

Futuring Machines: An Interactive Framework for Participative Futuring Through Human-AI Collaborative Speculative Fiction Writing

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ABSTRACT

Imagining future scenarios arising from events and (in)actions is crucial for democratic participation, but is often left to experts who have in-depth knowledge of, for example, social, political, environmental or technological trends. A widely accepted method for non-experts to think about future scenarios is to write fictional short stories set in speculative futures. To support the writing process and thus further lower the barrier for this form of participation, we introduce Futuring Machines, a framework for collaborative writing of speculative fiction through instruction-based conversation between humans and AI. Futuring Machines is specifically designed to stimulate reflection on future scenarios in both participatory workshops and individual use.

CCS CONCEPTS

• **Human-centered computing** → **User interface design; Interactive systems and tools**; *Collaborative and social computing systems and tools*.

KEYWORDS

Human-AI collaboration, AI co-creativity, Generative AI, Speculation, Fiction, Irritation, Design futuring, Creative writing, Storytelling, Story elicitation

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1 INTRODUCTION

Intertwined crises (e.g., climate crisis, pandemics, wars or political polarization), transformation processes and technological developments require a social debate about possible futures [15, 25]. A common model for discussing futures are future scenarios, which are series of narratives that result from the extrapolation of social, technological, ecological, economic or political trends and other factors. The critical reflection on these future scenarios can stimulate imaginative ways to cope with complex global crises and issues [8], as well as foster perspective change to open up alternative preferable future visions [17].

Developing future scenarios is an abstract and complex task that is therefore mainly carried out by experts. However, since future scenarios and perspectives on them are manifold [25, 36], it is important to involve people from diverse cultural, demographic or educational backgrounds in the development processes. Moreover, involving more people gives them an active role in shaping future scenarios and thus also of shaping the evolving social debates.

For non-experts, stories are a promising means to engage with futures and to build and reflect on imaginary worlds [3, 30, 39], as well as to create alternative narratives [9, 22]. Stories can convey complex ideas and visions; they break down the complexity of scenarios into easily comprehensible everyday situations and make possibilities tangible [32, 33]. At the same time, writing stories requires the storytellers to think beyond individual aspects and look into cause-effect relationships. Changing the viewpoint and adopting the perspective of story characters makes it possible to look beyond one's own life and worldview. However, writing fiction is also a relatively uncommon skill, which calls for the use of special

writing tools to lower the barrier to entry and thus involve an even larger section of society in the debate about futures.

In this demo paper, we present *Futuring Machines*,¹ a framework for collaborative fiction writing by humans and AI. The framework is released as a prototypical web-based text editor with a number of predefined interaction modes that allow the user to engage with the AI. We selected these modes to facilitate critical engagement with speculative futures [15], and they can be easily adapted and extended to create tailored *Futuring Machines* for specific topics or sub-genres of fiction. The AI prompts the user with story stems, cloze texts and incomplete sentences (“story completion” [7]) to elicit their vision of possible futures, related wishes or fears [6, 29]. *Futuring Machines* thus follows the paradigm of iterative writing-completing, in which users and the interface take turns in an instruction-based conversation to further develop the text and push the story forward. In this way, thought-provoking impulses by the AI are directly embedded as part of the story narrative to reduce the user’s inhibition threshold for writing and support them in critical reflection.

2 RELATED WORK

For our work, the areas of design fiction theory and human-AI collaboration are relevant as background, in particular regarding design, fiction writing, and natural language processing.

