

## KEN LIU'S *THE ALGORITHMS FOR LOVE*: HUMANITY IN CRISIS IN A WORLD GOVERNED BY ARTIFICIAL INTELLIGENCE

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**Abstract.** This article aims to explore the crisis of humanity when facing unprecedented developments in artificial intelligence. Applying Darko Suvin's framework of the poetics of the science fiction genre, particularly the two concepts of cognitive estrangement and novum, this article will elaborate on not only the fundamental poetics of the genre, but also the ways in which Ken Liu employs it to convey a sense of suspicion surrounding the disorienting speed of scientific progress. Through the protagonist's frenzied internal conflict with her state-of-the-art smart robot dolls, *The Algorithms for Love* reflects the wave of skepticism regarding technological advances in modern science fiction.

**Keywords:** science fiction, genre, formalism, cognitive estrangement, novum, Ken Liu, Darko Suvin, artificial intelligence.

### 1. Introduction

A literary phenomenon that has existed for several centuries yet is still considered an "outcast" with little literary "value," the science fiction genre (sci-fi or sf/SF) still garners debates over its definition and core characteristics. Nevertheless, on popular encyclopedic sources, scholars have come to a consensus regarding the core essence of science fiction as a genre: sci-fi works portray a world rooted in our experimental world, but with key differences in terms of science, technology, history, etc., that render the world in a science fiction work simultaneously familiar and unfamiliar [1-3]. Nowadays, particularly after 1992, faced with global upheavals and changes such as fear of terrorism and environmental crisis, the science fiction genre responds through the births of new movements. Soaring from the past three decades is a group of writers that no longer focus on creating heroic characters as in the past, but considers their work a place to demonstrate and "as the trigger for an exploration of human emotions and relationships" [4; p. 181]. Notable authors of the past three decades, such as Mary Gentle, Richard K. Morgan, Adam Roberts, Liz Williams, Christopher Priest, Philip Roth, etc., employ literary techniques of science fiction to pose ethical questions such as

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war, colonialism, individual identity, the nature of reality, etc. In addition, the distrust over technology began to grow in the 1930s and led to two opposing approaches to the science fiction genre. In 1978, Isaac Asimov examined a number of science fiction works and concluded: “two strands of development – one optimistic [...] and one expressing the fear that machines may get out of control” [5, p. 49]. He calls it the “Myth of the Machine,” “a double-edged concept reflected in the frequent suspicions of the applications of technology in much subsequent science fiction” [5, p. 49]. Even Juliette Bessette suggested that science fiction “pushes the gaze past certain ecological, technological, and political points and adopts a fictional standpoint to observe the possibilities for human life in new conditions from which in reality there would be no way back” [6, p. 58].

The article applies the theoretical framework of Darko Suvin, a pioneering theorist in the study of science fiction as a genre, and his two key concepts of the genre - cognitive estrangement and new elements (novum) - to study the short story *The Algorithms for Love* by Chinese American author Ken Liu. Looking closely at the main character's virtual vs. reality crisis, one can see the unique world view of the science fiction genre, or in other words, the structure of the work's science fictional world on display, through the delirious gaze of the first-person narrator, Elena. Through this contemporary science fiction work, the article aims to shed light on the recent transformation of science fiction from a technological-utopia-driven genre to one that doubts and even challenges a nightmarish future of technological advancements. In contrast to classical science fiction, *The Algorithms for Love* puts forth elements akin to a technological resolution toward utopia then constantly reiterates skepticism toward that very imaginary utopia, demanding the modern science fiction reader and researcher to read the genre from approaches beyond the structural. “Love,” a seemingly fundamentally human emotion, is relentlessly put into question and even disproved throughout the short story as a mere computer algorithm. As this article hopes to elucidate, a post-humanist consideration is urgently imperative to comprehend the development of the genre and its discourse on technological advancements.

## **2. Content**

### **2.1. An overview of science fiction as a genre and *The Algorithms for Love* short story**

#### **2.1.1. Science fiction as a genre**

Through a detailed analysis of the science fiction genre, this article draws an overview of the science fiction periods recognized by the majority of researchers: proto-science fiction, which includes works from the Renaissance Age and early 19<sup>th</sup> century that bear resemblance to contemporary science fiction; scientific romance, whose definition started being used in 1840 to describe works about the future that are informed by the period's existing scientific basis; Golden Age of Science Fiction, coined by John W. Campbell Jr. in 1937 in *Astounding* magazine featuring famous science fiction writers; and New Wave, which spans across the 1960s and 1980s with the hope of dismantling motifs and tropes that are trite and overused, only to gradually wither away due to its departure from science fiction in favor of fantasy.

