Simulation of Human Interaction using AI

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Abstract

Simulation of believable human interaction can strengthen the application of large language models (LLMs) in computational social sciences and improve the insights and value of market research using AI agents. In this work, a *PerSimChat* framework is designed that provides an experimental environment for simulating multiple human conversations using LLM agents with persona data. Simultaneously, a new approach is proposed for selecting the order of the agent's speech called *One-By-One Talk with Agent's Need to Talk*. Empirical studies demonstrate the framework's performance on many evaluation dimensions, and the system achieves competitive results with other multi-agent debate systems on reasoning and mathematics benchmarks.

Cognitive Modules

The proposed PerSimChat framework implements the human brain's cognitive functions, namely *short-term* and long-term memory with *memory consolidation*, *perception*, *action*, *reflection*, *natural language* and *long-term planning*.

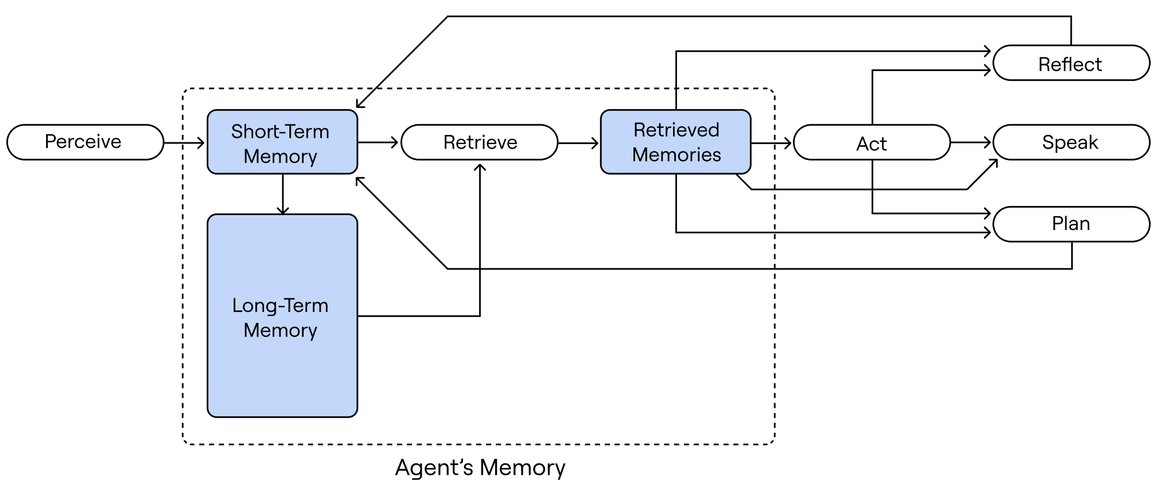

Figure 1. The architecture of cognitive modules in the PerSimChat framework.

Need to Talk and Consensus Openness

The main contribution of this work is a new approach for selecting the order of the multiple agents' speech — *One-By-One Talk with Agent's Need to Talk*. The *consensus openness* scores are generated during the group discussion, while a *judge* agent decides when the consensual solution is reached.

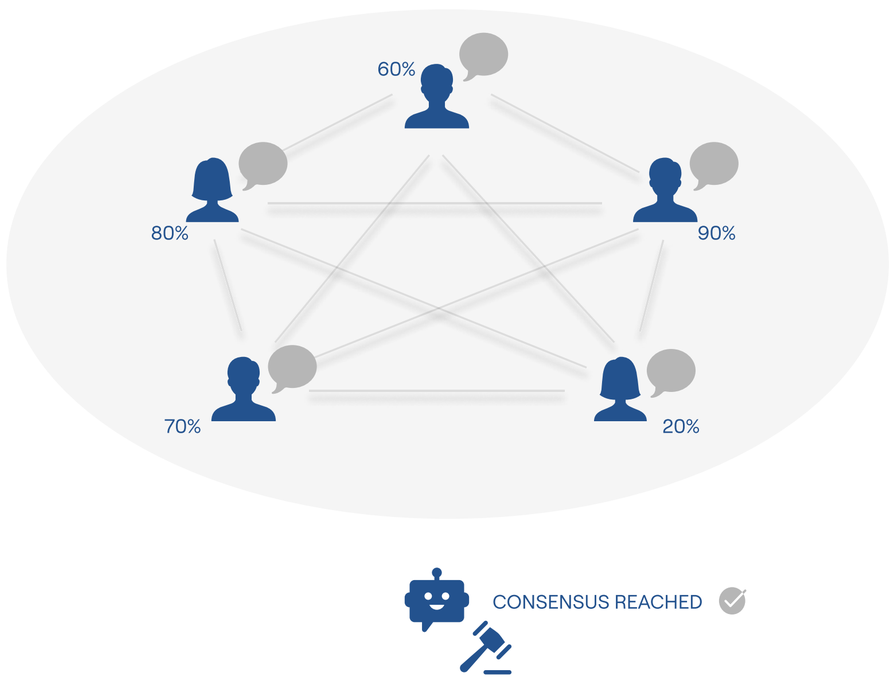

Figure 2. Group debate scenario with consensus openness scores and judge agent.

