Agentic AI for rice farming

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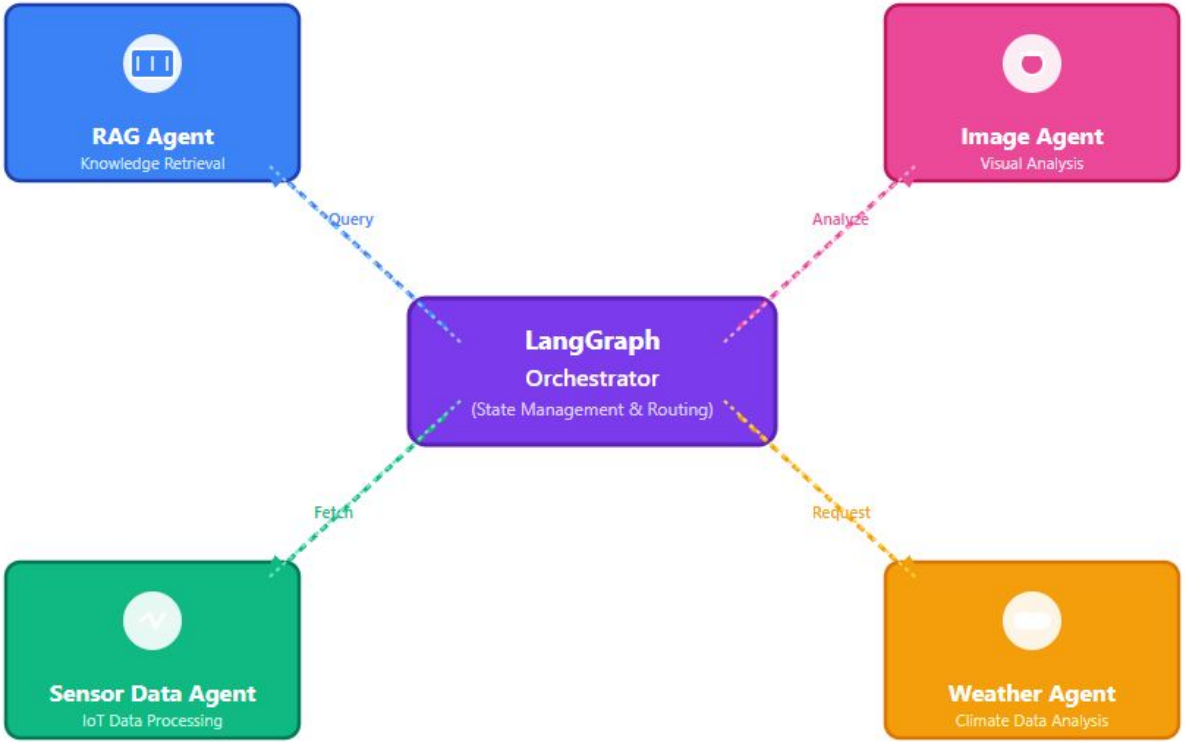
General Plan

- Agent Orchestration with LangGraph
- Introducing Two Core Operational Agents
- MCP (Model Context Protocol): The Interoperability and Governance Layer

Agent Orchestration with LangGraph



RAG Agent

Retrieves relevant knowledge from document databases and vector stores

Image Agent

Analyzes field images, detects crop health and pest issues

Sensor Data Agent

Processes real-time IoT sensor data from the rice field stations

Weather Agent

Fetches and analyzes weather forecasts and climate patterns

Why LangGraph ?

