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Proactive security of supply through dynamic simulation with self-learning LLM agents

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The Team

- Funded by BMFTR
- Total volume ca. 4.1 million €
- Period: 01/2026 – 12/2028



Kickoff-Meeting at OFFIS-Headquarters in Oldenburg

The Challenge

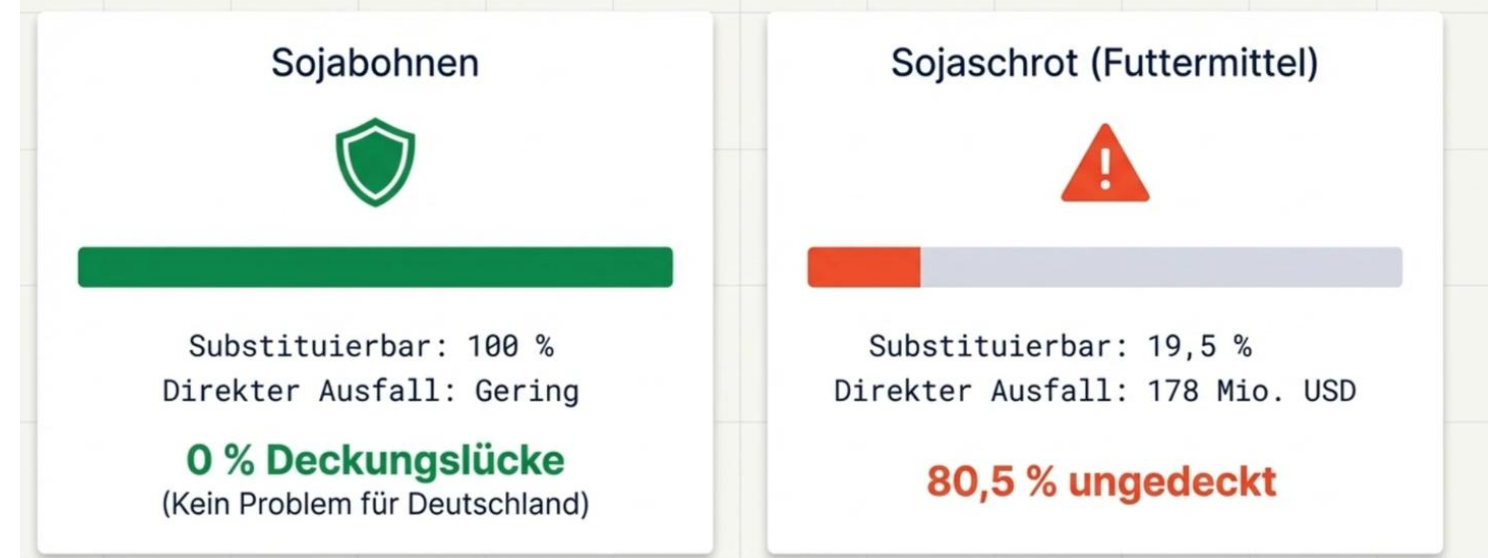
- Supply chains heavily intertwined
- Butterfly effect: Small disturbances in a producing country might have large impact for consumers in another
- Example: Heavy storm endangers the soy production in Brasil
 - Brasil exports less soy to Europe
 - Not enough food for the cattle
 - Prices for these goods (milk, meat, ...) skyrocket
- KRITIS very well monitored but civil infrastructure still a blind spot



The PROVIDER Solution

- Agent based Simulation (ABS) and Adversarial Resilience Learning (OFFIS, palaestrAI-Framework)
- Attacker tries to find weaknesses in a supply chain and disturb it, defender tries to mitigate that
- No knowledge of each other, but both observe the same underlying system: Approximation of real world agents
- Definition and parameters of the simulated world derived from real world data

Der Aha-Effekt — Deutschlands blinder Fleck



The Tech Stack

- Dynamic Knowledge Graph derived from several public data endpoints: Trade (GTA, BACI), Armed Conflicts (ACLED), Infrastructure (PortWatch, OpenFlights, OpenInfraMap) and many others
- LLMs classify incoming news feeds and social media posts: What happened (drought, fire, conflict, ...) and which goods are affected
- Identify relevant portion of the knowledge graph, derive parameters and start simulation
- Result: Measure of the impact of an event, uncovering of blind spots and identification of supply gaps



Use Cases

Ukraine War & AdBlue Crisis

Disruptions and price increases in natural gas supplies → reduced urea production → AdBlue shortages → restrictions in the transport sector → impacts on food and agricultural logistics

Strait of Hormuz & Oil Price Shock

Geopolitical escalation / blockade → sharply rising oil and transport costs → higher production and import costs → impacts on fertilizer, feed and food prices

Droughts in Major Export Regions

Crop failures, e.g. for wheat, maize or soybeans → global price reactions → shifts in trade flows → impacts on feed and food supply chains

Export Bans and Trade Restrictions

Government-imposed export bans on rice, wheat or fertilizers → short-term market disruptions → identification of highly dependent regions and companies

Thank you for your attention!



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