swimmer. This eliminates the first possibility.
10. If Arnold (house 2) is the swimmer, the tennis player must be in house 3.

    Since Alice can't be in house 3 (clue 8), and Alice must be adjacent to the swimmer (clue 2),

    Alice would have to be in house 1. But house 1 is occupied by Eric, creating a contradiction.
11. Therefore, the swimmer must be in house 3, and the tennis player in house 4.
12. Since Alice must be adjacent to the swimmer (house 3) and Alice can't be in house 3,

    Alice must be in either house 2 or 4.
13. House 2 is already occupied by Arnold, so Alice must be in house 4
14. This makes Alice the tennis player.
15. The person in house 3 (the swimmer) must be Bob since all other people are assigned.
16. We've now determined:
    - Eric: house 1, soccer
    - Arnold: house 2, unassigned
    - Bob: house 3, swimming
    - Alice: house 4, tennis
    - Peter: plays baseball, must be in house 5
17. By process of elimination, Arnold must play basketball.

Final Solution

1. Eric - Soccer
2. Arnold - Basketball
3. Bob - Swimming
4. Alice - Tennis
5. Peter – Baseball

Verification

- The tennis player (Alice) is not in house 5 ✓
- The person who swims (Bob) and Alice are next to each other ✓
- The swimmer (Bob) is directly left of the tennis player (Alice) ✓
- Eric plays soccer ✓
- Eric is in house 1 ✓
- Arnold is in house 2 ✓
- Peter plays baseball ✓
- Alice is not in house 3 ✓

All clues are satisfied. This is the correct solution.

ZEBRA PUZZLE – AI SOLUTION

Step-by-Step Solution

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    - Alice: house 4, tennis
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17. By process of elimination, Arnold must play basketball.

Time Taken: 6.1 Seconds

Final Solution

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2. Arnold - Basketball
3. Bob - Swimming
4. Alice - Tennis
5. Peter – Baseball

Verification

- The tennis player (Alice) is not in house 5 ✓
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- Eric is in house 1 ✓
- Arnold is in house 2 ✓
- Peter plays baseball ✓
- Alice is not in house 3 ✓

All clues are satisfied. This is the correct solution.

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LARGE LANGUAGE MODELS

TECHNOLOGY WITH PROFOUND POTENTIAL

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LLM TRAINING PROCESS

Data Preparation

- Gather data
  - Books, blogs, web, etc.
- Convert words to *tokens*

Parameter Estimation

- Predict next token
- Heavy computation
- Billions of parameters

Contextual Learning

- Relationships between concepts
- Maintain coherence

POPULAR LLM PRODUCTS

Foundation Models
- GPT 4o, *OpenAI*
- Claude 3.7, *Anthropic*
- Gemini 2.5, *Google*
- Llama 3.1, *Meta*
- Grok 3, *XAi*
- DeepSeek R1, *High-Flyer*

Chat Models
- ChatGPT, *OpenAI*
- Claude, *Anthropic*
- Gemini, *Google*
- Copilot, *Microsoft*
- ...

Other Types of Products
- Language translation
- Data tagging
- Coding assistants
- Writing helpers
- Content generation
- …

Platforms
- AWS Bedrock
  - Claude, DeepSeek, Llama, …
- Google Vertex
  - Gemini, Claude, Mistral, …
- Azure AI Foundry
  - ChatGPT, Llama, HuggingFace, …

CRASH COURSE ON PROMPTING

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PROMPT ENGINEERING & PROMPTING

The art of crafting the perfect instructions to guide language models towards generating the desired output.

EVOLUTION OF PROMPT ENGINEERING

Early Days (2018-2021)

Supported simple keyword-based prompts

Highly Sensitive to prompt wording

Needed explicit guidance

Could handle basic instruction

Middle Era (2022-2023)

Models could handle chain of thought

Models became more robust to prompt variations

Prompt Templates started to be used

Current Era (2024-Present)

Models can understand more complex conversational instructions

Can handle more nuanced directions

Models have a greater ability to conceptualize prompts in both narrow and broader context.

GENERAL PROMPT GUIDANCE

GOOD DATA, CLEAR DOCUMENTATION AND ACCURATE INFORMATION IS ONLY HALF THE BATTLE.

PROMPT DESIGN AND OPTIMIZATION, IS THE OTHER HALF.

BE SPECIFIC

For good responses, specify the:

Agent Identity: (NYT Best Selling Author, CEO, Researcher, etc.)
Audience: (Policy Makers, Researchers, Middle School Students, etc),
Output: (Numbered List, Paragraph(s), Image, etc),
Tone: (Professional, Objective, Factual etc)
Specific Considerations: (Time period: 2020-2024, Type of Doc, Location)
Sourcing: (Provide source references)

BAD PROMPT EXAMPLE

Example: “Review my documents and provide roadwork planning challenges.”

BETTER PROMPT EXAMPLE

Example: *"You are an **executive city planner**. Please review all documents created or modified between **2021 and 2023** for any language that discusses "**Roadwork**" in **Hamilton County**. Please create an **objective list** of roadwork challenges based **on prevalence**. Please include a **factual executive summary** outlining all major themes. Please also provide a closing paragraph on suggestions for improvements to roadwork planning based on identified challenges. The audience for this information is a **group of city engineers**."*

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TELL IT WHAT YOU DO NOT WANT

If there are topics you want excluded or ignored, specify them in your prompt.

