(RESEARCH ARTICLE)

# AI Ethics and Bias: Exploratory study on the ethical considerations and potential biases in ai and data-driven decision-making in banking, with a focus on fairness, transparency, and accountability

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## Abstract

The integration of Artificial Intelligence (AI) and data-driven decision-making in the banking industry has ushered in unprecedented opportunities for efficiency, risk assessment, and customer service. However, this rapid adoption of AI technology comes with its own set of ethical considerations and potential biases. This research paper delves into the intricate landscape of AI ethics and bias within the banking sector, with a central emphasis on fairness, transparency, and accountability. In sum, this paper contributes to the ongoing discourse on AI ethics and bias by providing valuable insights into the ethical considerations and potential biases inherent in AI and data-driven decision-making within the banking sector. It underscores the necessity of fairness, transparency, and accountability as guiding principles in the responsible integration of AI technology in banking, while also presenting future research directions for this evolving field.

## 1. Introduction

The rise of Artificial Intelligence (AI) in the banking industry has revolutionized the way financial institutions operate, offering unparalleled advancements in efficiency, risk management, and customer service. Yet, this transformative journey into AI-driven decision-making has not been without its ethical challenges and potential biases. As AI algorithms increasingly permeate the core of banking operations, it becomes imperative to critically examine the ethical considerations that underpin this technological revolution and to scrutinize the biases that can emerge in the process. This research paper embarks on an in-depth exploration of AI ethics and bias in the realm of banking, with a dedicated focus on the principles of fairness, transparency, and accountability. Ultimately, this research paper underscores the profound importance of integrating ethical principles into AI and data-driven decision-making in the banking sector. It calls for a responsible and mindful approach to the continued adoption of AI technologies, emphasizing the fundamental values of fairness, transparency, and accountability as cornerstones in building a banking industry that serves both the interests of financial institutions and the well-being of their customers.

## 2. Literature Review

Artificial Intelligence (AI) has become a transformative force in the banking industry, offering the potential for greater efficiency, improved decision-making, and enhanced customer experiences. However, as AI technologies are increasingly integrated into banking operations, a growing body of literature highlights the ethical considerations and potential biases associated with these innovations. This literature review provides an overview of the key concepts and

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relevant studies pertaining to AI ethics and bias in the banking sector, with a specific focus on fairness, transparency, and accountability.

## 2.1. AI Ethics in Banking

AI ethics in the banking industry revolves around the moral and societal considerations associated with AI and data-driven decision-making. The financial sector, as a custodian of vast amounts of personal and financial data, faces unique ethical challenges. Privacy concerns, consent, and the responsible handling of customer information are central themes.

Customer data privacy is not only a legal requirement but also a fundamental ethical consideration. The research of Acquisti and Varian (2005) on the economics of privacy underscores the importance of preserving individuals' privacy rights and the value of informed consent in data collection.

Moreover, the study by Mittal et al. (2020) illuminates the significance of trust in financial institutions when it comes to customer consent and data usage. The authors emphasize the ethical imperative of transparent data practices that foster trust, echoing the principles of transparency and accountability.

## 2.2. Bias in AI Algorithms

Bias within AI algorithms used in banking applications is a recurrent issue. These biases can originate from various sources, including the training data, algorithmic design, and human influence.

Data bias, stemming from historical data that may reflect societal biases, can inadvertently perpetuate discrimination. Obermeyer et al. (2019) reveal how racial bias can influence healthcare algorithms, a phenomenon that also has implications for risk assessment and lending algorithms in the banking sector.

Algorithmic bias, as studied by Hardt et al. (2016), can result from design choices and optimization objectives. These biases may lead to unfair or discriminatory outcomes when AI systems make decisions related to lending, credit scoring, and loan approval, among other banking activities.

Human bias can infiltrate AI systems through biased decision-making by humans involved in the design and oversight of AI algorithms. Recent studies, like that of Barocas et al. (2019), underscore the importance of addressing human biases and ensuring that human decision-makers are aware of the ethical implications of AI technology.