State Management

Maintains conversation context across all agents

Smart Routing

Dynamically routes queries to the most relevant agents

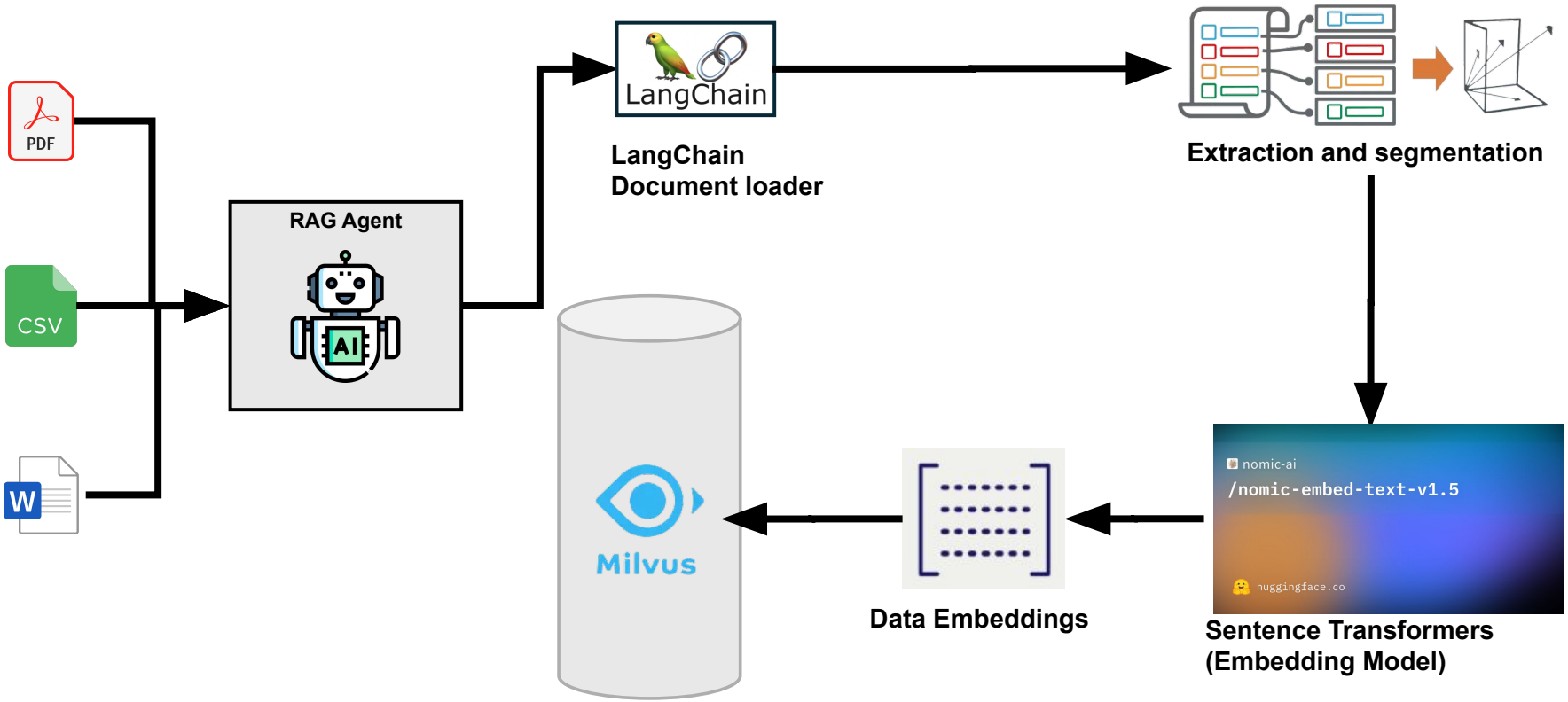
Parallel Execution

Executes multiple agents simultaneously for faster responses

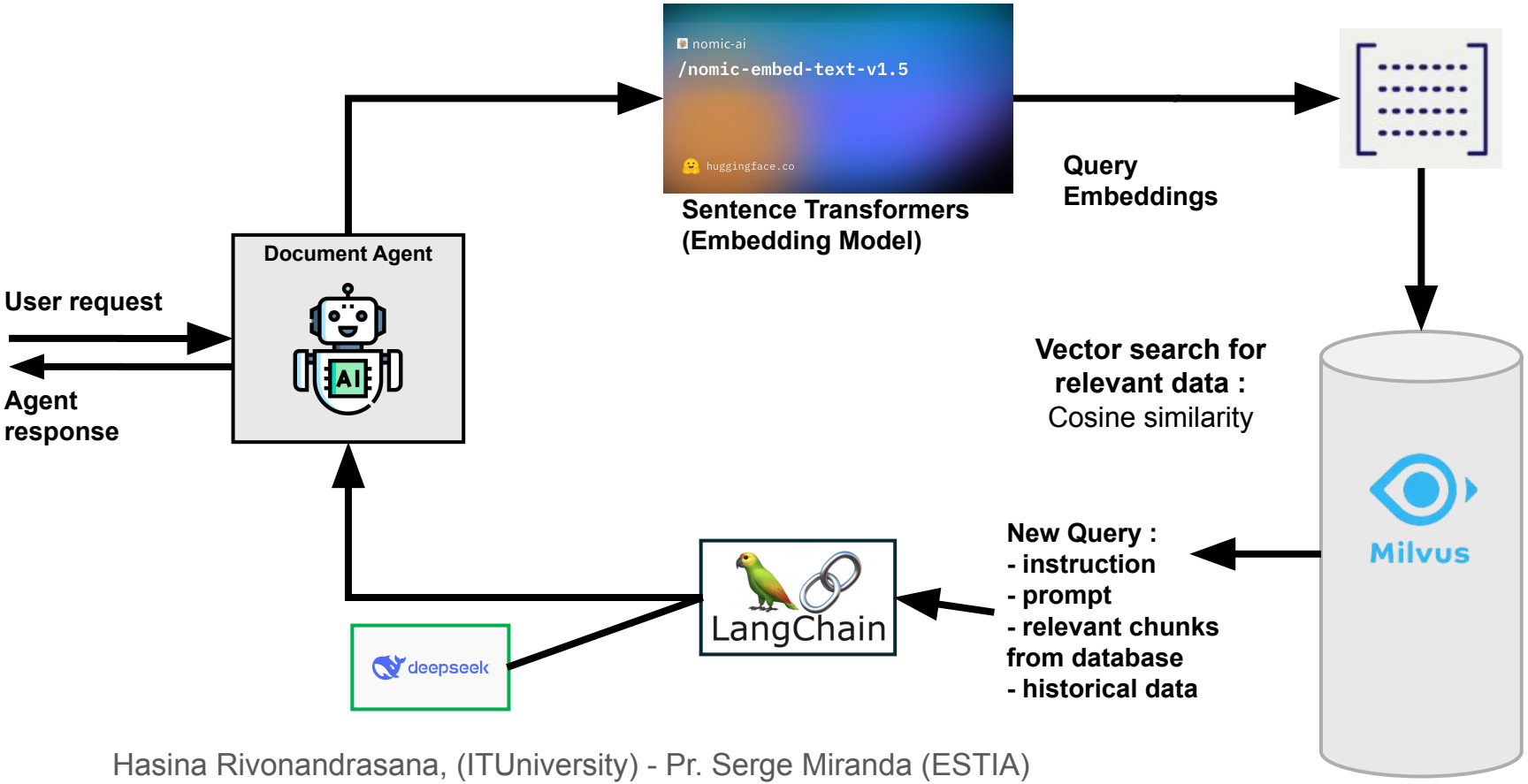
Open Source