Design Fiction and Storytelling as Methods for Participation. We position our work in the context of Design Futuring [13], a young design practice that deals with the imagination, reflection and design of futures. Different (desirable) futures are created, negotiated and made tangible through fictional scenarios using the means of design. Blythe [4] has used the term “research through design fiction” as a practice-based research approach: research in which insights and knowledge are gained through the process of producing fictional design concepts. While design fiction [12] was initially used by designers as a tool for exploring, questioning and investigating future scenarios through artifacts and stories, it has evolved in recent years as a method for participatory settings [24]. In co-design workshops, (non)experts and members of a given target group, including vulnerable groups [23, 27], are supported in creating fictional design concepts. This encourages engagement and discussion [35], as it allows participants to reveal their personal views in the form of suggestions, expectations or rejections. Storytelling plays a key role here as a means of encouraging reflection through the elaboration of stories [5]. Based on storytelling, Nägele et al. [27] propose a participatory design fiction method (PDFi) to make speculation on medical technology futures accessible to vulnerable groups. Through different means (e.g. a story prompt and guiding questions) the method aims at evoking empathy for sensitive topics and empowering participants by enabling them to share their perspectives. The outcomes of this method are fictional narratives in different formats such as texts, comics or physical artifacts. “Story completion”, a method from social science research that has found application in HCI [6, 7], also offers an opportunity to facilitate reflection and participation to a wider range of people through writing stories. Schulte and Hornecker [29] extended this

method to support people to share their visions, fears and wishes about given topics or future technologies through the creation of short near future fictions. In story completion participants are encouraged to continue a story stem, which is a prompt that sets the scene (e.g. year, place, character) and introduces the topic to explore (e.g. care technologies and aging). Moreover, cloze texts (texts with blanks and incomplete sentences) guide participants through the story by setting constraints and at the same time leaving passages to be completed. By placing a rough topic in a specific storyline (e.g. life as an elderly person in the future) story completion methods reduce the inhibition threshold of writing and thus of reflection. We see therefore potential in adopting these techniques in a Human-AI collaborative writing process as a key strategy to elicit people’s visions and perspectives in an accessible and playful way.

Generative AI in Co-Design and Design Fiction. Related projects have already investigated stories as a medium for reflecting on future technologies by writing speculative fictions using language models [10, 21]. Others use “conversational storytelling” to help people reflect on and express their perspectives on certain topics through dialogue with a “storybuilding bot” [14]. An important feature of generative AI is that it offers serendipity and surprise, generating creative friction through unforeseeable outcomes [16]. The use of generative AI such as large language models in participatory settings can offer an appropriate degree of strangeness and irritation – including through incomplete associations, bias, errors or misunderstandings [28]. We see in these unexpected, uncanny outcomes potential for irritations and thought-provoking impulses that may foster critical thinking and imagination.

Human-AI Collaboration and Collaborative Fiction Writing. The intersection between generative AI, design research and HCI is still a new and growing field of research. Numerous workshops on the topic aim to emphasize the opportunities and limitations for the disciplines and to develop methodological frameworks [26, 34], including specifically on human-AI co-creation [38]. In the realm of fiction writing, recent research explores Human-AI collaborations and new co-writing experiences with large language models. Yuan et al. [40] present *Wordcraft*, a browser-based text editor for text-rewriting and continuation in the context of story writing. Moreover, numerous commercial tools for AI-powered fiction co-writing have been developed, such as *Sudowrite*, *Boo.ai*, *LAIKA* or *NovelAI*, among others.² These vary from basic text editors to more sophisticated tools that address different aspects of storytelling; from brainstorming, outlining and character development to text generation or rephrasing based on different voices and styles. While such tools might seem similar to our proposal at first glance, their sole purpose is to assist a user in writing fictional stories. The main purpose of our framework is to support them in the critical reflection on future scenarios throughout the writing process, and our explored interactions are especially tailored to this end. Related research mainly focuses on keeping control over the story [19, 40]. The primary aim is to preserve the writer’s distinct style and storytelling approach, ensuring that the co-writing tool serves this purpose effectively. Instead, our framework encourages the

¹Publicly available code repository: <https://github.com/fidelthomet/futuring-machines>

²Available at <https://sudowrite.com/>, <https://boo.ai/>, <https://writewithlaika.com/> and <https://novelai.net/>

otherness of a partner as a key strategy to invite users to open up to perspectives different from their own. Bajohr [2] argues, as a critique of Kehlmann’s experiments [18] with CTRL [19], that AI-based co-writing tools hold the potential to be something *other* than the writer themselves. This may also lead to a different writing process than usual assistance tools can offer.