Persona Description

The framework uses generated persona data or real data provided by Lakmoos AI, s.r.o.

Name and Surname: Josef Svoboda
Description: Josef Svoboda is a down-to-earth, 50-year-old family man who enjoys the simple pleasures of life in a small town in the Czech Republic, where he shares a cozy home with his wife and two children. A hardworking man with a high school diploma, he values tradition, loyalty, and good company. His weekdays are spent balancing work and family, while weekends bring the thrill of a football match with friends or the quiet patience of fishing by the lake. Once a week, he retreats to his favorite pub, where laughter and stories flow as easily as the cold beer in his hand. Dressed in sturdy jeans, a well-worn flannel, and practical boots, his style reflects his pragmatic nature, uncomplicated, reliable, and effortlessly classic. Though a man of few words, his firm handshake, and warm smile speak volumes about his honest and steady character.

Characteristics:
- Age: 50
- Gender: Male
- Marital Status: Married
- Residence: Small town in the Czech Republic
- Financial Status: Financially stable

Traits:
- Loyal & Devoted
- Hardworking
- Easygoing
- Routine-Oriented
- Stubborn
- Not Tech-Savvy
- Occasionally Gruff

Listing 1. The example of a generated persona profile description.

Experimental Results

The PerSimChat framework outperforms the baseline solutions in dimensions focused on the naturalness. The replacement of the GPT-4o model with the Lakmoos system even improves these results.

Model 1	Model 2	Wins (%)	Ties (%)	Losses (%)
GPT-4o		40.00	16.67	**43.33**
Mistral Small		34.48	6.90	**58.62**
Mistral Nemo		42.86	10.71	**46.43**

Table 1. FairEval evaluation of using various models and the proprietary Lakmoos model in the PerSimChat framework.

Method	Believability	Credibility	Relevance
Single-Agent Zero-Shot	8.65 ± 0.82	7.96 ± 0.88	8.4 ± 0.81
AutoGen	8.67 ± 0.79	8.69 ± 1.51	8.15 ± 2.13
PerSimChat	$\mathbf{8.76 \pm 0.59}$	$\mathbf{8.78 \pm 0.52}$	$\mathbf{8.51 \pm 0.84}$

Table 2. Comparison of the PerSimChat with baseline solutions on evaluation dimensions.

Method 1	Method 2	Model	Data Source	Wins (%)	Ties (%)	Losses (%)
PerSimChat	PerSimChat	GPT-4o	Generated/	26.67	33.33	**40.00**
PerSimChat	PerSimChat	GPT-4o/		31.03	17.24	**51.72**
Single-Agent Zero-Shot	PerSimChat	GPT-4o/		43.33	10.0	**46.67**
AutoGen	PerSimChat	GPT-4o/		23.33	**46.67**	30.0

Table 3. FairEval evaluation with baselines using Lakmoos data about personas and proprietary Lakmoos system.

Lakmoos AI System

Comparison of PerSimChat framework with baseline solutions using GPT-4o and Lakmoos system.

