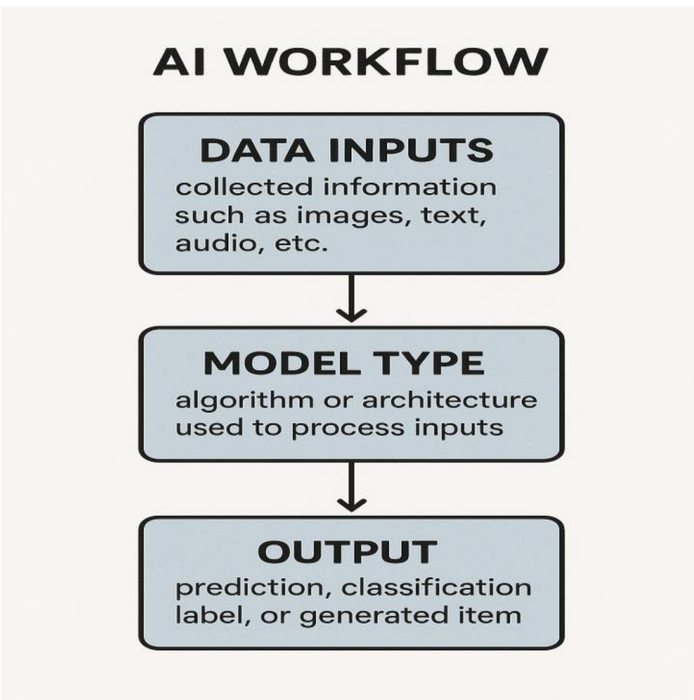
AI Application for 2030: *AetherSynth*—AI-Powered Atmospheric Carbon Sculptor

Problem It Solves

By 2030, mitigating climate change will hinge on reversing atmospheric carbon levels—not just reducing emissions. Traditional carbon capture methods are costly, passive, and slow to scale. *AetherSynth* introduces an autonomous, AI-powered system that actively sculpts local atmospheres to extract CO_2 and convert it into usable synthetic fuel, integrating seamlessly with smart cities and industrial zones.

AI Workflow Diagram



Stage	Description
Data Inputs	- Collected information used to train or operate an AI system. This can include: - Text (documents, messages, transcripts) - Images (photos, scans) - Audio (speech, music) - Video (recordings, live streams) - Structured data (spreadsheets, databases) - High-quality and relevant data is essential for accurate results. - Real-time atmospheric sensor data (CO_2, temp, humidity, pollutants) - Satellite imaging - Energy grid loads - Local industrial activity metrics

Model Type

- The specific algorithm or architecture used to learn from the inputs and make decisions. Examples include:

- **Linear Regression** – for numerical prediction

- **Decision Trees / Random Forests** – for classification tasks

- **Neural Networks** – for deep learning tasks like image or speech recognition

- **Transformers** – for tasks like language translation or text generation
The model type determines how the input data is processed.

- Reinforcement Learning for environmental response optimization
- Graph Neural Networks for spatial modeling of urban carbon flux
- Generative Models (GANs) for predicting low-energy conversion methods

Output

-The final result produced by the model after processing the inputs. This could be:

- A **prediction** (e.g., price forecast, next word).
- A **classification label** (e.g., spam/not spam, dog/cat).
- A **generated item** (e.g., AI-written text, generated image, synthesized voice)

-The output is the actionable result or insight from the AI system.
Optimal CO_2 extraction and conversion pathways
- Predictive deployment schedules for aerial drones and nanofiber filters
- Visualizations for city planners and environmental engineers

Societal Risks and Benefits

	Benefits	Risks
1. Data Inputs	- Enables better decision-making (e.g., health, agriculture) - Allows personalized services - Powers early warning systems	- Violates privacy if misused - Reinforces social bias if data is biased - Concentrates power in big tech (data monopolies)
2. Model Type	- Automates repetitive/dangerous tasks - Scales decisions across large populations - Accelerates scientific innovation	- Opaque decision-making (black-box AI) - Can be misused (e.g., surveillance, deepfakes) - Displaces human jobs
3.Output	- Enhances services (e.g., customer support, education) - Increases accessibility for marginalized groups - Delivers fast, scalable results	- Spreads misinformation or deepfakes - Creates over-reliance on AI decisions - Reinforces echo chambers in society

Bonus Task: Quantum Computing Simulation

Concept

Using **IBM Quantum Experience**, we build a basic quantum circuit to demonstrate **Grover's algorithm** for accelerating molecule property search in a synthetic drug discovery pipeline.

Circuit Summary

python
```python
from qiskit import QuantumCircuit
qc = QuantumCircuit(2)
qc.h([0, 1])  # Initialize superposition
qc.cz(0, 1)   # Oracle to mark the desired state
qc.h([0, 1])  # Diffusion
qc.draw('mpl')
```

AI Optimization Use Case

In AI-assisted drug discovery, models often screen billions of molecular structures. A quantum search algorithm like Grover's can reduce search complexity from $O(N)$ to $O(\sqrt{N})$. For instance, combining this with a generative AI model (e.g. variational autoencoder) enables quantum-accelerated identification of drug candidates that target rare diseases—potentially shaving months off the development cycle.