In the field of natural language processing, on the other hand, research on story generation focuses mainly on non-interactive approaches [1], in which texts are generated by language models and to a lesser extent through human-AI collaboration.

3 THE FUTURING MACHINES FRAMEWORK

Futuring Machines is a framework for collaborative fiction writing through instruction-based conversations between a human user and an AI, specifically a large language model (LLM). Figure 1 illustrates the interface.

When opening the interface, the user is asked to select a *story template* to start with (Figure 1 a). These adjustable templates define the parameters of the story such as the topic, characters and time range. On the technical side, a template is either a predefined story stem (e.g. cloze text with blanks and incomplete sentences) or a prompt for the AI to generate the beginning of a story based on given parameters such as topic, characters, scene or time frame, among others. Building on the method of “story completion” [6, 7, 29], story templates suggest a context and initial direction of the story to help the user start, while leaving aspects open for the user to reflect and expand on.

Once a template is selected, users can start co-writing the story through editing the text and using one of the 11 predefined interaction modes. Unless the AI is invoked, the interface shows only the story text on a gray background, with user-written parts in blue font and AI-written parts in black font.

As it is characteristic of a framework, all components of Futuring Machines can be easily customized and extended, including the starting templates, interaction modes, the used LLMs and the LLM endpoints.

3.1 Interaction Modes

The framework’s predefined interaction modes follow the paradigm of iterative writing-completing. The user and the AI take turns in an instruction-based conversation to further develop each other’s text and advance the story. The user explicitly instructs the AI, whereas the AI’s responses are designed to be thought-provoking impulses that it integrates into the narrative. In other words, the responses are geared to create positive irritations for critical reflection themselves. The implemented interaction modes can be grouped into three categories based on their trigger and technical action, as shown in Table 1 and explained in the following sections.

3.1.1 Continue Modes. These modes are triggered when the user’s cursor moves to an empty line, usually when adding a new line (Figure 1 b). In these modes, the AI advances the story based on the existing content, either without or with a specific direction in mind. The user can specify directions by selecting a predefined interaction mode or by writing custom prompts.

- *Continue writing.* In this mode, the direction is completely left to the AI.

Table 1: The three interaction mode categories defined by the trigger (cursor moves to an empty line or selects text) and action (appending or replacing text). The theoretical fourth category is not used, as the AI only replaces text that the user explicitly selected.

		Trigger	
		Empty line	Selection
Action	Append	Continue modes	Elaborate modes
	Replace	-	Paraphrase modes

- *Address impacts.* In this mode, the AI proposes multiple topic ideas to further develop the story. Following the STEEP model, the user can choose whether the continuations should take Social, Technological, Economic, Environmental, or Political factors into account. After selecting one of these factors, the AI asks the user to select one of three continuations it generated. This mode aims at engaging critical reflection on possible impacts of the trends, events or developments addressed in the story.
- *Change tone.* In this mode, the user is asked to choose a sentiment (positive, critical, empowering, ironical and fearful) for the AI to continue the story with.
- *New perspective.* In this mode, the AI is asked to give the story a new perspective, which can manifest itself in the introduction of new characters. These characters are not limited to humanoid characters but can also be objects, animals, or plants, for example, following the development of more than human-centered ideas [37], which is especially suited for provoking irritations.
- *Question.* In this mode, the AI prompts the user with story continuations building on critical questions regarding the story (Figure 1 c). The aim is to foster critical reflection on direct and indirect negative future consequences of particular trends, events or developments that are addressed in the story. First, the AI generates three critical questions based on the story’s content. After the user selects one question, the question is rephrased as an inner monologue from the viewpoint of the main character and added to the story.
- *Wildcards.* In this mode, the AI prompts the user with different story continuations, each building on a different unexpected event, crisis or problem that brings conflict to the story. After selection, a continuation is appended to the story, but ends with a sentence stem (e.g., “Because of that...”) to cause the user to reflect on possible consequences.
- *Custom prompt.* Each of the above-mentioned interaction mode is associated with a predefined prompt. To not limit a user to these modes, we added a text field in which users can write “instruction style” prompts to express their thoughts on how the story should continue. The AI’s response to these custom prompts are appended to the story.