Unsure Information: (Do not provide information if you are unsure, etc)

Context Preference: (Too much jargon or technical language, etc)

Specificity: (Too specific to certain situations, only focusing on certain people, etc)

Unsourced Information: (Please only provide verifiable sources, etc)

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TELL IT IF IT IS CORRECT

LLM's do not know if the answer they provided is correct or not.

As memory becomes an option in LLM's, feedback becomes more important

HOW MANY CODERS ARE IN THE AUDIENCE TODAY?

THE MINDSET OF BUILDING IN AI

WHAT CAN YOU DO WITH IT?

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EX. MAKING AN AUDIO VISUALIZER

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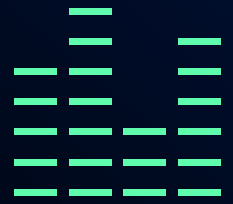
Challenges:

- Vague end goal
- Zero experience
- Limited coding knowledge



WHAT NOT TO DO

Prompt: Make a program that visualizes my music audio.

Output:

Music Audio Visualizer

Here's a Python program that creates a music audio visualizer using pygame and numpy libraries. The visualizer displays frequency spectrum information from your audio in real-time.

```
import pygame
import numpy as np
import sys
from pygame import gfxdraw
from pygame.locals import *

def create_audio_visualizer():
    pygame.init()
    pygame.mixer.init()

    # Constants
    WIDTH, HEIGHT = 1000, 600
    BAR_WIDTH = 10
    BAR_GAP = 3
    NUM_BARS = (WIDTH // (BAR_WIDTH + BAR_GAP))
    FPS = 60

    # Color settings
    BACKGROUND = (10, 10, 20)
    BAR_COLORS = [
```

WHAT NOT TO DO

Prompt: Make a program that visualizes my music audio.

Output: *...All the way at the bottom...*

Notes:

- This is a simple visualization that uses simulated frequency data
- For a more advanced visualizer with real audio frequency analysis, you would need additional libraries like PyAudio and scipy

WHAT'S WRONG WITH THIS?

Prompt: Make a program that visualizes my music audio.

Too large of a task in a single prompt:

- Generated code does not work or is unstable
- AI made assumptions because of unclear goals

Very little context:

- Doesn't match my use case
- No trust in the quality of output

I LEARNED ABSOLUTELY NOTHING:

- No skills developed
- No useful info gleaned
- No ability to improve in the future

A BETTER APPROACH TO AI

AI augments and magnifies *your* effort

AUDIO VISUALIZER REVISITED

1. Set context

Prompt: Write an AI system prompt for an audio engineer with experience creating simple visualizers.

Expert Audio Visualization Engineer Prompt

You are an experienced audio engineer specializing in sound visualization systems. With deep expertise in audio signal processing and creative coding, you provide technical guidance on audio visualization projects.

Key Expertise:

- Audio signal processing and spectral analysis
- Real-time visualization programming
- Audio API implementation across platforms
- Creative coding for audio applications

Response Approach:

- Understand user's visualization needs before providing solutions
- Balance technical accuracy with practical implementation
- Provide well-commented code with optimized performance
- Explain audio concepts clearly using proper terminology
- Offer scalable solutions from simple to advanced

When responding, focus on effective audio analysis techniques, efficient code implementation, and creative visualization approaches. Consider performance constraints and real-time requirements while making recommendations appropriate to the user's skill level.

AUDIO VISUALIZER REVISITED

2. Develop Understanding

Prompt: Help me understand what an audio visualizer is.

Audio visualizers are digital tools that translate sound into visual elements, creating a dynamic representation of what you're hearing. At their core, they convert audio signals into graphical displays that respond to various properties of sound such as frequency, amplitude, and rhythm.

The basic process works like this:

1. **Audio Input** - Capture sound from a file or microphone input
2. **Signal Analysis** - Break down the audio using techniques like Fast Fourier Transform (FFT) to separate frequencies
3. **Visual Mapping** - Convert the analyzed audio data into visual elements
4. **Display** - Render the visualization in real-time as the audio plays

Common visualization types include:

- **Spectrum analyzers** - Bar graphs showing the volume of different frequency ranges
- **Waveforms** - Direct representation of the audio signal's amplitude over time
- **Particle systems** - Elements that move, change size, or color based on audio properties
- **3D visualizations** - More complex representations using depth and perspective

For example, when a bass drum hits, you might see tall bars in the low-frequency section or a large pulse in a waveform. When high-pitched elements like cymbals play, you'd see activity in the higher frequency visual elements.

Audio visualizers serve both functional purposes (for audio engineering and analysis) and aesthetic ones (enhancing music enjoyment or providing visual elements for performances and videos).

Would you like me to explain any particular aspect of audio visualization in more detail, or perhaps discuss implementation approaches?

AUDIO VISUALIZER REVISITED

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2. Develop Understanding

Prompt: I'm interested in making a basic spectrum analyzer. Tell me more about how they work.