Free, transparent, and community-driven development

RAG Agent Data Ingestion Pipeline



RAG Agent Request Flow



RAG Agent

Knowledge Stored as Vectors – Milvus Vector Database

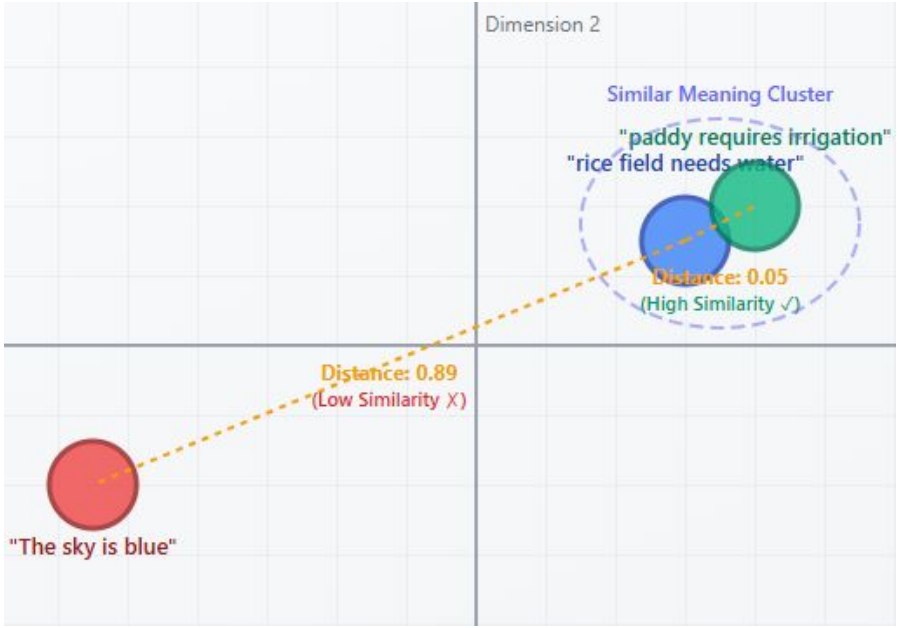


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Image Agent Data Ingestion Pipeline

