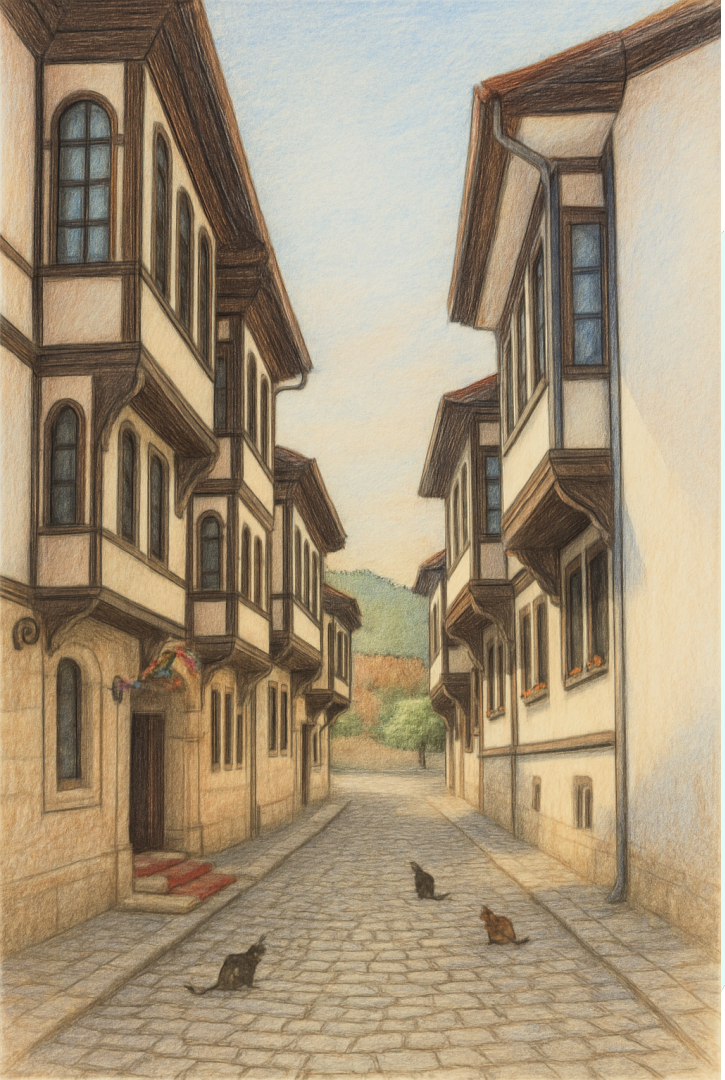
Hi!

Agentic Search: A New Way of Doing Old Things...

...That Requires Nuclear Powerplants :)

Mustafa Kıraç, CTO@GengageAI



Who am i?

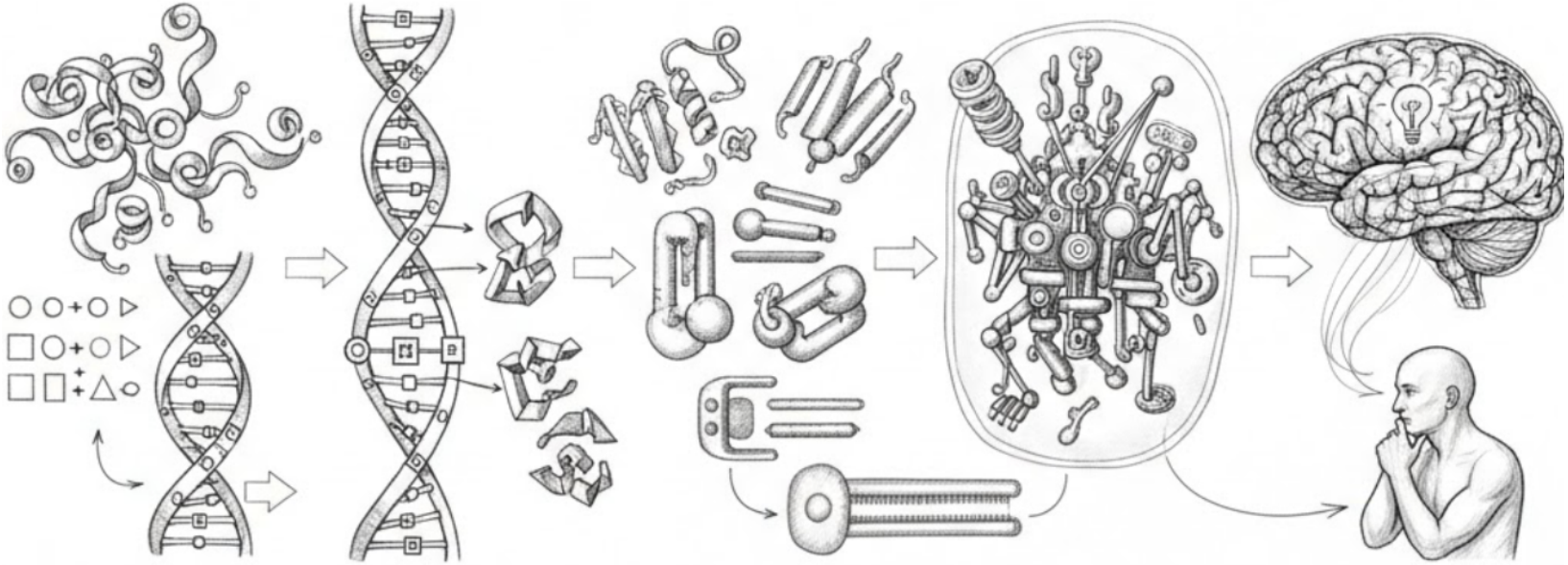
BS, CS @ Bilkent
PhD, Bioinformatics @ Case
DBMS Kernel @ Oracle
Data Mining @ Turkcell
Data Science @ iyzico
AI @ Afiniti
Agents @ GengageAI