The New Wave period, as the genre's last breath of fresh air, has contributed greatly to many schools of thought and art. Especially, New Wave writers began to pose questions about the idealization of science in the genre, which has become the concern of many modern writers such as Philip K. Dick, J. G. Ballard, and Ursula K. Le Guin. Like Campbell has warned: "The reactions of science-fictioneers [...] over the last few decades has [sic] persistently and explicitly been that they want heroes – not anti-heroes. They want stories of strong men who exert themselves, inspire others, and make a monkey's uncle out of malign fates!" [7, p.52]. Frank Herbert went against this idea and inspired New Wave writers, saying: "What better way to destroy a civilization, society or a race than to set people into the wild oscillations which follow their turning over their judgment and decision-making faculties to a superhero?" [7, p. 52]. Even Damien Broderick also writes: "It was a lesson that is never quite learned until New Wave writers began to peel open the ideological myth of supreme scientific competence and galactic manifest destiny" [7, p. 52].

Due to its Western origin and the techno-scientific advancement in the respective countries, science fiction continues to grow quietly but exponentially and diversely in the United States. However, the genre also began to attract the attention of Eastern countries, with China and India having produced notable works of science fiction. In Vietnam, science fiction is still a novel concept and there seems to be a lack of critically acclaimed works, but it has accumulated a small but passionate audience. The closed Facebook group, "Sci Fi Lovers" currently consists of nearly four thousand members, and the genre is also rated by some press as having the potential to grow and expand [8, 9]. Nam Thanh and Nguyen Thanh Phong's work, *Devil of the Ruin Forest* (Ác quỷ rừng phé tích, 2020), has stirred the interest and curiosity of many readers. With the pace of technological advancement and scientific discovery nowadays, the fostering and criticism of science fiction literature are not only practical, but even timely for readers to approach and understand the digital world around them.

### **2.1.2. Overview of Ken Liu, *The Algorithms for Love*, and methodology**

Born in 1976 in Lanzhou, China, Ken Liu immigrated to the United States at the age of 11, majored in English and Computer Science at the bachelor's level, pursued Law at the Ph.D. level, and began publishing his own fiction in 2002. "Carthaginian Rose" is his first published work, which was featured on *The Phobos Science Fiction Anthology Volume 1*. To this day, he continues to write in the sci-fi genre with his impressive body of work, and at the same time expands the epic fantasy genre (also known as high fantasy).

Many of his works received critical acclaim and have won many literary awards, most notably the short story "The Paper Menagerie" and the novel *The Grace of Kings*. *The Grace of Kings* is also the first installment of *The Dandelion Dynasty* series, which now consists of four books and is written in his own creative genre, silkpunk [10]. "Silkpunk" is defined by Liu as "a technology aesthetic based on a science fictional elaboration of traditions of engineering in East Asia's classical antiquity" [11]. Ken Liu has also translated multiple science fiction works from Chinese to English, with his most notable translation work being *The Three-Body Problem* (Chinese: 三体) by Liu Cixin. In interviews and presentations, Ken Liu shows a particular interest in topics

such as “cryptocurrency, futurism, implications of new technologies (5G, GPT-3, nanomaterials, etc.) science fiction, virtual reality, and sustainable storytelling” [11].

Given the fact that Ken Liu is mostly known as a translator, there has not been substantial literary research on his own original works despite his growing body of work and intriguing takes on the genre. Thus, this article aims to shed light on some of his literary accomplishments and contribute not only to the discourse on futurism in science fiction in general but also to critical readings of Ken Liu's works. Particularly, this article will work on his short story *The Algorithms for Love* as one of his most celebrated works. *The Algorithms for Love* was published in July 2004 in *Strange Horizons* magazine. It was translated by Miên Túc and published on *Zzz Review* no. 7, on 21 January 2020. The full translation was also posted on the *Zzz Review* website on the same day at the following link: Ken Liu, “Thuật toán tình yêu” – *Zzz Review*.