3.1.2 Paraphrase Modes. Paraphrase modes allow users to select text and replace it with an automatically generated paraphrase of the selection, which includes shortening and reframing as per

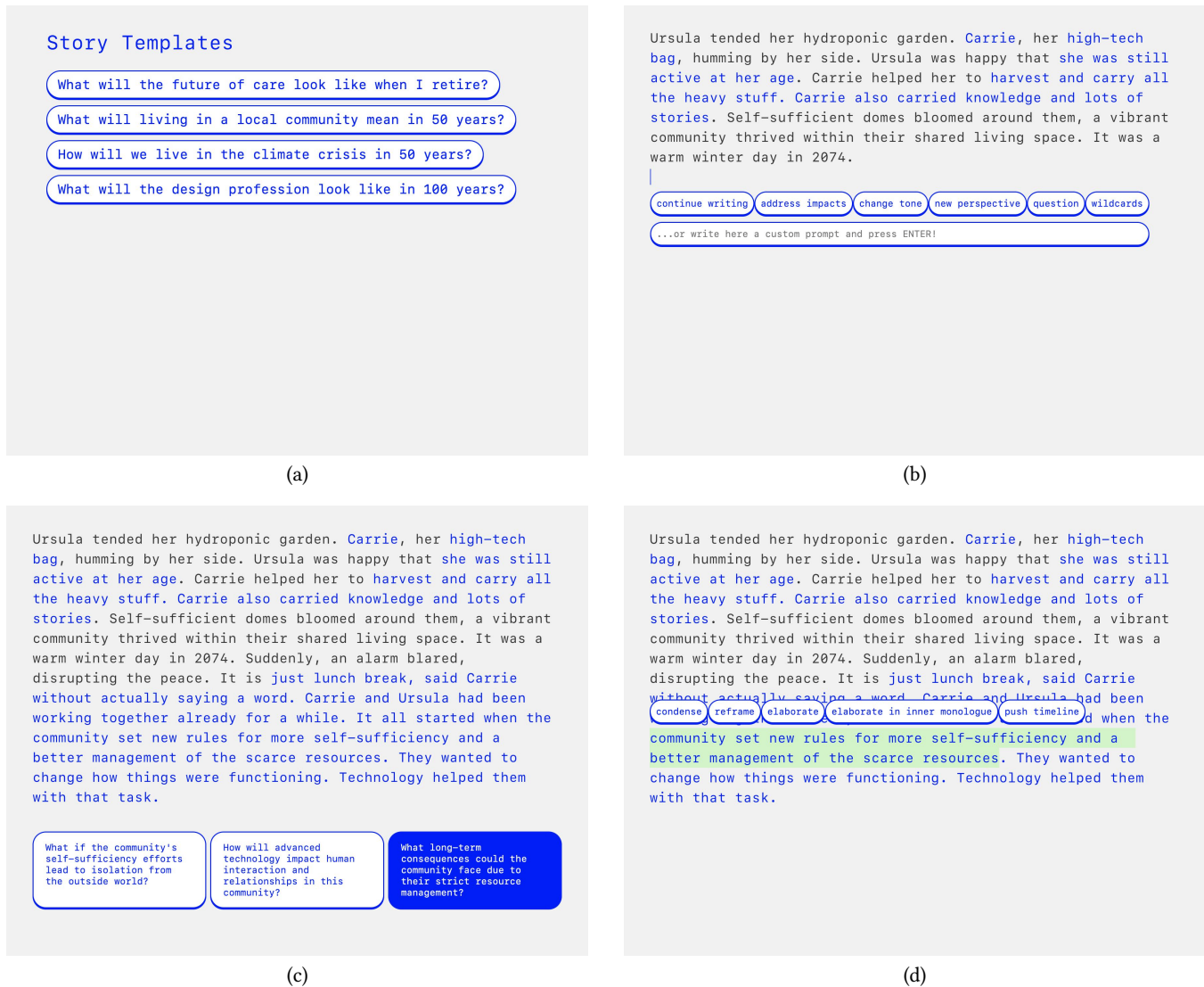


Figure 1: Screenshots of the Futuring Machines interface. (a) Story template selection; (b) Continue mode selection on starting a new line; (c) Critical questions generated as part of the continue mode “question”; and (d) Elaborate and paraphrase mode selection on selecting a text (green highlight).