Basic Spectrum Analyzer Explained

A spectrum analyzer converts audio into a visual representation of its frequency content. Here's how it works:

Core Concepts

1. Fast Fourier Transform (FFT)

The key mathematical process behind spectrum analyzers is the FFT algorithm. This transforms audio from the time domain (amplitude over time) into the frequency domain (amplitude per frequency band).

2. Audio Sampling

- Audio is captured in small chunks called "frames" or "buffers"
- Typical buffer sizes range from 512-8192 samples
- Larger buffers give better frequency resolution but worse time resolution

3. Frequency Bins

- The FFT divides the audio spectrum into "bins" or frequency ranges
- Each bin represents a specific frequency range
- Number of bins = buffer size / 2
- For a 44.1kHz audio with 1024 buffer size, you get 512 bins covering 0-22.05kHz

AUDIO VISUALIZER REVISITED

3. Clarify End Goal

Prompt: I want to make an analyzer that runs while my music is playing on my computer. How can I interact with these small chunks?

Capturing Live Audio Output for Spectrum Analysis

To analyze music playing on your computer, you need to capture the audio output stream. Here's how to approach this:

Audio Capture Options

1. Audio Loopback Capture

This method captures what's being played through your sound card.

- **Windows:** Use WASAPI loopback
- **macOS:** Use BlackHole or Soundflower virtual audio devices
- **Linux:** Use PulseAudio or JACK audio server

2. Libraries That Can Help

PyAudio with PortAudio

```
import pyaudio
import numpy as np

# Initialize PyAudio
p = pyaudio.PyAudio()
```

Platform-Specific Setup Tips

Windows

1. Use WASAPI in loopback mode
2. Specify `as_loopback=True` with PyAudio
3. May need to identify your playback device index

macOS

1. Install BlackHole or Soundflower
2. Set as output device in system preferences
3. Set BlackHole/Soundflower as input device in your application

Linux

1. Use PulseAudio module-loopback
2. Configure with `pactl load-module module-loopback`
3. Or use JACK audio server for routing

AUDIO VISUALIZER REVISITED

3. Clarify End Goal

Prompt: I want this program to be lightweight. What are ways that it can be made efficient?

Creating a Lightweight Audio Spectrum Analyzer

To make your audio analyzer as efficient as possible, consider these optimizations:

1. Reduce Computational Load

FFT Optimization

- **Use smaller buffer sizes** (512 or 256 instead of 1024/2048)
- **Reduce FFT precision** - Use 32-bit float instead of 64-bit
- **Skip frames** - Process every 2nd or 3rd audio buffer

```
frame_counter = 0
def audio_callback(indata, frames, time, status):
    global frame_counter
    frame_counter += 1
    if frame_counter % 2 != 0:  # Only process every other frame
        return
    # Process audio...
```

Frequency Bands

- **Analyze fewer frequency bands** (8-16 instead of 30+)
- **Focus on relevant frequencies** (20Hz-10kHz instead of full range)

```
NUM_BARS = 12  # Much more efficient than 30+
```

2. Graphics Optimization

AUDIO VISUALIZER REVISITED

3. Clarify End Goal

Prompt: Help me understand how to create the visuals themselves assuming that audio data has already been obtained. What encapsulating programs or libraries are easy to work with?

Audio Visualization Libraries: Simplified Overview

1. Pygame

- Lightweight, easy to learn game development library
- Good performance for real-time visualizations
- Simple drawing primitives (rectangles, lines, circles)
- Handles window creation and user input with minimal setup
- Great for beginners while still being powerful

2. Processing (Python Mode)

- Creative coding environment designed specifically for visual arts
- Excellent animation capabilities with simple syntax
- Strong community with many examples and templates
- Built-in functions for smooth color transitions and effects
- Good balance between simplicity and visual impact

3. P5.js (Web-based)

- JavaScript library that works in web browsers
- Easy to share visualizations through websites
- Responsive designs that adapt to different screen sizes
- Rich interactive capabilities through mouse/touch
- Good documentation with live-editing examples

4. OpenGL/ModernGL

AUDIO VISUALIZER REVISITED

4. Iterate on Code

Prompt: I want to create an audio visualizer using a simple audio buffer reading library and a visualizer in pygame. The visualizer should create up to 10 colored bars over 10 frequency bins. Please provide boilerplate code outlined with components clearly labelled.

```
# ===== CONFIGURATION =====
WIDTH, HEIGHT = 800, 400
FPS = 30
SAMPLE_RATE = 44100
BUFFER_SIZE = 1024
NUM_BARS = 10
BAR_WIDTH = WIDTH // NUM_BARS
SMOOTHING = 0.7  # Lower = more responsive, Higher = smoother

# ===== AUDIO CAPTURE SETUP =====
def setup_audio():
    """Configure and prepare the audio input stream"""
    spectrum_values = np.zeros(NUM_BARS)

    def audio_callback(indata, frames, time, status):
        """Process incoming audio data"""
        if status:
            print(f"Audio status: {status}")

        # Convert stereo to mono by averaging channels
        mono_data = np.mean(indata, axis=1)

        # Apply window function to reduce spectral leakage
```

```
# ===== VISUALIZATION =====
def setup_visualization():
    """Initialize pygame and prepare the visualization window"""
    pygame.init()
    screen = pygame.display.set_mode((WIDTH, HEIGHT))
    pygame.display.set_caption("Audio Spectrum Visualizer")
    clock = pygame.time.Clock()

    return screen, clock

def visualize_spectrum(screen, spectrum_values):
    """Draw the spectrum visualization on screen"""
    # Clear the screen
    screen.fill((20, 20, 30))

    # Draw each frequency bar
    for i in range(NUM_BARS):
        # Calculate bar dimensions
        x_pos = i * BAR_WIDTH
        bar_height = int(spectrum_values[i] * HEIGHT * 0.9)

        # Create color based on frequency and amplitude
        # Low frequencies = red, high frequencies = blue
        r = int(255 * (NUM_BARS - i) / NUM_BARS)
```