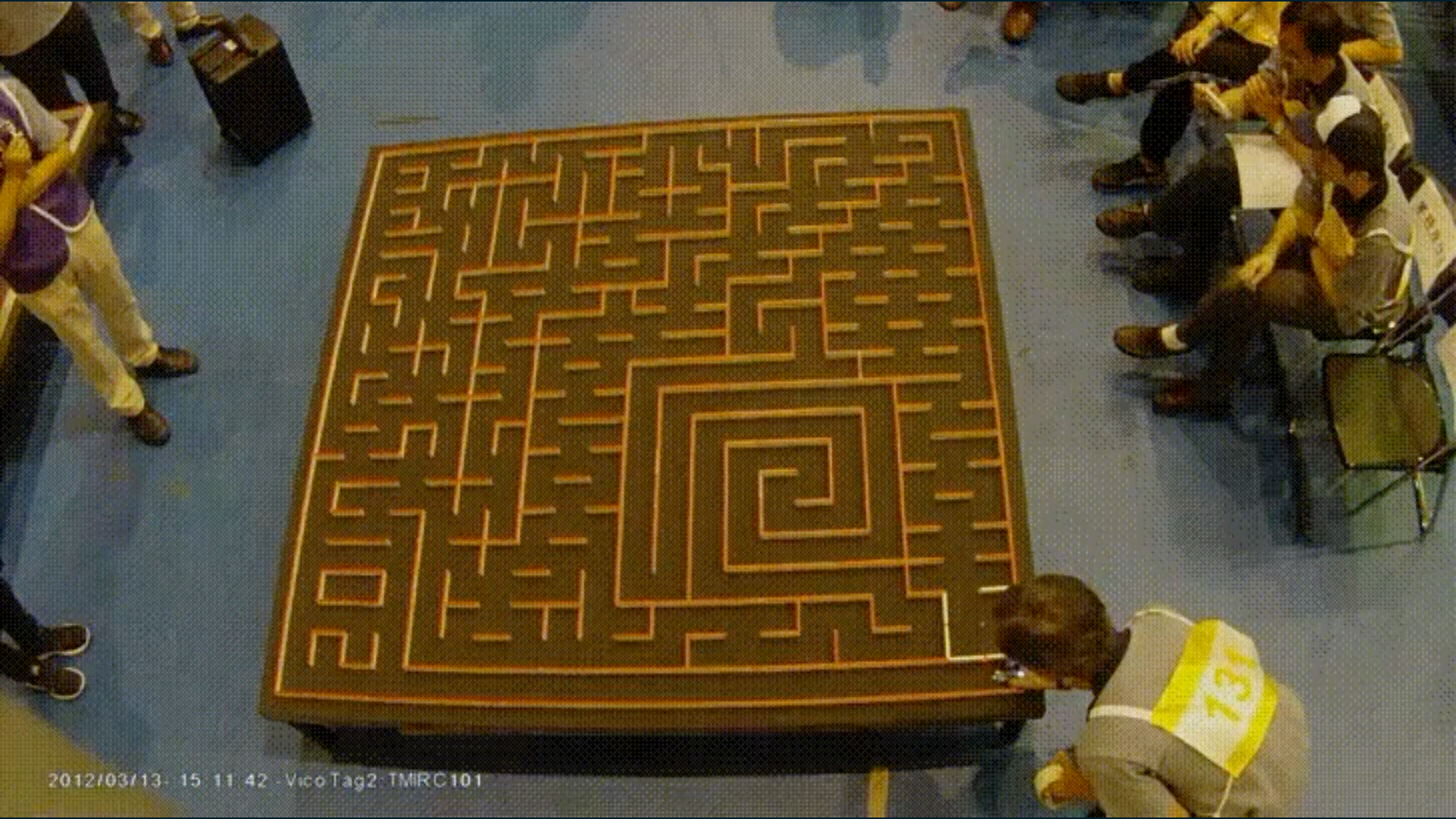
@muskirac

/mustafakirac

Biological Agents

agent(n.) late 15c., "one who acts," from Latin *agentem* (nominative *agens*) "effective, powerful," present participle of *agere* "to set in motion, drive forward; to do, perform; keep in movement".