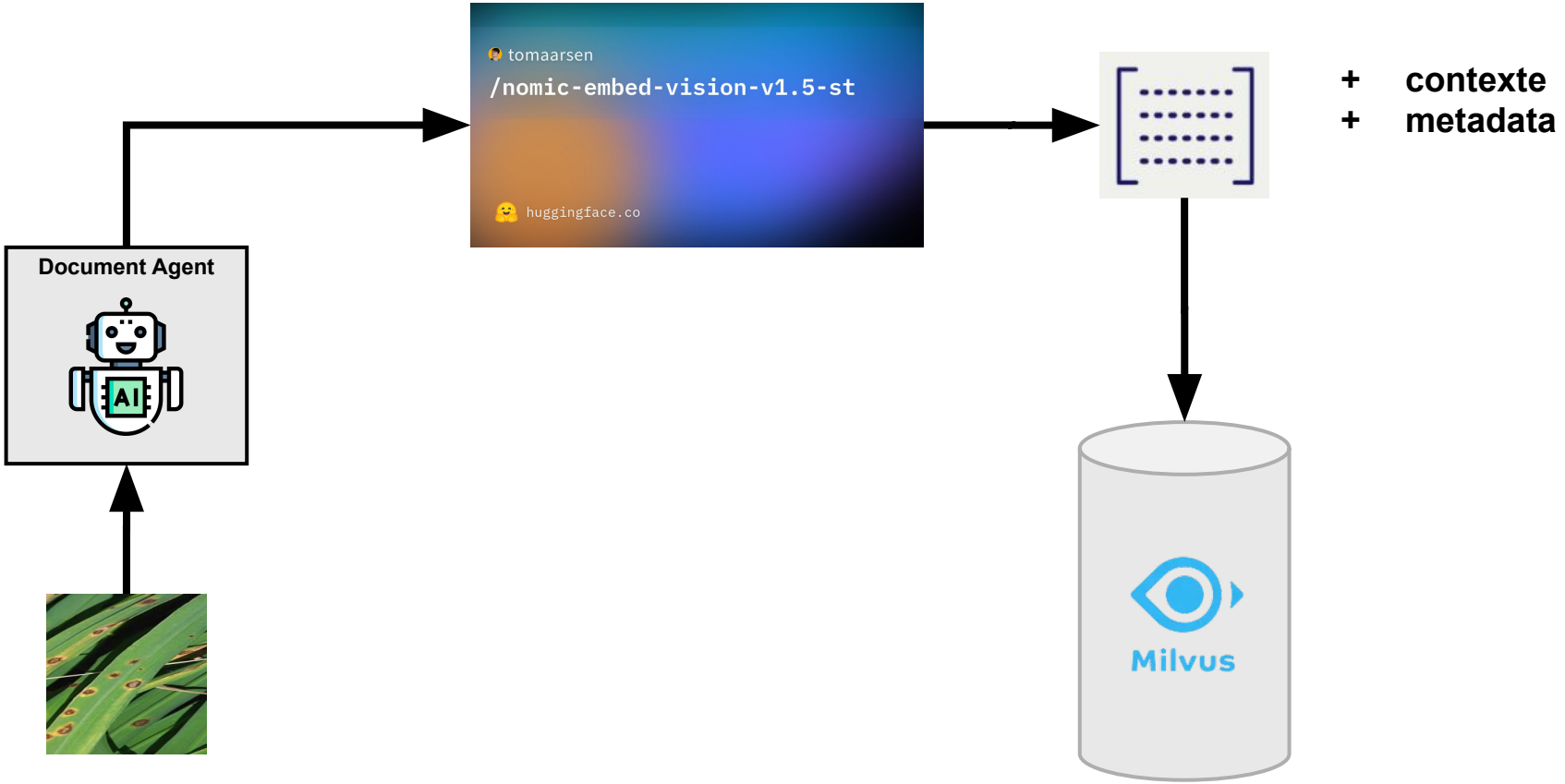