Released in 2004, *The Algorithms for Love* presents an interest in human psychology and the skepticism of technology shared by many contemporary science fiction writers. The story revolves around Elena, an aspiring computer scientist, and her distorted sense of the world through her own line of extraordinary artificial intelligence dolls. The short story puts emphasis on the psychological influence of technology application in human life through Elena's first-person perspective; therefore, the article chooses to approach it from the perspective of internal structure in order to shed light on Elena's violent internal struggle and to reflect upon the theme of skepticism in science fiction discourse. More specifically, the article will apply the theoretical framework of the poetics of the genre by Darko Suvin, in order to illuminate how Ken Liu uses the genre's very own literary techniques to convey a skeptical attitude of the development of artificial intelligence in human life.

## **2.2. The literary nature of science fiction through Darko Suvin's theoretical framework**

Firstly, to further elaborate on the nature of the world of science fiction, Stanislaw Lem, a seasoned writer and literary critic of this genre, once draw clear divisions between science fiction and other genres such as classical fairy tale, mythology, and realism, as follows:

“If the depicted world is oriented positively toward man, it is the world of the classical fairy tale, in which physics is controlled by morality, for in a fairy tale there can be no physical accidents that result in anyone's death, no irreparable damage to the positive hero. If it is oriented negatively, it is the world of myth (“Do what you will, you'll still become guilty of killing your father and committing incest.”). If it is neutral, it is the real world--the world which realism describes in its contemporary shape and which SF tries to describe at other points on the space-time continuum” [12, p. 28]. In other words, according to Lem, the world of a science fiction work is entirely different from the reader's empirical world, with its own consistent laws but still obeying to the empirical world's line of logic.

Darko Suvin, a pioneer in science fiction scholarship in the second half of the 20th century, expanded on Lem's observations. Suvin's body of work on science fiction covers a variety of aspects of the genre, namely his *Metamorphoses of Science Fiction: On the Poetics and History of a Literary Genre*, published in 1979. Suvin is aware of

the fact that academics deem the science fiction genre a form of “para-literature” – a kind of literature for the “popular, ‘low,’ or plebeian literary” [13, p. vii]. Disagreeing with this marginalization of the science fiction genre, he proposes a definition of the genre as “literature of cognitive estrangement,” thanks to which he can “lay the basis for a coherent poetics of SF” [13, p. 4]. In specific, he proposes two fundamental concepts for the analysis of science fiction works from the perspective of internal structure: cognitive estrangement and novum.

Suvin’s concept of “cognitive estrangement” comes from Russian formalism’s *ostraneie*, combined with Berthold Brecht’s *Verfremdungseffekt*. Suvin believes that the world in a science fiction work is the experimental world that is “estranged” through a different perspective and still evokes a rational “cognition” from the reader. This “estrangement” in science fiction, different from other “estrangements” in fairy tales or fantasy, must consist of consistent logic and scientific basis in order to create a world that bears resemblance to the real world yet still functions on its own accord.

Drawing from German Marxist philosopher Ernst Bloch, the second fundamental concept in science fiction proposed by Suvin is “novum.” Novum describes a new thing in the world of science fiction work, which serves as the greatest distinguisher between the science fiction world and the real one [14, p. 118]. For a lack of a better word, novum poses the “What if” question in the science fiction world on the basis of science and empirical history. This is where science fiction differs from other genres. Suvin writes: “The theoretical discussion so far seems to lead to the conclusion that the scientifically validated, although sometimes anti-scientific, novum is [...] the necessary and sufficient condition for an SF tale [...] The first boundaries to be drawn were those most immediately necessary - toward horror fantasy, naturalistic fiction, and fairy tale. There was wide agreement here that both SF and fantasy deal “with things that are not,” but fantasy then deals with the subclass of things “that cannot be” and SF with that of things “that can be, that someday maybe” [15, p. 40]. Therefore, Suvin systematizes the poetics of the sci-fi genre, focusing on two main tactics: **cognitive estrangement** – creating a world with close resemblance to the reader’s world, and **novum** – a new thing that separates the world of the work from the real world but still preserves the logic of science to a certain extent.

Applying Suvin’s theorization of poetic features in science fiction to analyze “The Algorithms for Love,” one might be tempted to compare the world of the work to the real world to find the estrangement and novum – the very criteria to determine whether the story qualifies as a work of “science fiction.” However, this article argues that one cannot find the “sci-fi” of this short story with the organization of its inner world, but through the inner world of Elena's character.