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Reinforcement Learning

FMs as Universal Intelligence

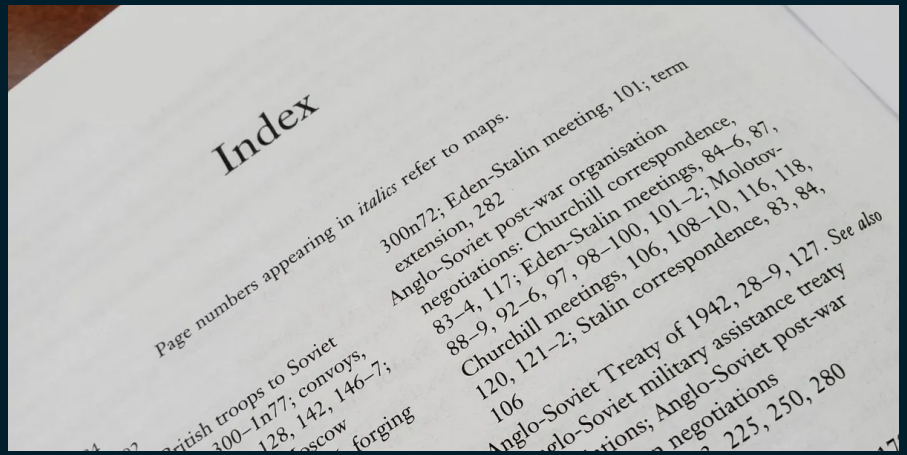
FMs can be "programmable" through simple prompts, they can understand context, make decisions, and perform complex reasoning.

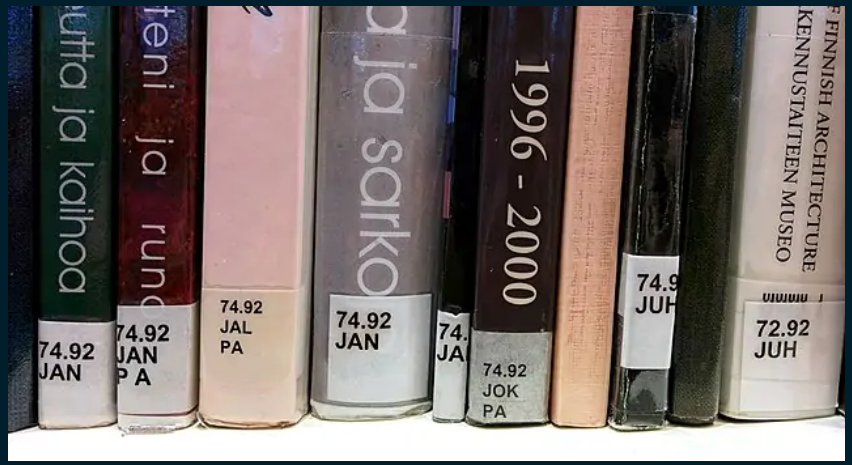
1. Neural Networks as Function Approximators: The Universal Approximation Theorem proves this capability exists, though in practice, deep networks with many layers are required to learn complex functions efficiently.

2. Few-Shot Learning: LLMs could adapt to new tasks without retraining. By simply showing the model a few examples in the prompt, it can "learn" a new function on the fly, without any weight updates. This is what makes prompts "programmable"

