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ANALYSIS OF NAMED ENTITY RECOGNITION IN THE INSURANCE DOMAIN WITH AI AGENTS

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In the insurance sector, automated text data processing is becoming a key component of digital transformation, as the volume of contracts, applications, policies, regulations, and risk reports is growing exponentially. A significant portion of these documents contain unstructured information that requires effective methods of extraction [1–4] and classification [5–9]. Named Entity Recognition (NER) is critical for identifying key elements such as policy numbers, customer names, dates, payment amounts, addresses, and coverage terms [10–14]. This reduces the human factor, speeds up business processes, improves the accuracy of analytics, and facilitates compliance with regulatory requirements.

Modern approaches to NER in insurance go beyond classical statistical methods such as Conditional Random Fields (CRF) or BiLSTM, and approaches based on Large Language Models (LLM), Retrieval-Augmented Generation (RAG), and Model Context Protocol (MCP) are becoming increasingly popular.

LLM provides semantic understanding of text and is capable of recognizing entities even in contexts where explicit patterns are absent. RAG adds external context to the generation process, such as corporate documents, policy databases, and regulatory acts, which significantly improves recognition accuracy. MCP, in turn, standardizes LLM interaction with external tools, APIs, and data stores, creating a single, consistent communication layer (Fig. 1).

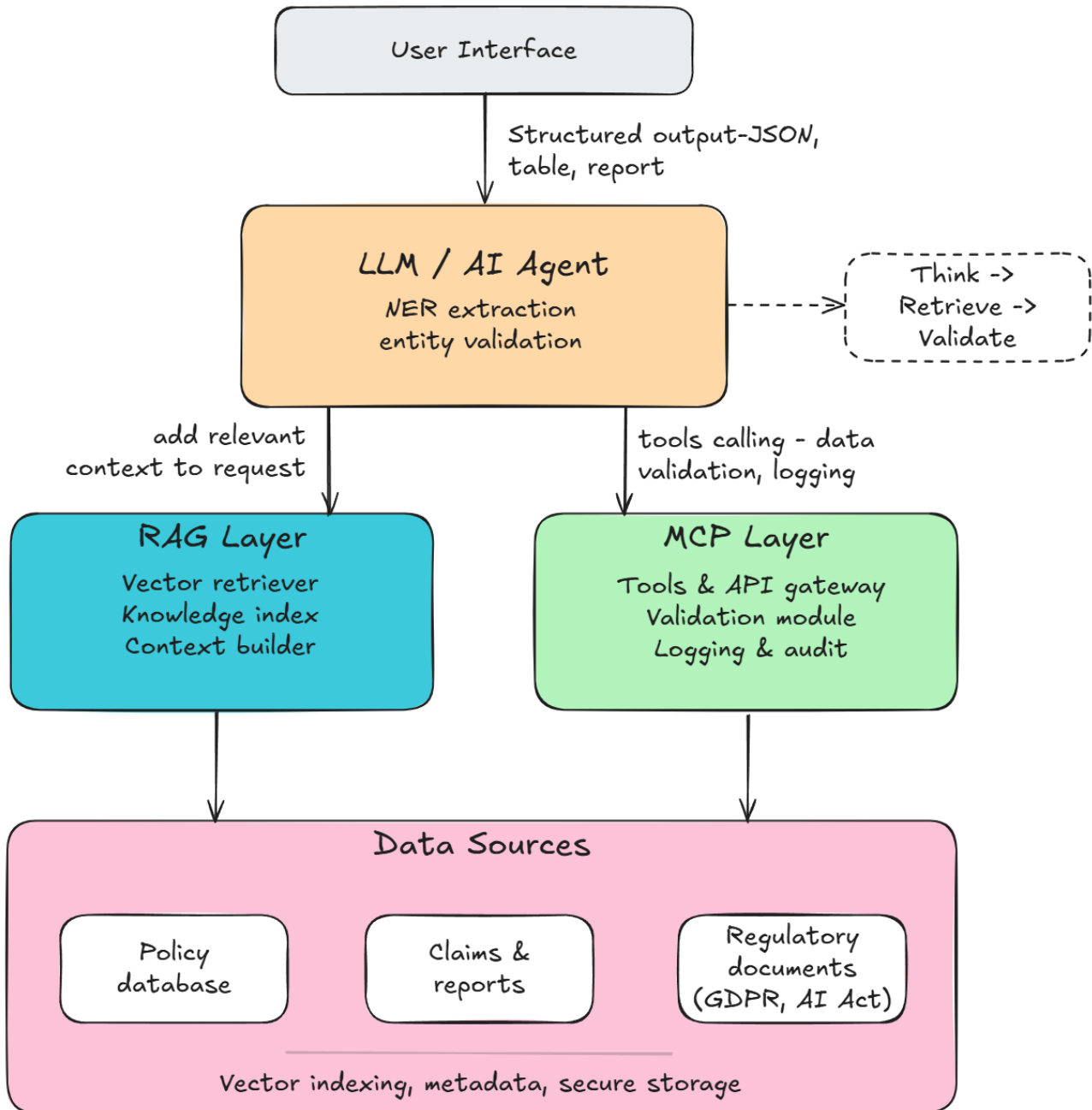


Figure 1. Architecture of LLM_RAG_MCP-based NER system in the insurance domain

Using RAG allows you to connect verified fragments of corporate data to the language model, reducing the risk of generating inaccurate responses. This is especially important for the insurance business, where errors in extracting or interpreting data can lead to legal consequences.

The Azure AI Search and AWS Bedrock Agents platforms implement hybrid search methods that combine vector and keyword indexing. This approach ensures high relevance of results and supports continuous knowledge updates without the need to retrain the model.

The MCP acts as an intermediary layer between Large Language Models (LLMs) and enterprise systems. In NER scenarios, MCP enables the model to query a policy

database to verify PolicyIDs, validate insurance amounts or conditions, and return a structured response.

This creates a transparent and auditable process in which every query is logged, which is important for auditing and compliance with GDPR and AI Act requirements. As a result, MCP helps build trust in the use of artificial intelligence in sensitive financial areas.

Agent systems play a special role in ensuring autonomy and controllability process. AI agents can independently determine the sequence of steps, select the necessary tools, analyze intermediate results, and adapt their strategy of action.

The ReAct and Toolformer models demonstrate the effectiveness of such interaction between «thinking» and «acting»: ReAct alternates logical reasoning with tool calls, while Toolformer trains the model to independently decide when and how to use an external API. This opens prospects for building self-learning systems in insurance – from automatic risk assessment to intelligent underwriting.

In addition, with MCP, agents can call tools that are available on the MCP server. This means that the model can directly initiate access to available services/tools in the corporate environment. This opens prospects for creating self-learning systems in insurance from automatic risk assessment to intelligent underwriting.

Security and compliance remain key aspects of implementing such systems. The OWASP Top 10 recommendations for LLM and the NIST AI Risk Management Framework define practices for preventing prompt injections, uncontrolled API calls, and data leaks. According to Articles 35 and 44 of the GDPR, as well as Annex III of the AI Act, the use of AI for life and health insurance falls into the high-risk category and requires a Data Protection Impact Assessment (DPIA).

Therefore, the integration of LLM, RAG, and MCP, complemented by agent-based management, forms a flexible, transparent, and reproducible architecture for NER in the insurance sector. This approach not only optimizes text processing but also ensures regulatory compliance, increases customer trust, and lays the foundation for new InsurTech solutions based on generative artificial intelligence.

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