To better organize the order and timeline of the short story, this article divides the story into segments, each corresponding to parts of the story that are divided by an asterisk in the original text. The article will focus on analyzing the poetics of the sci-fi genre through four main events: segment 1 (Elena is discharged from the hospital), segment 2 (first interview with the Laura doll), segments 4 and 6 (Aimée’s death and the subsequent creation of the Aimée doll), and segment 8 (the Tara doll is born) [16]. Chronologically, after each event, Elena’s psyche grows increasingly unstable and the

people around her become eerily peculiar like absurd androids. At the same time, alongside Elena's changing mentality, comes a new doll more technologically advanced than its predecessor. These dolls represent the novum that separates Elena's inner world from not only the world around her, but also the real world. They are based on science and are imagined (and crafted) by Elena to be more advanced and sophisticated than anything the reader has encountered in their world. In contrast, the descriptions of these dolls' creation process still incorporate real scientific terms in order to maintain a resemblance between Elena's world and the empirical world, much like her own crisis over the blurred division line between humans and androids. As a result, at the end of the story, Laura's response to Elena can be considered both an objection to Elena's hope for technological advancements and an affirmation of a world of confusion, pain, and loneliness seeded by Elena's strange, distorted reassertion of life.

### **2.3. Skepticism of A.I. Advancement Through First-Person Crisis in *The Algorithms for Love***

#### **2.3.1. The problem of essentialist crisis in *The Algorithms for Love***

*The Algorithm for Love* easily falls under the "science fiction" category recognized by the majority of academia with its root in the real world and enough crucial modifications in science, technology, and/or history in order to create a sci-fi world that is both grounded in and departed from the real one. In summary, Elena is an inspiring computer scientist with hopes of creating intelligent and useful artificial dolls. However, Suvin's theoretical framework on science fiction, particularly with the concepts of cognitive estrangement and novum, shines a critical light on Elena's identity crisis. It is Suvin's belief that the science fiction world needs cognitive estrangement and novum in order to help readers differentiate it from the real world. Applying these two concepts in analyzing *The Algorithm for Love* shows how the work dances between its own inner world and the reader's, similarly to the story's climax where Elena wrestles with the problem of android and human. Throughout the story, the world around Elena is described in detail with much realism, bringing about a sense of similarity between the story world and the reader's. When the two worlds bear such striking resemblances, the estranged factor is precisely the narrator's point of view – Elena. We have a world that coincides with the real one, but it is viewed through a unique and fresh point of view. This estranged point of view is accompanied by the development of these robotic dolls that grow more sophisticated daily, subsequently leads to the creation of Tara (the height of Elena's career), and is itself the very defining factor that separates Elena's worldview from not only the real world but also the world in which she resides.

#### **2.3.2. The seemingly empirical world in *The Algorithm for Love* in segment 1**

In the first segment, Elena meticulously describes the opening scene similar to a realist story and parallels her world with the reader's. In the hospital, Elena, the protagonist, is getting dressed to meet up with Brad, her husband. The premise of Elena's character from the events of the beginning of the story is rather troubling: she has experienced an incident that landed her in the hospital, and "lost so much weight that the jeans hang loosely from the bony points of [her] hips." She is being treated with Oxetine, a medication for people with psychological conditions such as depression, obsessive-compulsive disorders, panic disorders, and such. Elena's behaviors, such as

“[picturing herself] opening the door and throwing [her] body onto the highway” or being unable to “even surprise [herself],” though alarming, can be read as symptoms of depression – a real condition. Details of Elena’s injury are not disclosed in specifics, but just enough for readers to have a comprehensive picture of her situation. Her negative thoughts, up to this point, are still within acceptable limits based on our knowledge of health and human psychology.

Next, when Elena is in the car and Brad is driving, the surrounding is described as “smooth and light,” perfect to a point of “postcard-perfect” boredom. Until the last two sentences of this segment, Elena describes herself and her husband as “just another tourist couple from Boston on a mini-break for the weekend: stay at a bed-and-breakfast, visit the museums, recycle old jokes.” On the surface, the two look like a typical couple, with a typical schedule in a real American city and typical ways of talking like one would expect from the real world. The world of *The Algorithm for Love* seems not so different from the readers’.