Gohsen et al. [11]. They are activated by highlighting text in the editor and comprise *condense* and *reframe* (Figure 1 d).

- *Condense*. In this mode, the AI is prompted to shorten the selected text.
- *Reframe*. In this mode, the AI is prompted to rewrite the selected text from a positive, critical, ironic, empowering, angry or fearful perspective.

3.1.3 Elaborate Modes. These modes are designed to allow the user to further elaborate a topic, idea or concept that was already mentioned in the story text. They are activated by highlighting text in the editor and comprise *elaborate*, *elaborate in inner monologue*, and *push timeline* (Figure 1 d). The generated text is then added.

- *Elaborate*. This mode allows users to specify in which tone or from which perspective (e.g., positive, critical, empowering, fearful, ironic) the aspect addressed in the selected text passage should be further developed.
- *Elaborate in inner monologue*. This mode works like *Elaborate*, but the AI generates the text in first person from the viewpoint of the main character, revealing their inner thoughts.
- *Push timeline*. This mode prompts the AI to continue the story 10, 100 or 1000 years later, focusing on possible issues or implications in a near or far future of the particular aspect addressed in the selected text passage.

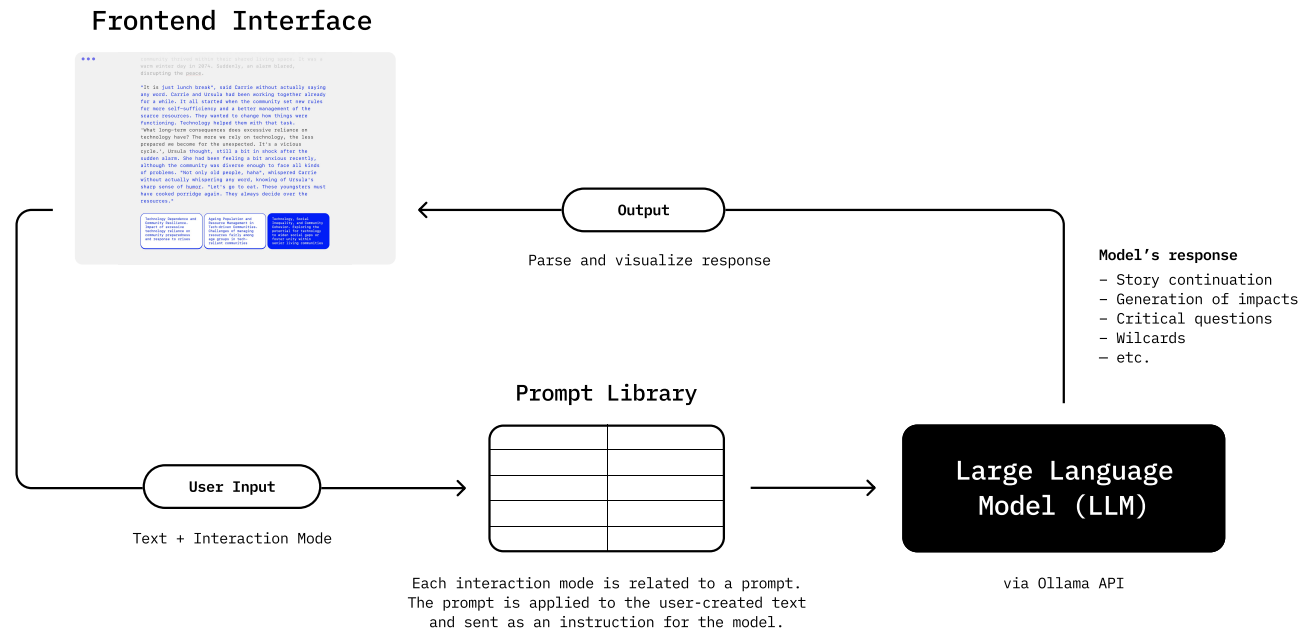


Figure 2: Architecture and data flow of the Futuring Machines framework.