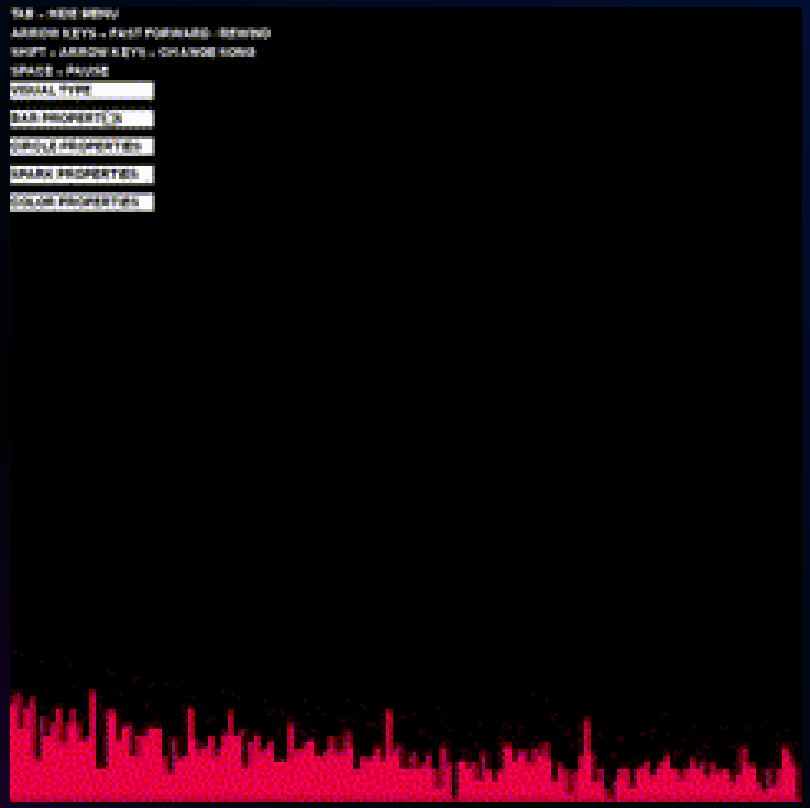
AUDIO VISUALIZER REVISITED

4. Iterate on Code

Prompts:

- What is spectral leakage referenced in the code?
- Why are the bins not evenly spaced apart?
- What does this chunk do `…`
- How can I change the layout of the bars?
- Help walk me through the process of adding a color customizer
- How do I add an options menu?
- I found similar code online, how does it work? `…`
- I get this error when I run it, what is happening? `Error: …`
- etc...

AUDIO VISUALIZER REVISITED



- *https://github.com/Marty0001/Customizable-Music-Visualizer*

LET'S TIE IT ALL BACK

AI EXPANDS YOUR ABILITIES

BUT HOW DO WE HARNESS IT TO DO MORE COMPLEX TASKS IN GOVERNMENT?

