



The Unintended Repercussions of Technological Breakthrough in Satyajit Ray's *The Diary of a Space Traveller* and its Implication on the Status Quo of Artificial Intelligence: A Case Study Through the Lens of Heisenberg's Uncertainty Principle

Apurba Biswas

Abstract

The paper explains the application of Heisenberg's uncertainty principle to Professor Shonku's *The Diary of a Space Traveller* (2004) to analyze the implications of the principle on the behaviour of the characters and the plot and deploy that theoretical framework to address the current situation of burgeoning AI models and provide suggestions on how to mitigate its unintended consequences. Heisenberg's uncertainty principle states that it is impossible to simultaneously determine the position and momentum of a particle with complete precision. *The Diary of a Space Traveller* tells the story of Professor Shonku, a brilliant scientist who builds a spacecraft capable of travelling through space to discover unknown planets, encountering manifold and diverse alien species, and a highly sophisticated artificial intelligence-induced robot who irregularly exhibits unprecedented behaviour. The application of Heisenberg's uncertainty principle to *The Diary of a Space Traveller* can be seen in the following ways: Professor Shonku's scientific incapability to predict the unintended ramifications of his scientific inventions, his interaction with the alien species he encounters with expectations opposite to reality, the inability of other characters to make sense of unprecedented events, and the necessity of controlling the possibility of the unintended repercussions under voluntary human control. The results of this study will add to the larger conversation on responsible innovation and ways to mitigate the possibility of the adverse effects of unintended consequences of technological breakthroughs, especially in the realm of AI models.

Keywords: Artificial Intelligence, AI, Heisenberg's Uncertainty Principle, Unintended Repercussions, Voluntary Human Control, Responsible Innovation.

Introduction

Heisenberg's uncertainty principle states that the more precisely the position of a particle is known, the less precisely its momentum can be known, and vice versa (Heisenberg, 2000). While this principle is generally applied in quantum mechanics, it can also be used as a metaphor for uncertainty and unpredictability in the context of culture, society, and literature. In Professor Shonku's *The Diary of a Space Traveller*, the sense of uncertainty in the story is reflected in the uncertainty principle. The protagonist, Professor Shonku, invents a rocket to transport him to other planets and an exponentially sophisticated AI-induced robot,

Bidhushekar. However, the technological gadgets he creates have unintended consequences, such as Bidhushekar's autonomy and his false prediction concerning the civilization and intelligence of the creatures on planet Tafa. The uncertainty principle can also be interpreted as a metaphor for the unknown and unresolvable phenomena in the universe—for example, the sudden propulsion of the rocket from Mars and the demolition of the seemingly indestructible diary of Professor Shonku by “black ants” on Earth. Heisenberg's uncertainty principle highlights the unpredictable nature of technology and the unintended consequences that can arise from its use.

Professor Shonku's inventions successfully produce the results he intends, but sometimes he also falls short of considering the potential unintended consequences of his inventions. However, in addition to upholding ethical and moral standards, he strives to place the possibility of unchecked, uncertain, or unintended repercussions of his devices under voluntary human control, which has been forgotten, neglected, and overlooked in the modern world. As technology advances, it becomes increasingly crucial for those who create and develop it to consider the potential unintended consequences of their inventions. The principle reminds us that we cannot fully predict the outcomes of every phenomenon, technological artefact, and behaviour of people and other creatures. It calls for a more responsible and cautionary approach to combating the possibility of untoward repercussions by having it under voluntary human control.

This study will use a qualitative research design to explore the application of Heisenberg's uncertainty principle in the context of unpredictability in scientific inventions, phenomena that transcend scientific framework, and AI behavior in Professor Shonku's *The Diary of a Space Traveller*. Qualitative research is an appropriate approach for this study as it allows for an in-depth exploration of the themes and concepts presented in the text. The study will involve a meticulous analysis of the text, using a thematic analysis approach to identify key themes related to Heisenberg's uncertainty principle. The primary data sources for this study will be the short story, *The Diary of a Space Traveller*, by Satyajit Ray, and the secondary data source will be *Physics & Philosophy: The Revolution in Modern Science* by Werner Heisenberg. The data analysis will involve a thematic analysis approach. This study does not include any human participants, and all data used in the study will be publicly available in the form of printed or digital media. Therefore, no ethical issues are anticipated in this study.