3. Structured Output: LLMs can be fine-tuned to learn specific grammars.

Search and Ranking

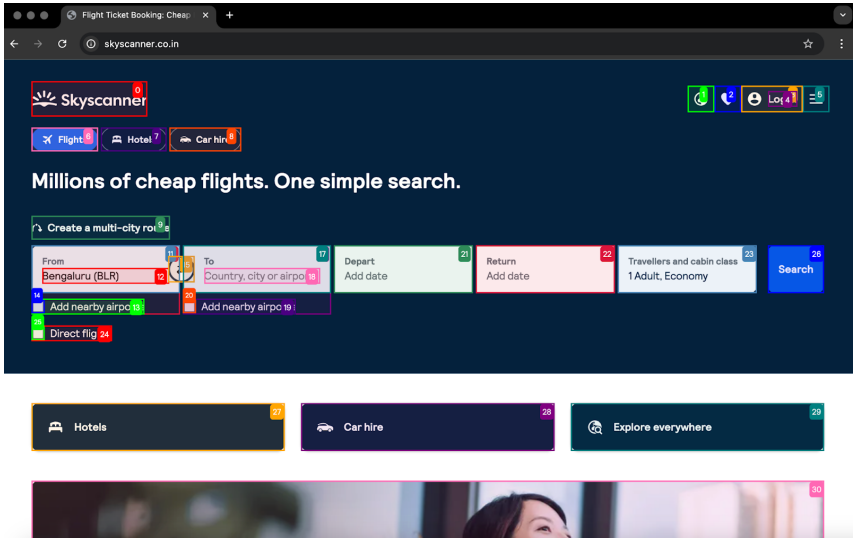




- `grep` for exact-match and regex scanning.
- `SQL` for structured data.
- `Gremlin` (for graph databases) to search for relationship patterns.
- GET-SET **K-V stores**
- **Bloom filters** for probabilistic "does this exist?" checks.

- For structured documents, this was easy: `ORDER BY`.
- **BM25** and **TF-IDF** normalize ranking.
- **PageRank** global “prestige” rank.
- **Mat. Factorization** ranking *per-user*.
- **Embeddings** for "semantics”
- **HNSW** for "similarity islands”

Agentic RAG via FMs



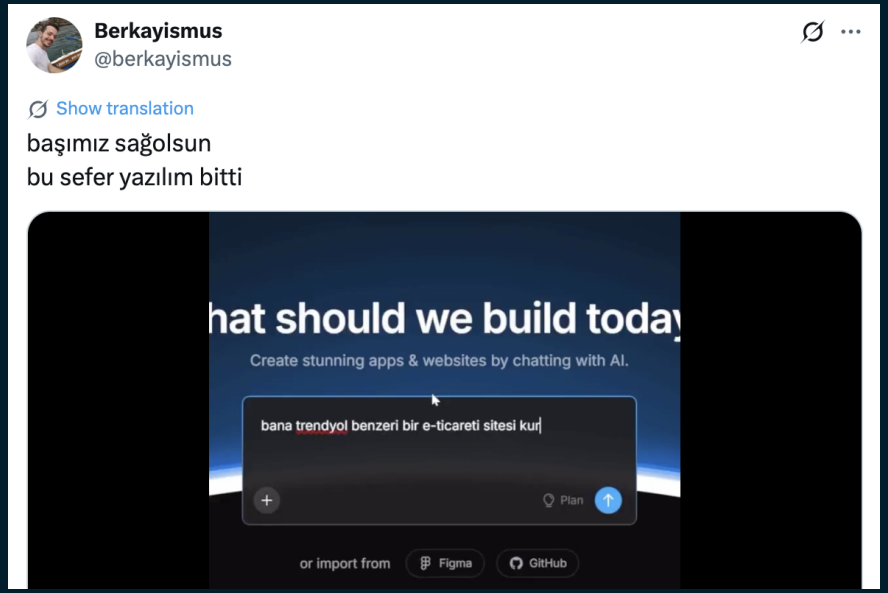
- **Analyze the goal** from the user's prompt.
- **Check what tools are available** in its "toolbox."
- **Create an execution plan.** Similar to cost-based query optimization in SQL. The agent "thinks" about which tool is best. *Should I do a fast vector search first to get general context, or a precise keyword filter to narrow the results?*
- **Execute the plan** by calling a tool and then **checking the results** (sensing the new environment state).
- **Change the plan if needed.** If the search returned no results, it can autonomously decide to retry with a different query or a different tool.

Halting Problem

For an agent that can "refine" its plan indefinitely, how does it ever know it's "done"?

Implement cost controls, hard token limits, budget circuit-breakers, and timeouts.

SOTA



Hierarchical Multi-Agent Systems: A manager agent delegates tasks to specialists.

ASearcher: Solves the "long-horizon" problem, where agents "get lost." It uses a scalable, asynchronous RL training on 40+ turn trajectories, making it robust for tasks that take days.

Agent Swarms: The agents use shared protocols and memory to coordinate, allowing complex, emergent behavior.

ADAS: AI Designing AI. This is the "Meta Agent Search" algorithm.

MongoDB

Solves Agent Amnesia: MongoDB provides persistent, long-term agent memory.

Provides the SOTA Tools: Atlas is the engine for Agentic RAG, allowing agents to dynamically orchestrate Hybrid Search (Vector + Full-Text) as a tool.

The future is not one giant "brain." It's a swarm of smaller, specialized agents. And the one thing they all need is a common, reliable, stateful memory and search tools to access to right data.

Thanks.