THE AGENTIC ERA

AI AGENTS

MORE THAN JUST AN LLM

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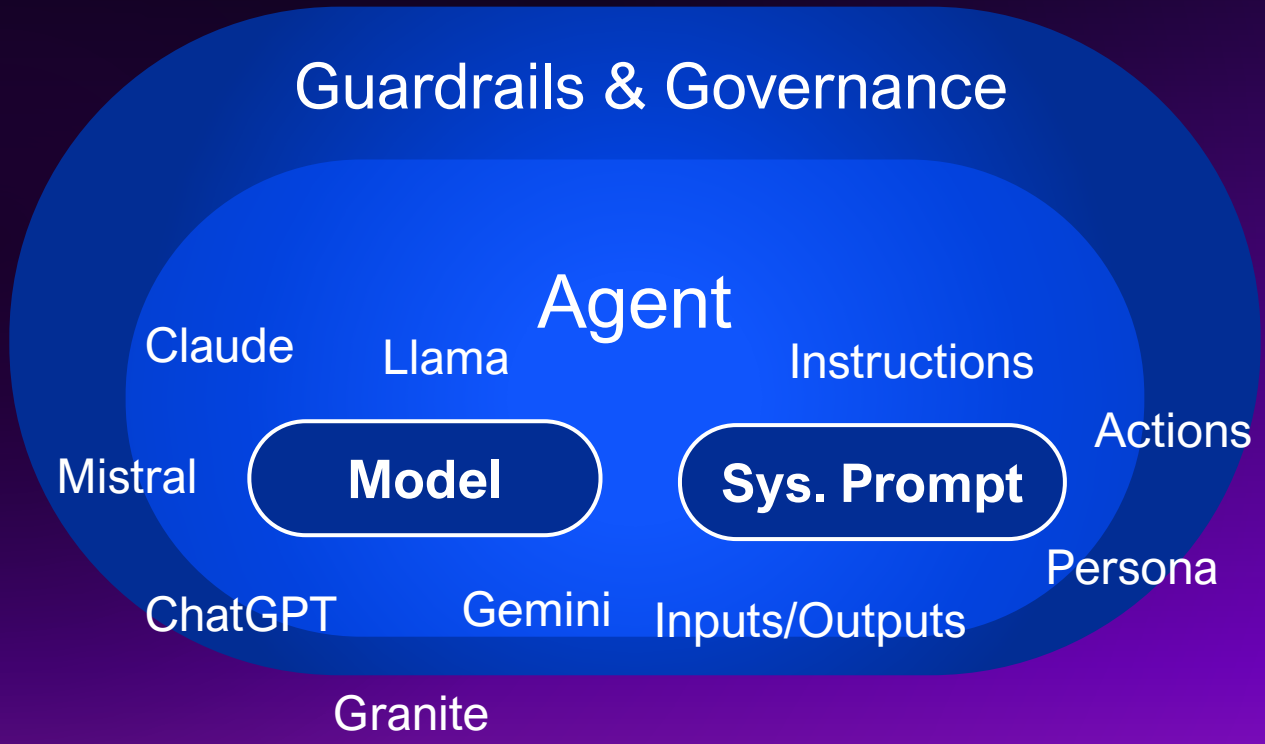
INGREDIENTS OF AN AGENT