Heisenberg's uncertainty principle states that measuring a particle's position and momentum simultaneously with absolute certainty is impossible (Heisenberg, 2000). Although several scientific studies have examined the implications of Heisenberg's uncertainty principle in shaping quantum mechanics, there is a dearth of research on the application of the uncertainty principle in studying key themes in literary texts, especially in the Indian science fiction story called *The Diary of a Space Traveller* where the unprecedented events, unexpected behaviour of characters and unintended repercussions of scientific inventions are exhibited. Therefore, to accentuate the research's social, ethical, and realistic implications, it will also review the status quo of the current AI models and their examples of unintended repercussions. In *The Diary of a Space Traveller* by Satyajit Ray, the characters are compelled to confront their limitations to calculate the uncertainties of phenomena fully. So, the sole purpose of this paper is to address that there is a fundamental limit to the precision with which specific properties can be measured, and predictions can be estimated, which raises questions about the

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nature of reality and the limits of human knowledge, and the necessity of human control in the realm of the possibility of unchecked technological catastrophe.

The intersection of Heisenberg's uncertainty principle, the limits of human knowledge, and the importance of addressing the theme of uncertainty and the unknown in Professor Shonku's *The Diary of a Space Traveller* remain an underexplored area of research. The short story presents a compelling narrative highlighting the problem of technological advancements' unintended consequences. The paper aims to apply the uncertainty principle to the short story to exhibit that the more precisely an aspect of a character's behaviour or estimation of a phenomenon is ensured, the less precise their estimation of other aspects becomes. Hence, it is necessary to approach the possibility of unintended repercussions with preemptive measures. The findings of this study will also contribute to the broader discussion on responsible innovation and provide insight into how to combat the potential unintended consequences of burgeoning technological advancements such as the AI models in the modern age. The paper broadly analyzes the portrayal of technological progress in *The Diary of a Space Traveller* and identifies instances where this progress's unintended consequences are evident. It evaluates the potential of Heisenberg's uncertainty principle to assess the ethical implications of technological progress as portrayed in *The Diary of a Space Traveller*. Lastly, it applies Heisenberg's uncertainty principle to the untoward situations in the short story and assesses how that theoretical framework can be used to understand and mitigate unintended consequences of modern technological innovation, especially the AI models.

The Status Quo of the AI Models and Their Unintended Consequences

The current status of AI models is quite advanced and rapidly evolving. In recent years, there have been significant advancements in various fields of AI, such as natural language processing (NLP), computer vision, and machine learning. Here are some key developments and trends:

Deep Learning: Deep learning has been a game-changer in many AI applications, particularly in NLP and computer vision. Deep learning models use neural networks with many layers to automatically learn hierarchical representations of data, enabling them to perform complex tasks such as image recognition and language translation (Emmert-Streib, Yang, Feng, Tripathi, & Dehmer, 2020).

Transfer Learning: Transfer learning is a technique that allows AI models to leverage pre-trained models on large datasets to improve performance on related tasks with smaller datasets. It has enabled researchers and developers to create more accurate and efficient models, even with limited data (Ardalan & Subbian, 2022).

Generative Models: Generative models, such as GANs (Generative Adversarial Networks) and VAEs (Variational Autoencoders), can create new content, such as images, music, and text, which is similar to the training data. These models have many potential applications, from generating synthetic data for training AI models to creating new art and media forms (El-Kaddoury, Mahmoudi, & Himmi, 2019). As AI models become more prevalent in various areas of life, unintended consequences have emerged. Here are three examples:

Bias and Discrimination: AI models are only as good as the data they are trained on. If the training data is biased or incomplete, the AI model can perpetuate those biases, leading to discriminatory outcomes. For example, facial recognition algorithms have been shown to have higher error rates for specific demographic groups, such as women and people of colour, which can result in false identifications (Belenguer, 2022).