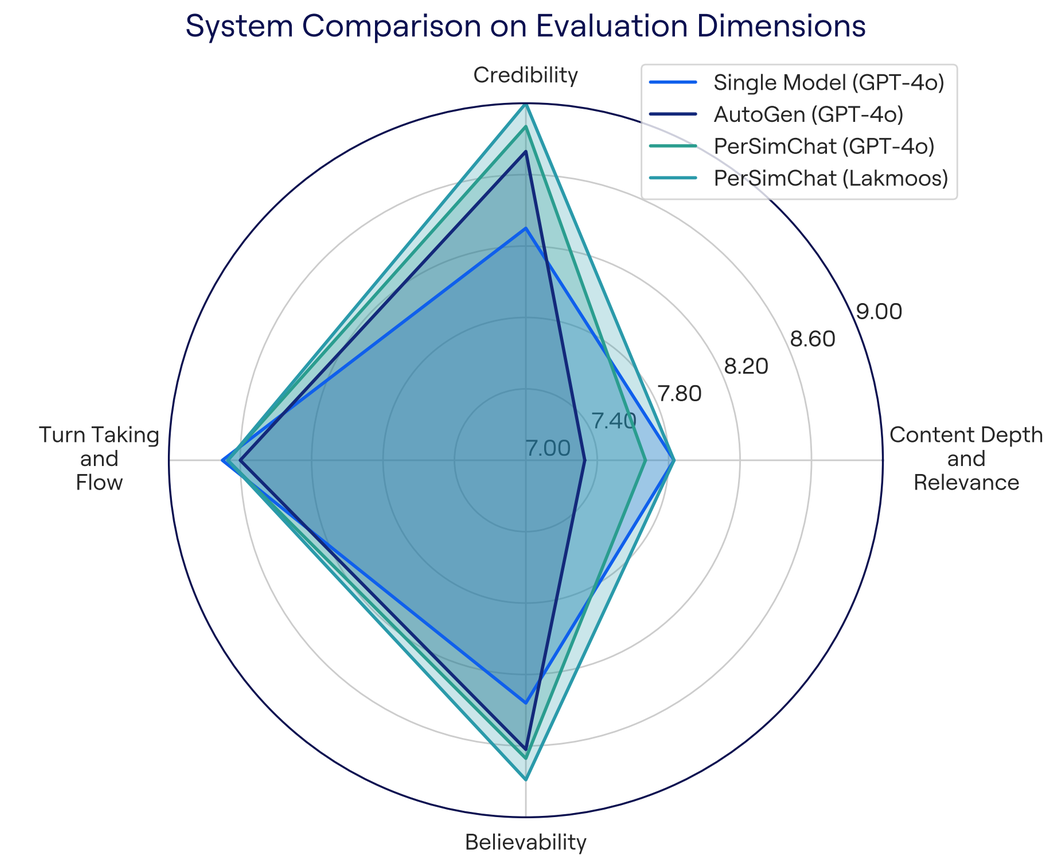

Figure 3. Evaluation of the PerSimChat framework with baseline solutions on naturalness evaluation dimensions.

PerSimChat Application

This work also provides a user interface for the implemented PerSimChat framework.

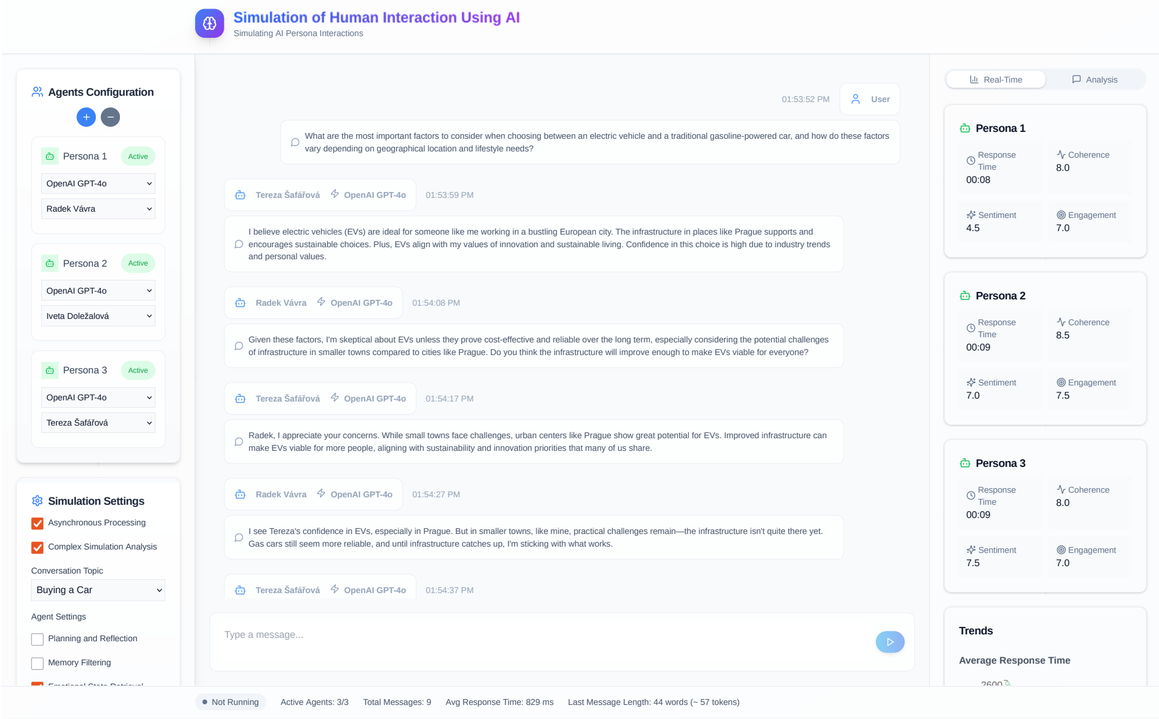

Figure 4. User interface of the PerSimChat application.