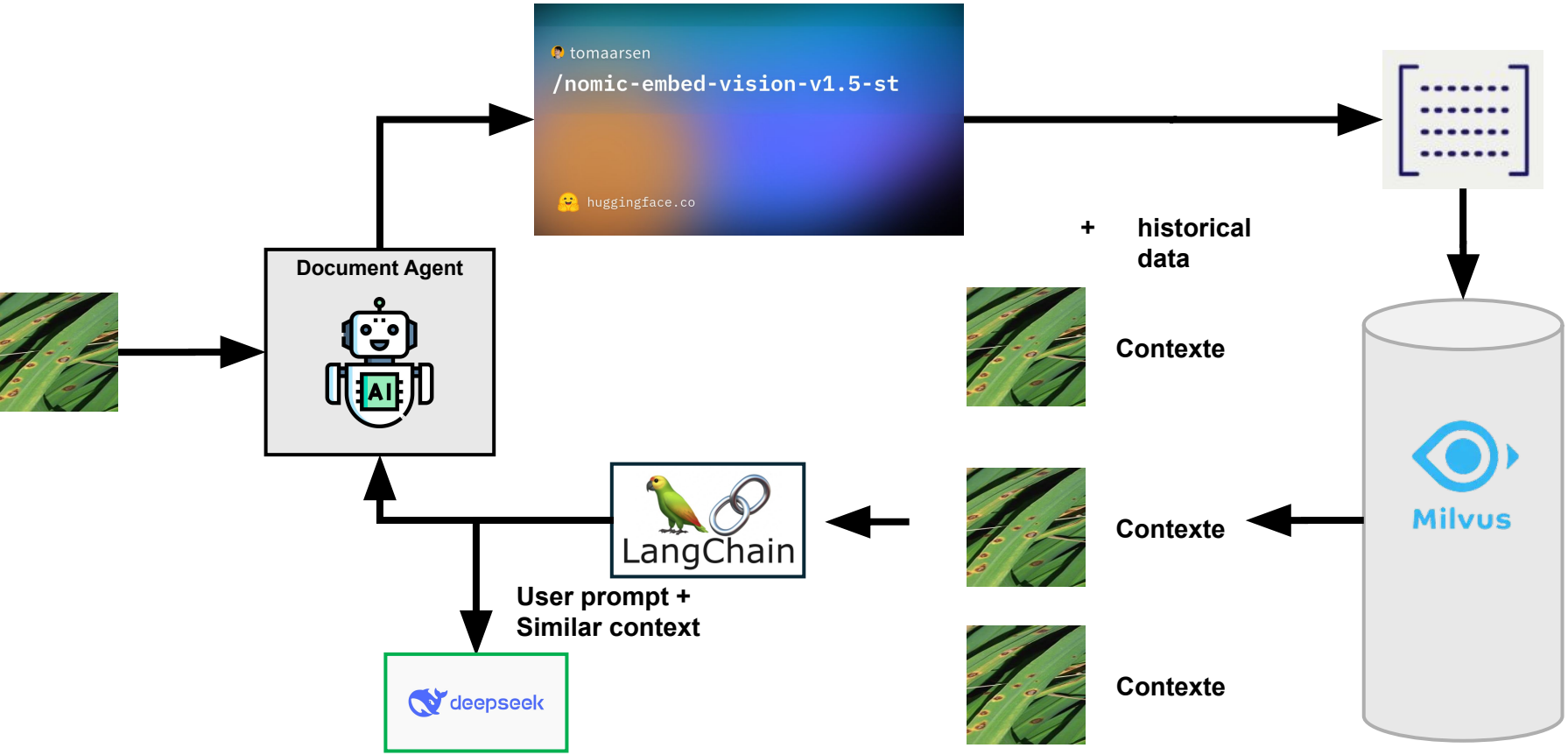