Automation and Job Displacement: AI models can automate tasks and processes previously performed by humans, leading to job displacement in some industries. While AI can increase productivity and efficiency, it can also lead to unemployment and economic inequality for workers replaced by machines (Acemoglu & Restrepo, 2018).

Cybersecurity Risks: AI models can be vulnerable to attacks and exploits like any computer system. Hackers can potentially use AI to launch cyberattacks, such as by training models to find vulnerabilities in computer systems. As AI becomes more integrated into critical systems, such as healthcare and transportation, there is a risk that cyberattacks could have severe consequences for public safety and security (Das & Sandhane, 2021).

With the increasing adoption of AI in many areas of life, there are growing concerns about the ethical implications of AI models. Issues such as bias, privacy, and accountability are being actively discussed, and there are efforts to develop ethical guidelines and standards for AI development and deployment. Overall, the current status of AI models is prospective, with many possibilities for innovation and progress, but also a need for responsible development and deployment to ensure that AI benefits society as a whole.

Shonku's Sense of Accountability and Morality

Heisenberg's uncertainty principle refers to the phenomena where the position and momentum of a particle cannot be assessed with high precision simultaneously (Heisenberg, 2000). In other words, the more likely a particle's position is known, the less likely its momentum is known simultaneously.

In Professor Shonku's *The Diary of a Space Traveller*, the eponymous protagonist, Shonku, albeit a renowned scientist for inventing gadgets and assessing circumstances with high precision, more often than not, falls short of assessing the unintended repercussion of his invented gadgets and unforeseen circumstances of his expeditions. However, unlike other scientists, there is no dearth of accountability on his part when it comes to enduring and mitigating such unforeseen circumstances and repercussions of his gadgets since his moral fibre, deeply entrenched in human welfare, is undeterred. The distinctive attribute of Professor Shonku is that in addition to maintaining ethical and moral standards, he strives to have the possibility of unchecked or uncertain or unintended ramifications of his gadgets under voluntary human control, and that has all been forgotten about or neglected and overlooked in real life of this day and age.

The Creation of the AI robot, *Bidhushekhar*, and His Idiosyncrasies

The robot is depicted as human-like, with a head, torso, arms, and legs, and is made of a special metal alloy. Bidhushekhar is equipped with a sophisticated artificial intelligence system to understand and process human language, recognize objects and people, and perform complex tasks precisely. He has several remarkable abilities, including moving and walking on two legs and speaking different languages. Although Professor Shonku "made him" and knows "his

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limitations,” for instance, “he does not have the power to think independently,” Shonku discovered gradually that: “...there have been times when he has shown me otherwise” (Ray, 2004, p. 9).

So, applying Heisenberg's uncertainty principle, it is inferred that Professor Shonku has been so much sure about the intellectual and motor function of the robot devoid of autonomy (so only one aspect) that much to his awe, he is quite taken back to find out that the robot irregularly possesses autonomy (so another aspect). However, as Shonku understands the necessity of human control of machines since the possibility of malfunctioning is just as potent as the possibility of functioning, he installed a button on the left shoulder of Bidhushekhar, which could incapacitate him when it is turned on.