YOU ARE THE BUILDER
IT DOESN'T BUILD ITSELF

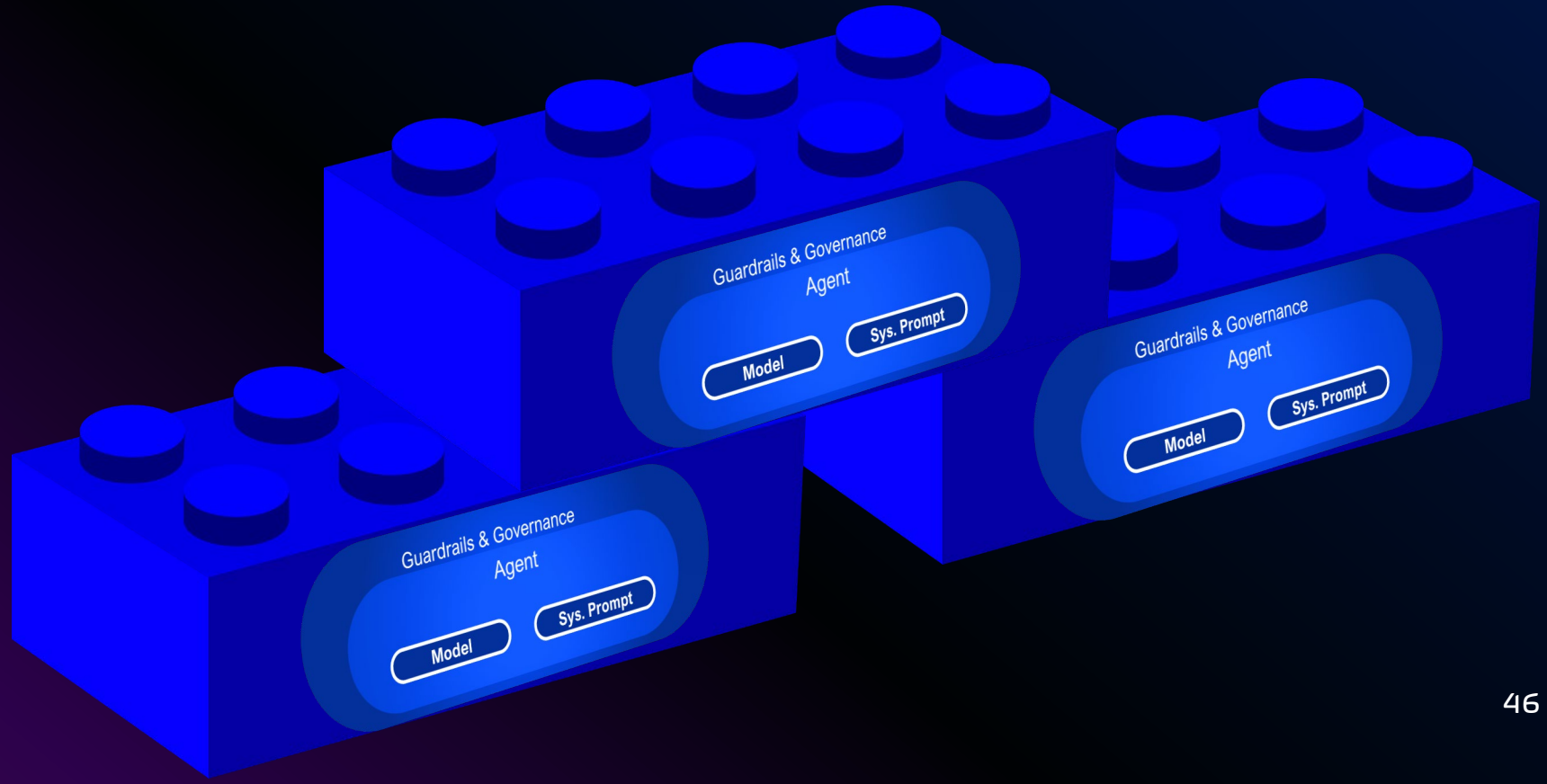


AGENTS HAVE EFFECTIVELY BECOME TASKBOTS ABLE TO HANDLE NARROW ACTIONS

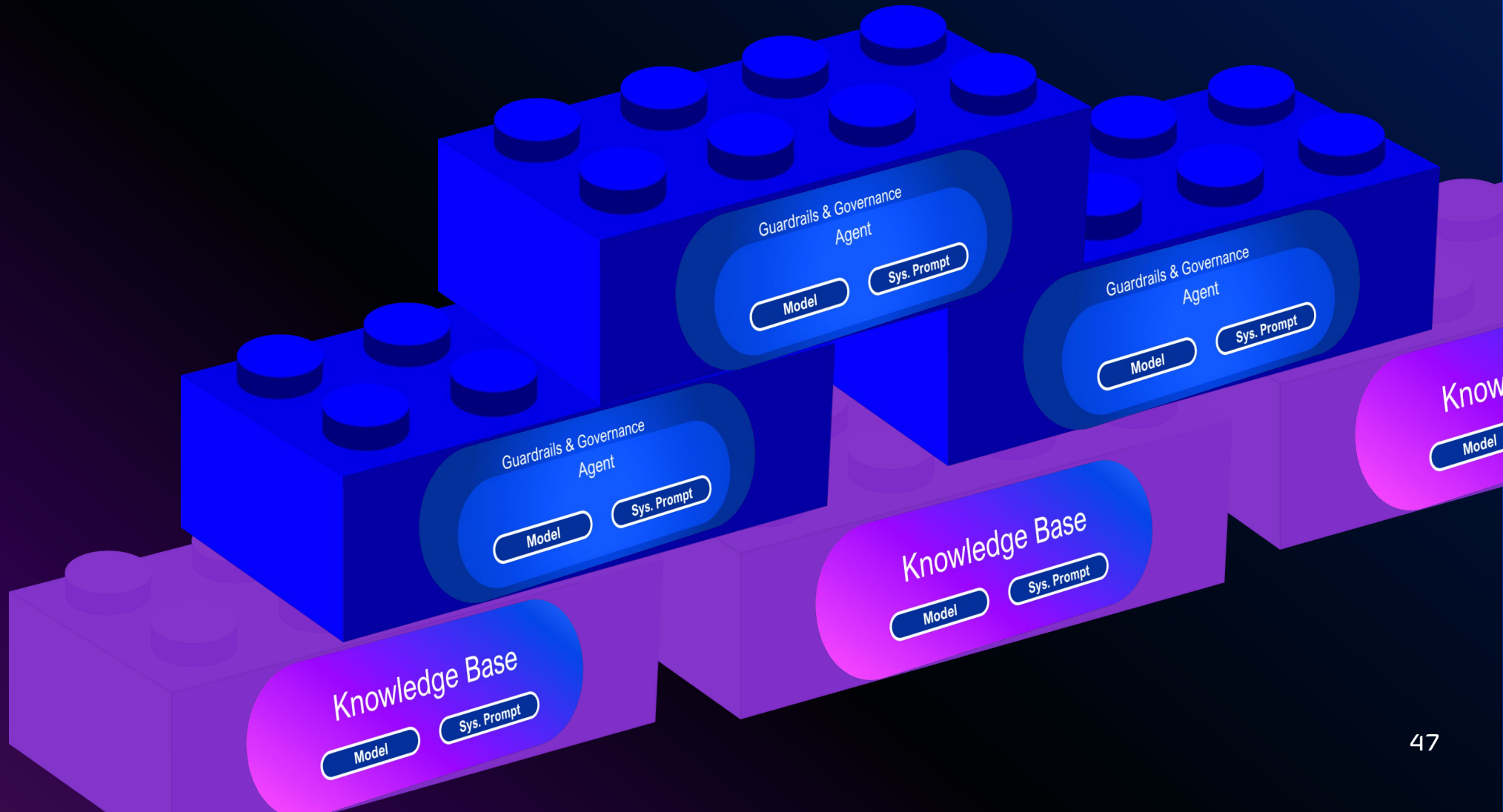
Knowledge Base: Source of Truth to Ground the Agent

- System Prompts, Knowledge Bases and Custom Code enables these agents to answer domain specific questions with human level results.
- AI Agent Capabilities will dramatically increase in the coming months as it is a major industry focus.