And then come the last two sentences of the segment: “It’s an algorithm for love. I want to scream,” abruptly intercepting the realistic world Elena has just painted before the readers. She affirmed that the image of the other couple is just an “algorithm,” a pre-programmed phenomenon rather than one that plays out organically, naturally, and spontaneously. Particularly, Elena believes “love” – a human-to-human emotion – to be an algorithm, mechanical and repetitive. Elena’s judgment disrupts the perception of normality in the world of “The Algorithm for Love,” which should be familiar not only to her but also to the reader. To put it differently, the story creates a world that resembles the real world in both space and time, but Elena’s perception of her surroundings is what seeds and fosters the differences – the very crux of “cognitive estrangement” through Elena’s point of view.

#### **2.4.3. The estranged perception through Elena’s point of view in segment 2**

Segment 2 talks about the past when Elena finished her first doll named Laura, giving readers more information in order to compare the similarities and the strangeness in the world of *The Algorithm for Love* and the empirical world. Applying Suvin’s condition that the world of science fiction must be an estranged empirical world, Elena’s interview shows the closeness of the world in the work through its internal culture and social etiquette, exposing more of Elena’s estranged awareness through the way she approached Laura. First of all, regarding similarities to the experimental world, the media culture in the society of *The Algorithm for Love* must be mentioned. The name of the witty toy company “Not Your Average Toy,” applying the English-language idiom “not your average \_\_,” bridges the work with other English-speaking countries in the empirical world. The familiar names in American culture further confirm that America is the inspiration for this fictional world, such as Christmas holidays, the CEO position in a company, TV channels like CNN, MSNBC, and TTV. Even the marketing trick of “dragging” Elena to interview and model Laura because she “looked like a mother” and “was blond and pretty” while her being “Laura’s designer was an afterthought.” These tactics are no different from marketing strategies in the empirical world that privileges physical appeal. Elena herself is a mere employee designing and putting together robots at a toy company, and she views this product release interview as a “dog-and-pony

show.” At this moment, Elena still considers that this Laura show is ridiculous, ludicrous, and out of the ordinary. In fact, in the interview, when Laura behaves in a way that shows a level of intelligence beyond the interviewer's expectations, the doll still caused “some awkwardness and unease.” Although robot dolls are nothing new, people are still not used to such an intelligent one. Conversely and also to expand on that, Laura itself is more advanced than current robots in the experiential world, and even society in the work's world is also cognizant of the fact that Laura represents something beyond their imagination.

On the other hand, Laura's unexpected sophistication is also the departure point of estrangement regarding the concept of robot dolls and thereby Elena's point of view. In the experiential world, robot dolls already exist, so fundamentally, Laura is not a new invention. Laura's functions as listed by Elena – “fully articulated joints, twenty motors, a speech synthesizer in her throat [...] temperature and touch sensors” – are all functions that already exist in current modern technology in the experiential world, and that which are not even “cutting-edge technology ... the software techniques ... at least two decades old.” Through Elena's view, the technology that she applies to Laura is already outdated and could be upgraded to meet contemporary standards. Based on the speed at which technology progresses in reality, twenty years are a long time for an abundance of new products and software to be created. Still, to the majority of people, Elena's design, no matter how *not* cutting-edge, is enough to astonish them, Laura's intelligence already stunning to a fictional majority that closely resembles the real experiential majority. Applying Suvin's theory helps bring to light a theme that has slowly emerged through the first two segments of *The Algorithms for Love* on the world around Elena and the world through Elena's perspective. The world around Elena/the work's closed world reflects with proximity the experiential world, through overlapping details regarding not only geography but also culture and language. Elena's first-person point of view establishes this estrangement of the world, through her attitude toward Laura in particular and her perspective on her surrounding environment in general. Reading from Elena's viewpoint, the reader experiences a cognitive estrangement of the world incredibly close to their experiential world, with the catalyst being the series of robots that she invents.

#### **2.4.4. The novum established by Elena in segments 4 and 6**

Through her research and doll design process, Elena's distorted worldview reaches its peak in segments 4 and 6 surrounding the passing of her firstborn 91 days after her birth and the news that she can no longer bear children. Out of that devastating loss, she decides to craft a robot child to replace the one she lost. The idea of a robot child to compensate for mothers who need something like Aimée is the very novum nucleus of the short story, and the eventual creation of Tara serves as the ultimate outcome of that nucleus.