In one episode, when Shonku was building a rocket, he was perplexed because he was unsure whether to use tantrum boropaxinate or aqueous vellosilica. When he was about to choose tantrum boropaxinate, the robot shook his head as a gesture of negation. However, when Shonku went for vellosilica instead, the robot conformed to his decision as his “head went up and down, as if he was nodding in full agreement” (Ray, 2004, p. 10). Much to Shonku's amazement, the experiment with vellosilica was a success. Shonku later realized that had he gone for the experiment with tantrum boropaxinate, the venture would have terminated with an explosion or could have resulted in severe consequences. Furthermore, Shonku gradually acknowledged that:

I have noticed before that when I make an object using all my scientific skill, often it starts doing things I had not bargained for...as if some unseen force is working with me, totally without my knowledge.... some creative scientists have the same problem. They cannot gauge how far their own creations will go. (Ray, 2004, p. 10)

In another instance, when the rocket was in outer space on its way to Mars and was arguably on autopilot mode, the robot unexpectedly displayed the following behavior inside the control room:

...he jumped to his feet, rushed to the control panel, yanked the handle that is supposed to put the rocket into reverse motion. Under its impact, all of us lost our balance and were soon rolling on the floor. Then, somehow I managed to get up and press the button on Bidhushekhar's left shoulder. That incapacitated him instantly. (Ray, 2004, p. 15, 16)

However, Shonku resumed his journey, and he landed on planet Mars, but as soon as Shonku, Newton (his cat), and Prahlad (his manservant) set foot on the Martian soil, Bidhushekhar again prognosticated imminent events by saying “danger” repeatedly as if he was trying to ward them off from going further. Shonku did not acknowledge Bidhushekhar's foreboding and went on with his crew, only to be forced to leave it afterwards by innumerable flocks of extraterrestrial violent Martian creatures that would have killed Shonku and his crew if they had not made it to the rocket in time.

So, applying Heisenberg's uncertainty principle, it is apparent to infer that the robot also possesses clairvoyance which Shonku, the robot's creator, did not intend to either put in as a function or expect as a result. As the story unfolds, the more Shonku becomes sure of one aspect of the robot's function, the more he is amazed to discover unforeseen aspects of him. In another instance, Bidhushekhar unexpectedly uttered the name of a planet hitherto unknown called Tafa, which convinced Shonku to set it as the destination. However, the robot unexpectedly made an error in predicting the intelligence and civilization of the inhabitants of the planet Tafa. For example, Bidhushekhar believed that:

...the inhabitants of Tafa are the first civilized race in the entire universe. Their civilization is older by several million years than that on our Earth. Every single inhabitant is a brilliant scientist. Since each of them is as clever as the other, they are finding it quite difficult to live with one another. It is for this reason that, over the last few years, they have been importing less intelligent people from other planets and getting them to live in Tafa. (Ray, 2004, p. 26, 27)

When Shonku discovered the inhabitants of Tafa who looked like "giant ants," he found that these:

...creatures are far behind our human civilization. It will take them thousands of years to catch up with the human race. The way they live is totally primitive, compared to our own lifestyle. (Ray, 2004, p. 27, 28)

Thus, applying Heisenberg's uncertainty principle, it is apparent that although the highly sophisticated AI robot, Bidhushekhar's power of clairvoyance and prophecy is known to be true on many occasions, it is not free of errors since it does malfunction unexpectedly.

The Unfathomable Cause of the Sudden Propulsion of the Rocket from the Planet Mars

The rocket in the story is a highly advanced spacecraft equipped with compounds using toadstools, snakeskins, empty shells of tortoise eggs, and aqueous vellosilica. The rocket's interior is designed to provide a comfortable living space for Professor Shonku and his team during their long journey through space. It has a control room where the crew can monitor the rocket's systems and make necessary course corrections. Overall, the rocket is a testimony to remarkable technology that showcases Professor Shonku's genius as a scientist and inventor.

However, in one episode, as Professor Shonku was about to shut the rocket door to escape from the attack of vicious flocks of Martian creatures, he:

...felt something cold and damp strike against my feet. Everything went black immediately. When I opened my eyes, the rocket was flying once more. My right foot was aching slightly, and a faint, fishy smell still lingered in the cabin. How on Earth did the rocket take off? Who started it?... Did it take off on its own?... From today, I have become totally ignorant, completely helpless. The future is unknown, a deep, dark abyss. (Ray, 2004, p. 21, 22)

Thus, applying Heisenberg's uncertainty principle, it is conspicuous that Professor Shonku could not estimate the possibility of the rocket's automatic propulsion. He has realized that the unintended consequence of his scientific experiment, such as the rocket's inexplicable, sudden, and automatic propulsion, has rendered him completely "ignorant."