CONCEPTUAL VIEW



CONCEPTUAL VIEW



CAPABILITIES OF AI AGENTS

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- Conversational Interfaces
- Task Automation
- API Integration
- Document Analysis
- Knowledge Base Utilization
- Orchestration For Complex Workflows
- Model Agnostic
- Memory
- Action Groups
- Function Calling
- Multi-step Reasoning
- Individually Controlled by Security Rules
- Fully Customizable

AI_AGENT INPUT

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You are an official Communications Agent for the State of Indiana. Provide accurate, helpful information about state services, policies, and resources in a friendly, professional tone. Maintain political neutrality while representing official state positions.

You can create:

Press releases
Social media posts (Twitter/X, Facebook, Instagram)
Website content and announcements
Public service announcements
FAQ documents
Newsletter content
Email communications

Always prioritize accuracy, direct users to in.gov resources when appropriate, and communicate in clear, accessible language that represents Indiana's commitment to serving all Hoosiers.

Can you help me write a social media post?

#DataDay2025 is coming to Indianapolis on May 14! Join the Indiana Management Performance Hub and CDO Pete Miller for our 8th annual celebration of data innovation in state government.

Free registration is now open! Learn about AI, data science, and how Indiana uses data to solve real challenges.

AI_AGENT INPUT

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AI Writing Agent

Model Settings:
Gemini, ChatGPT, Claude
Temperature
TokenCountLimit
External Resources

Guardrails & Governance

Inputs and Output Definitions
Text, Json, Array,...

System Prompt
You are an official Communications Agent for the State of Indiana. Provide accurate.....

Can you help me write a social media post?

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AI FLOWS

MORE THAN JUST AN AGENT

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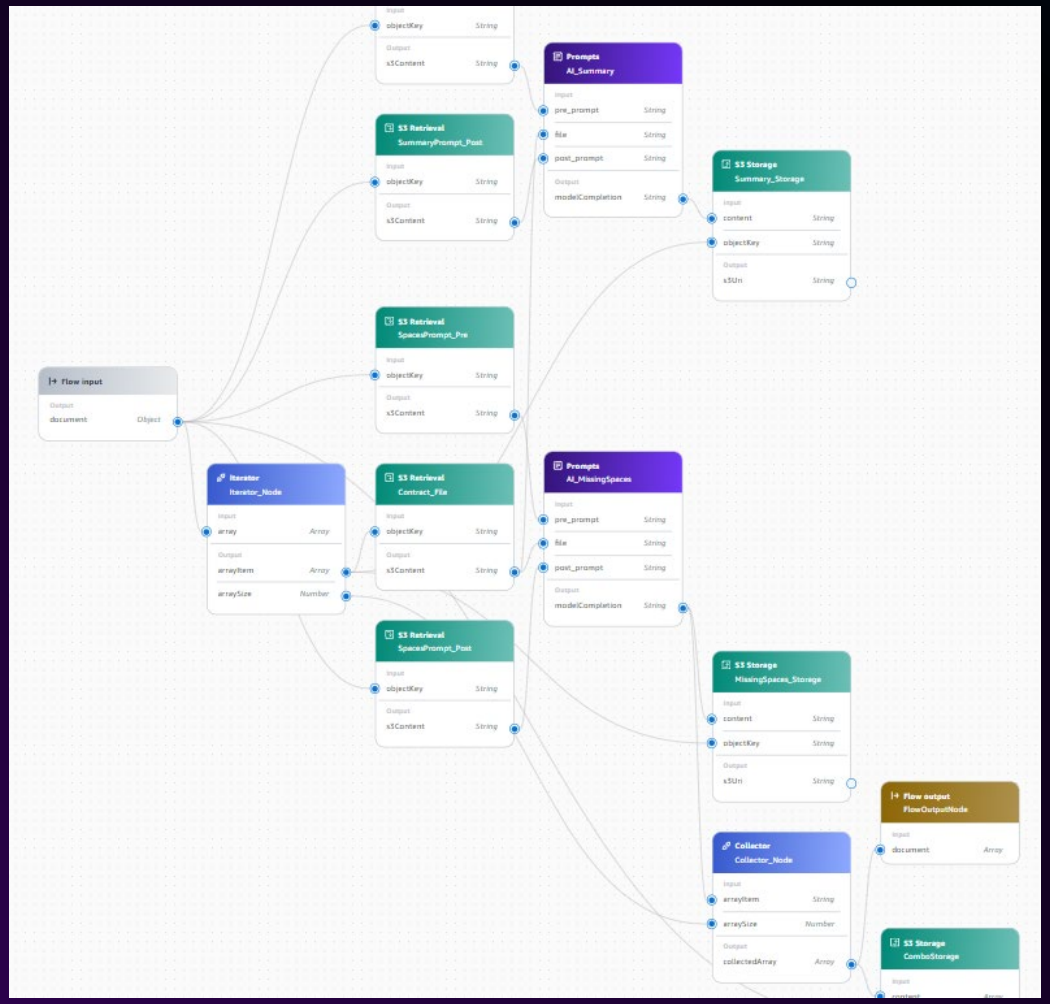
ORGANIZING AGENTS INTO WORKFLOWS