Elena's psychological progression at this point in the story illustrates with the most clarity the cognitive estrangement and novum in the science fiction genre. Suvin asserts that these two techniques, when used together, conjure up “a mode of thinking that is not only science-fictional, but also utopian... [and] critique empirical reality and imagine an alternative to it [...] true sf is genetically linked to the genre of literary



utopia [...] This combination of critical denial and wish-fulfillment is particularly active in sf, since it is concerned with the wishing into being of imaginary worlds constructed on ostensibly rational principles” [14, p. 119].

Interpreting Elena’s situation through Suvin’s reasoning, one sees that her desire to design the Aimée android represents the very desire for a novum to achieve that utopian society. What is more, Elena’s psychology after giving birth to and losing Aimée has been carefully recounted, as if to further emphasize this ambition. When the baby was still alive in the intensive care room, she could still “hear her cries” and even “always hear her cries” to the extent that she herself beat the glass window to the intensive care room until her bones broke. When Aimée passes away and is cremated, she could “still hear her cries.” The haunting cries compel her to think of fellow women who suffer through the same circumstances as hers, hoping for “something to fill [her] arms.” But this child cannot be real because “it would feel like a betrayal.” Eventually, Elena has come up with a solution for the world of her dream, a world in which she and mothers in similar situations will have not-real children to care for like real children: “Let technology heal all wounds.”

As such, Elena’s thought process and emotional development exemplify the harmonious combination of two literary techniques distinctive to the science fiction genre proposed by Suvin. The estranged object is Elena’s worldview through the first-person point of view, which is, if not manipulating, then actively influencing the reader to identify with her narration on the inner world of the work. Through the catalyst that is Elena’s deceased infant, the novum – the “what if” question – that resonates loudest and clearest is the invention of a robot child to replace real children so as not to betray real children. Elena’s peculiar mindset leads the reader to a potentially plausible world in which mothers can regain the children they lost through robot versions of the children. While this conclusion might seem far-fetched in the reader’s experiential world, the flow of logic retains its rationality and sensibility by ensuring coherence and connection across Elena’s cognitively estranged thoughts about robot dolls and her desire to innovate even more sophisticated ones.

#### **2.4.5. The influence of technological inventions on Elena’s psychology in segment 8**

Aimée doll’s successful production in segment 8 is the novum that officially draws a border between the experiential world and the fictional world – or, more precisely, Elena’s outside world (including the experiential world and the story’s internal world) and Elena’s inner world. That is because, even though Elena and Brad have produced and promoted the Aimée robot like the other dolls, the world of *The Algorithms for Love* is yet ready to receive such a doll. They reject the idea of an “artificial child,” and even though the public’s reaction is not mentioned, the fact that Brad has to “control the damage from Aimée” shows that the Aimée doll is not as well-received and the company has to cover up by other dolls. The resistance displayed here demonstrates that Elena’s outside world itself considers her invention strange, out of the ordinary, and gone too far. But Elena does not. The Aimée doll calms her, helps her overcome the trauma of losing her child, and pushes her deeper into the ambition for human-like dolls like true artificial children. Her wish leads to the creation of Tara, disabled from her neck down, but extremely clever like a real human from her neck up.

Adhering to the condition of logicity in science fiction, Tara the doll is not simply created overnight like a fantasy story but is developed quite reasonably based on scientific knowledge of the experiential world. The software and scientific tools that play a role in establishing Tara's core of human-likeness comes off clearly: "facial expression engine sent in by Kimberly enthusiasts at MIT's Media Lab," "augmented with many more fine micromotors" "the activation graphs for the nodes in the neural nets." Mentions of names of real prestigious universities such as MIT and Stanford elevate the realistic feel of this project. That said, Suvin also remarks on the poetics of scientific factors in science fiction:

"[Modern science fiction] discusses primarily the political, psychological, anthropological *use and effect of sciences, and philosophy of science*, and the becoming or failure of new realities as a result of it. The consistency of extrapolation, precision of analogy and width of reference in such a cognitive discussion turn into aesthetic factors. [...] Once the elastic criteria of literary structuring have been met, *a cognitive-in most cases strictly scientific-element becomes a measure of aesthetic quality, of the specific pleasure to be sought in SF. In other words, the cognitive nucleus of the plot co-determines the fictional estrangement in SF*" [17, p. 381].