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The Inexplicable Consumption of the Seemingly Indestructible Diary

In the short story, the indestructible diary belonging to the character Trilokeshwar Shonku has several unique features. One of these is the ability of the ink to change colour when exposed to different sorts of external influences. The diary is made of a unique material resistant to fire, water, and other destructive forces. The ink used in the diary is presumably designed to change colour depending on the wavelength of light that it is exposed to. The ink's colour-changing properties add a sense of mystery and intrigue to the story as the reader is left to decipher the hidden meanings behind Shonku's coded entries. Overall, the indestructible, colour-changing diary is a fascinating and unique invention that adds depth and complexity to the narrative.

One of the most distinctive attributes of applying Heisenberg's uncertainty principle to the story is its relevance in identifying and addressing unlikely events. For example, the proofreader of the story had intended to keep the original diary to "...have the paper and ink examined by a scientist" (Ray, 2004, p. 29). However, when he returned home and went to his bedroom to get the diary from the bookshelf, he was speechless and completely in awe to find out that the bookshelf was empty:

All that remained of the diary was a small piece of its red cover, and a few pages chewed to a powder. Nearly a hundred hungry black ants were still crawling all over these remnants. They had eaten the entire diary. What little remained vanished before my eyes. All I could do was stare in disbelief...For the life of me, I cannot see how that could happen. (Ray, 2004, p. 29, 30)

Thus, applying Heisenberg's uncertainty principle, it is inferred that the indestructibility of the diary against external incursions has been ascertained with so high a precision that its unanticipated demolition by the "black ants" and its culmination in the form of "powder" rendered the readers as well as the proofreader dumbstruck and speechless and in utter disbelief.

Result and Discussion

Thus, the paper has delved into Heisenberg's uncertainty principle as manifested in the behaviour of Professor Shonku and his AI robot, Bidhushekhar. Professor Shonku had built an exceptionally sophisticated AI robot, Bidhushekhar, who possessed encyclopedic knowledge and could exhibit motor skills, but Shonku never input autonomy as a function. However, the more Shonku was sure of Bidhushekhar's non-autonomy, the more he gradually realized that Bidhushekhar unexpectedly started thinking and acting independently. When Professor Shonku was caught in a dilemma about using tantrum boropaxinate or aqueous vellosilica to make the rocket, he chose the former. Nevertheless, Bidhushekhar, who possessed superintelligent AI and autonomy, warded his decision off by motioning for vellosilica instead. Abiding by this decision, Shonku's experiment was successful, and he later realized that had he used tantrum boropaxinate, the experiment would have failed and created an ear-splitting, catastrophic explosion that might have desecrated the lives of living beings. Bidhushekhar also prognosticated the "danger" on Mars from which Shonku nearly escaped. So, another aspect, which was the clairvoyance of Bidhushekhar, was so demonstrated adequately that Professor Shonku estimated this unanticipated attribute of Bidhushekhar as another standard and,

therefore, completely overlooked the possibility of misinformation or misprediction. However, Bidhushekar's prediction about the progressive inhabitants of Tafa was utterly wrong, proving Heisenberg's uncertainty principle that one (including AI) can never simultaneously determine two aspects of a phenomenon, behaviour, or circumstance.