Image Agent Request Flow



Vector-Based Approach – Performance Metrics

Accuracy (Précision globale)	**94.01%**
Precision (Précision moyenne)	**94.11%**
Recall (Rappel moyen)	**94.01%**
F1-Score moyen	**94.03%**
Images correctement classées	2292/2438
Images mal classées	146/2438

Global Metrics (2438 validation images)

127 images per classes

Easy to add new class

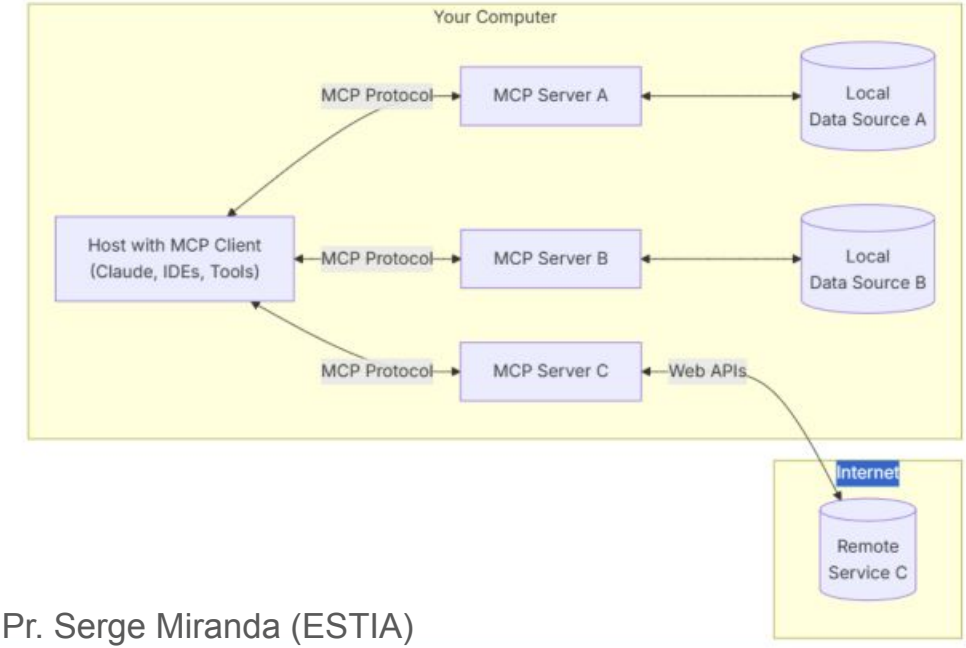
Confusion matrix (Next Slide)

Confusion Matrix for Vector Based Approach

	Bacterialblight	Blast	Brownspot	Healthy Rice Leaf	Tungro
Bacterialblight	546	26	10	8	2
Blast	18	504	26	0	0
Brownspot	0	38	562	6	0
Healthy Rice Leaf	2	0	0	190	2
Tungro	2	0	0	6	490

Open-source MCP (*Model Context protocol*) for AI AGENTS □ Standardization

- **Open Source (ANTHROPIC ; Nov.25, 2024**
- Then Microsoft (March 2025), Open AI (March 2025) Google and Amazon (April 2025)..)
- MULTI AI AGENTS ; multi LLM, multiple DATA SOURCES
- Client –server architecture
- Structuration & STANDARDISATION
- Like REST for WEB services



The Interoperability

MCP (Model Context Protocol)

- The New Standard for Agent-to-Agent Communication
- Every agent exposes itself as an MCP server
- Any other agent connects with 1 line of code

MCP turns every agent into a plug-and-play brain module

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(Note: Upcoming release on multiagent AI systems – core to agentic architectures)

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(Note: Essential guide for LLM orchestration in farming agents)

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(Note: MCP standard for seamless agent communication – key to Deep Rice scalability)

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(Note: Confirmed 2025/2026 release – precision farming, IoT analytics, yield optimization; highly relevant to sensor networks)