According to Suvin, in the science fiction genre, science has an aesthetic effect, a tool through which the genre explores the impact of science on humans. This idea echoes the condition for a science fiction world that Suvin proposes, a world that needs to be almost real but carries a new set of logic, and the logic of science in science fiction has aesthetic significance rather than hard science. In "The Algorithms for Love," even though the scientific essentials to Tara's creation have been described in seemingly logical detail, the reader does not get a blueprint or step-by-step record of how the robot is designed, programmed, and assembled that could be followed in real life to produce Tara. The computer jargon used carries a relative logic, suggesting a product that "can be" formed based on pre-existing concepts in the experiential world. The distinction between science fiction and experiential science becomes particularly important when reading the description of Tara's creation, because this process, despite the seeming realism, is only relative and for aesthetic and estrangement purposes, accentuating the heights of Elena's distorted cognition. On one hand, she still relies on real scientific concepts to build Tara. On the other hand, she is treading an imaginary dream completely deviating from the trajectory of experiential science.

Furthermore, throughout the story, Elena's outer world/the work's internal world has been narrated in a seemingly highly realistic approach. The world set up in the work reflects the reader's experiential world. The cognitively estranged one is Elena's mindset, and the novum introduced is her technologically advanced dolls. As the work's internal world reflects the very experiential world of the reader, her estranged cognition becomes the mindset that strays off in her very world. Utilizing science and progressing too far, she invents a robot that people cannot distinguish from a real human and push her to doubt the very nature of the humans around her. She thinks that humans are also just pre-programmed machines. In Suvin's language, Elena's crisis between humans and machines illustrates the "psychological [...] *use and effect of sciences*," and represents

the very topic that science fiction aims to tackle. Or, to use Brad's own words in the short story: "People have always associated the mind with the technological fad of the moment [...] Now you think the brain is just a computer. Snap out of it. *That* is the illusion." The one who always supports her in every revolutionary idea in technology also finds her "what if" speculation that all humans are machines as an impossible novum. However, to a person who has successfully assembled a robot so sophisticated that it cannot be distinguished from a real person, who has transformed a "what if" into reality, this speculation seems highly probable enough. It can be a new code of normalcy in her cognitively estranged world.

Eventually, when Elena says "I love you" to Brad but the response comes from Laura with another "I love you too," this moment not only encapsulates Elena's crisis, but also invokes eeriness as the boundary between human and machine has, once again, seemed to have been blurred even more. Before, Brad has been the one to say this first to Elena. When she finally takes the initiative to say it back to Brad first, the one who responds is Laura, the first robot doll she designed. The exchange seems the final, frightening reminder that while she mindlessly chases after her "ambition ... to show the world" her technical skills, her own perception of humans has become perverted through those very advanced dolls.

### 3. Conclusion

Elena's crisis between true humans and intelligent machines not only provokes the question, "What if the human brain is just a pre-programmed machine?", but also expresses a dismal unease toward that world. The integration of both the real world and the fictional world in science fiction puts the character in a mindset that, if we are to interpret comprehensively, calls for a consideration of both experiential and fictional factors in the work. Identifying experiential and fictional details in *The Algorithms for Love* provides a more in-depth picture of Elena's psychology – the estrangement in her cognition, the logic in her emotional progression, the new thing that she brings to the work's internal world missing from the experiential world, and the reason of her real – not-real crisis. Elena's crisis perhaps expresses a premonition of the upcoming era of artificial intelligence - a concern with which modern science fiction heavily deals. Thus, as the short story still utilizes the concept of utopia, once considered the telos of classical science fiction, it also challenges and destabilizes the very concept to communicate doubts regarding its own subject matter - a digitally transformed world. Through self-questioning, contemporary science fiction writers like Ken Liu break apart not only classical structures of the genre but also traditional formalist or structuralist approaches to the genre itself. Reading at face value *The Algorithms for Love* in particular (and science fiction in general) would not yield the insights necessary to grasp the core of modern science fiction; only through careful dissection of the work and placing it *against* traditional structures will we come to see the genre's rejection of deceptive utopia and current shift toward skeptical post-humanism.

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