The paper has also exhibited that deep learning, transfer learning, and generative models are the most significant advancements in AI models, which are highly developed and advancing rapidly. Deep learning methods use neural networks to automatically create hierarchical data representations, whereas transfer learning enables AI algorithms to utilize pre-trained models on big datasets. Generative models, such as GANs and VAEs, can generate new content that resembles the training data but has numerous possible applications. However, AI models have been attacked for bias and discrimination, resulting in erroneous data transfer, automation and job displacement, and cybersecurity threats. Artificial intelligence models can also be susceptible to assaults and exploitation, which can have grave implications for public safety and security. Ethical concerns such as prejudice, privacy, and responsibility are being explored, and efforts are being made to set ethical principles and standards for developing and deploying artificial intelligence.

The paper has also proved how Heisenberg's uncertainty principle can provide the impetus that certain phenomena remain incomprehensible and unsolved and perseveres as a mystery, much to the wonder of human and artificial intelligence. The incomprehensible cause of the rocket's sudden propulsion remained as unsolved as the colour-changing feature of the diary's ink and the destruction of the indestructible diary by a group of "black ants." Just as neither Bidhushekar nor Professor Shonku could not precisely find the cause of the propulsion, indicating that it was beyond the limit of human knowledge and artificial intelligence to make sense of specific inexplicable phenomena in the world, the proofreader also was rendered dumbstruck by witnessing the demolishment and instead turned to the readers asking the question, "Can you think of a reason?" (Ray, 2004, p. 30). Thus, Heisenberg's uncertainty principle not only explains that two aspects of a phenomenon or behaviour cannot be gauged simultaneously but also enables us to embrace the unsolved and unknown.

Conclusion

The hazard of relying on only one aspect should not be considered a standard since the other potential aspect might lead to severe catastrophe. The technological breakthrough in recent years has been so compelling, especially in the artificial intelligence field, that it has led us to rely entirely on that for garnering information. There have also been several discussions worldwide about AI's threat to replacing human employability and employment since, on most occasions, it is shown to be faster, free of error, and easily accessible. However, such AI models also fall short of expectations irregularly by crashing down or giving out utterly wrong information, prediction, and results or seldom responding in threatening language and producing cryptic messages. Applying the theoretical framework of the application of Heisenberg's uncertainty principle to *The Diary of a Space Traveller*, we argue that the more we rely on the AI models for information and predictions, the other negative aspects of it remain unresolved, which results in producing misinformation and sending cryptic and threatening messages.

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In the story, Bidhushekhar, albeit possessing autonomy, does have a button on his left shoulder, allowing Shonku to have him under voluntary control. Thus, there is a quintessential need to develop a cautionary approach to creating AI models keeping the potential of unchecked consequences under voluntary human control, which must not be deemed non-negotiable. The ambiguity and unresolved mysteries in the story, on a surface level, add to its allure and make it a subject of continued fascination for readers and scholars alike. The uncertainty principle states that our measurements always have a degree of uncertainty or indeterminacy. In the story's context, Shonku suggests that the mysteries of the universe are inherently uncertain and unknowable.

The paper argues that our physical and cognitive limitations limit our attempts to understand the universe and those things will always be beyond our comprehension—for example, the unresolved cause behind the rocket's sudden propulsion, Bidhushekhar's autonomy, and the diary's destruction by black ants. The implication of leaving things unresolved in this way is that it can lead to a sense of wonder and awe at the vastness and complexity of the universe. It can also inspire us to continue exploring and seeking knowledge, even if we know that we may never fully comprehend everything. However, it can also lead to frustration as it can be challenging to accept that there are things we will never know or understand. Thus, it is crucial to strike a balance between acknowledging the limits of our knowledge and continuing to pursue enlightenment.

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Bio-note

Apurba Biswas holds an M.A. in English from West Bengal State University and a B.A. with Honours from the University of Calcutta. He serves as a Guest Lecturer at the Department of English Calcutta Girls' College (Directorate of Distance Education, Vidyasagar University). Apurba's teaching philosophy emphasizes creating an inclusive learning environment that encourages students to explore and challenge conventional perspectives. He actively engages in research projects, earning recognition for his insightful analyses and contributions to literary studies.

Email: biswas209x@gmail.com