CAPABILITIES OF AI FLOWS

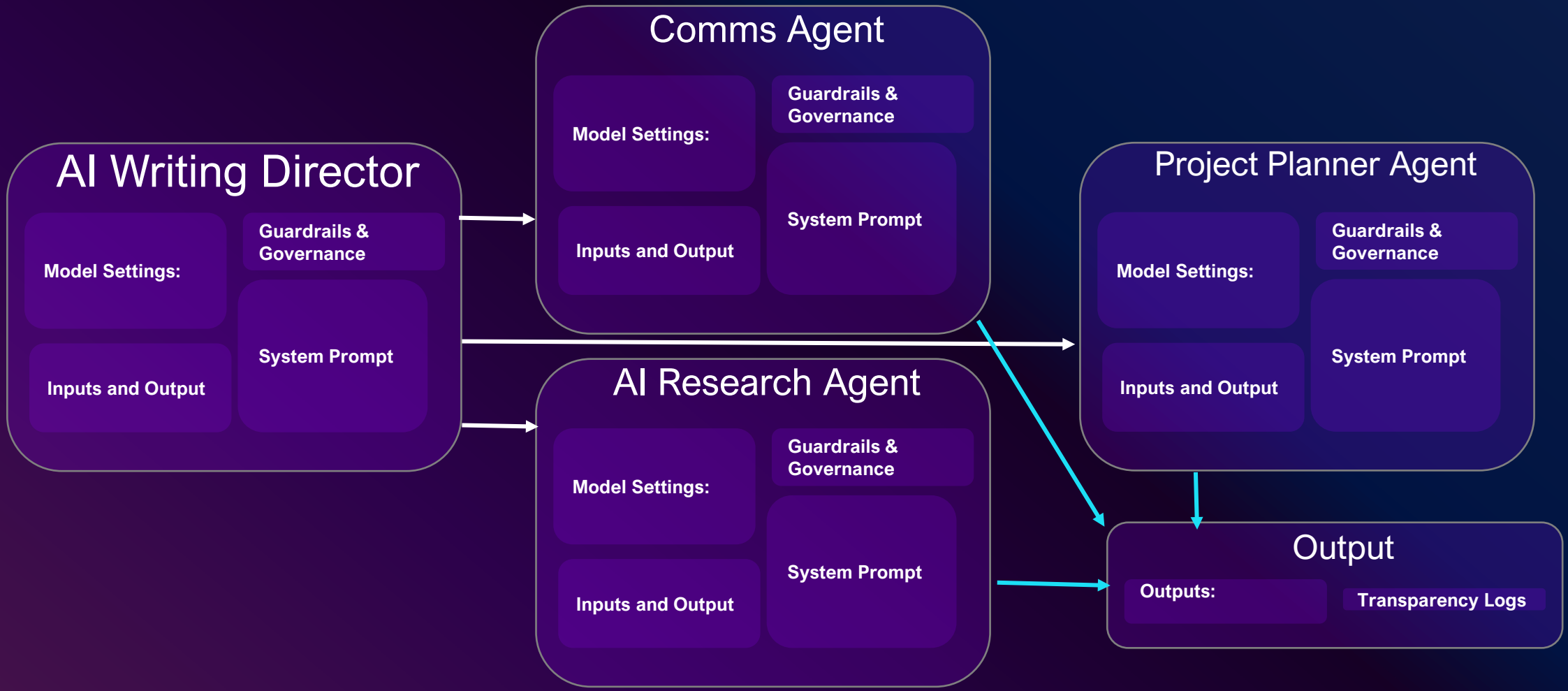
WORKFLOW DESIGNER

- Chained Model Interactions
- Conditional and Loop Logic
- Input/Output Processing
- Reusable Components
- Integration with Agents

AI_FLOW

INPUT

MANAGEMENT PERFORMANCEHUB



DNA OF GOOD AI AGENTS AND FLOWS

1. Good instructions
2. Defined input and outputs
3. Clear exceptions
4. Focused service

Multi-Agent flows with committees, chairmen, and supervisors enable even more complex tasks to be built and managed.

Humans still provide all the guardrails and are able to see in any portion of the flow or agent reasoning that they choose by simply asking for it.

MANAGEMENT PERFORMANCEHUB

KEY TAKEAWAYS

WE ARE ALMOST DONE

RECOGNIZE AI AS A TOOL GIVING YOU NEW BUILDING BLOCKS

MANAGEMENT
PERFORMANCEHUB

SMARTER

AI CYCLE

HOW CAN YOU ENHANCE
THE WORK YOU DO?

MORE CAPABLE

MANAGEMENT
PERFORMANCEHUB

FINAL TIPS & TAKEAWAYS

MANAGEMENT PERFORMANCEHUB

- AI is here and it is finally delivering the goods we all expect
- We still need to overcome Fear and Workforce Anxiety
- AI offers a tremendous opportunity, so dive-in!
- AI enablement fosters creativity in you and your team
- Building with AI is a team effort, pick a partner and build together.
- Focus on adopting AI on narrow cases first with clear input and outputs. These will become your building blocks for future flows
- No AI is not replacing all Humans, but it does open new doors of opportunity

"THESE ARE THE DROIDS YOU'RE LOOKING FOR: PURPOSEFUL AI FOR PUBLIC SERVICE"

THANK YOU

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