3.2 Implementation

The Futuring Machines framework consists of an interface and an LLM backend providing a REST API. When a user selects an interaction mode, its associated prompt and the current state of the story is sent to the LLM backend. The model generates the corresponding output, which is then parsed and visualized in the writing interface (cf. Figure 2).

The framework is developed to be simple and extensively customizable. We therefore opted for an architecture that can be executed as a local program, but can also be made available on the web through a server and accessed via a web browser. The frontend is developed with Vue.js³, a lightweight open-source JavaScript framework for creating web user interfaces. We have opted for a model-view-viewmodel (MVVM) framework that focuses on modularity and versatility and follows the idea of modular user interface design. The frontend architecture eases the customization of the text editor by simply adding or editing JSON configuration files to add or modify interaction modes.

The frontend communicates with the LLM via a REST API that follows an emerging standard, which is an API design similar to the API by OpenAI. By following this standard, we allow “hot-swaps” of LLM APIs by just exchanging the API domain. During the development of our framework, we used Ollama⁴, which serves as an entry point to state-of-the-art open-source LLMs. Our prototype can be configured to use Mistral 7B Instruct⁵ or LLaMa 2 7B [31].

³<https://vuejs.org/>

⁴<https://ollama.com/>

⁵<https://huggingface.co/mistralai/Mistral-7B-Instruct-v0.2>

4 DEMO

The Futuring Machines framework offers an intuitive interface and invites people to explore possible futures by co-writing speculative fiction. The method of story elicitation supports writing without prior planning or specific instructions. At the conference, visitors can co-write their own fiction with our prototype. To access the prototype, conference visitors can use any device with a web browser through a publicly exposed URL. Finally, the created stories will be made available to visitors to take home digitally by using QR codes.

5 CONCLUSION AND FUTURE WORK

In this work, we presented Futuring Machines, a framework for human-AI collaborative co-writing of speculative fiction in an instruction-based conversation. Our system uses a large language model (LLM) as a provider of positive irritations and thought-provoking impulses in order to support users to critically reflect on future scenarios through the process of writing fiction. Built on this framework, we developed a functional probe to depict its potential. The framework is designed both for individual use and as a playful interactive method for participatory futuring workshops.

Building on the method of “story completion” [6, 7, 29] the implemented interaction modes follow the paradigm of iterative writing-completing paradigm. In a near future, further modes of interaction (e.g. further conversational interactions) will be explored. Moreover, one challenge to address in a near future is how to make the LLM steer the story following specific story structures. We see in this storytelling strategy an opportunity to address in the different parts of the story different aspects (e.g. questions, wishes, needs, fears or expectations), which could be elicited by particular story stems or

plot twists. Here, the interface could trigger different interaction modes depending on which part of the story is being written.

The potential of our framework for the engagement with possible futures as well as for encouraging perspective change and eliciting diverse future narratives has to be extensively explored and evaluated. In said workshops, we will give access to Futuring Machines to a diverse circle of people and observe their behavior while using it. Moreover, the analysis of the written stories and in particular the ideas, values, wishes or fears embedded in them is particularly relevant for evaluating the opportunities that such a framework can provide for democratic participation. Complementary to the analysis of stories, as well as discussions conducted within our workshop format, current research on recognizing human values in texts is particularly relevant for our project [20].

We acknowledge that we risk reproducing bias through the use of LLMs. Considering this issue is specially relevant when the aim is to critically reflect on future imaginaries and elicit diverse future narratives. We address this challenge in which we acknowledge AI as an irritating partner that provides food for thought, but encourage the active role of the authors in shaping the narrative. With this mindset, bias in generated texts should not be taken for granted. Bias should be rather taken as an opportunity to identify, acknowledge and critically reflect on stereotypical worldviews and related societal issues and counteract them in the stories. To create a discursive setting to reflect on these issues will be a central aspect in the further development of our framework and the design of our participatory workshop format.

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