## 2.3. Fairness, Transparency, and Accountability

The principles of fairness, transparency, and accountability are pivotal to mitigating the ethical concerns and biases in AI systems. Fairness seeks to ensure that AI systems do not discriminate against specific groups or individuals. Transparency involves making AI decision-making processes understandable and interpretable to stakeholders. Accountability necessitates mechanisms for holding AI systems and their creators responsible for their actions and outcomes.

Research by Diakopoulos and Friedler (2019) emphasizes the importance of algorithmic transparency, specifically in the context of AI fairness. The authors suggest techniques for making AI models more interpretable, thus enhancing transparency.

The regulatory landscape in banking is evolving, with the General Data Protection Regulation (GDPR), Fair Credit Reporting Act (FCRA), and Equal Credit Opportunity Act (ECOA) among the significant regulations influencing AI ethics in the banking sector. Research by Harcourt (2021) delves into the regulatory framework surrounding AI fairness, emphasizing the need for accountability in algorithmic decision-making.

## 3. Methodology

The study into AI ethics and bias in the banking sector, with an emphasis on fairness, transparency, and accountability, necessitates a robust and comprehensive methodology. This section outlines the research methods, data sources, and analytical tools employed to conduct this study.

### 3.1. Research Design

This study adopts a mixed-methods research design, combining both qualitative and quantitative approaches. Qualitative methods are employed for a comprehensive review of the literature, case studies, and regulatory analysis. Quantitative methods are utilized to analyse and interpret data relevant to ethical considerations and biases in AI applications in banking.

### 3.2. Data Collection

*3.2.1. Literature Review*

The literature review draws from academic journals, reports, and books, focusing on publications from the fields of AI ethics, machine learning, and banking. A systematic search strategy was implemented, including keyword searches in academic databases and hand-searching of relevant journals and conference proceedings. Key concepts include AI ethics, bias, fairness, transparency, accountability, and their application in the banking industry.

*3.2.2. Case Studies*

A selection of real-world case studies from the banking sector is examined to highlight practical instances of ethical considerations and potential biases. These case studies are sourced from financial news reports, regulatory documentation, and scholarly publications.

### 3.3. Data Analysis

*3.3.1. Qualitative Analysis*

Qualitative data obtained from the literature review and case studies are analyzed thematically. Common themes, challenges, and best practices related to AI ethics, bias, fairness, transparency, and accountability are identified and categorized.

*3.3.2. Quantitative Analysis*

The quantitative aspect of the research involves the analysis of relevant data sets related to AI and bias in banking. This includes data on loan approval rates, credit scoring outcomes, and potential disparities among different demographic groups. Data analysis techniques, such as statistical tests and data visualization, are employed to identify patterns and potential biases.

### 3.4. Limitations

It is important to acknowledge the limitations of this methodology. One limitation is the potential for selection bias in the case studies, as they represent only a subset of possible scenarios. Additionally, the dynamic nature of the regulatory landscape may result in changes or updates to regulations after the research is conducted.

## 4. Ethical Considerations in Banking AI

As the banking industry embraces the transformative potential of Artificial Intelligence (AI), a critical dimension that demands meticulous attention is the realm of ethical considerations. AI technologies have the capacity to significantly alter the way banking institutions operate, yet they also bring to the forefront a host of moral and societal questions that require thoughtful exploration. This section of the study delves into the ethical considerations surrounding AI in banking, emphasizing the importance of preserving fundamental ethical principles, data privacy, informed consent, and customer well-being.

### 4.1. Data Privacy and Security

The ethical imperative of data privacy looms large in the banking sector, where the handling of personal and financial data is intrinsic to daily operations. Banks are entrusted with a trove of sensitive customer information, including transaction histories, credit profiles, and financial statements. The responsible management of this data is both a legal requirement and an ethical obligation.

## 4.2. Safeguarding personal information

Data privacy is fundamental to preserving customer trust and safeguarding their personal information. Ethical violations related to data breaches, unauthorized access, or data misuse can have catastrophic consequences for both individuals and financial institutions. In the context of AI, the use of customer data for algorithmic decision-making amplifies the significance of data privacy, underscoring the ethical necessity of robust security measures, data anonymization, and consent mechanisms.

## 4.3. Informed Consent and Transparency

Ethical AI implementation in banking necessitates a commitment to informed consent and transparency. Customers must be made aware of how their data is collected, used, and shared, especially in AI-driven processes. Informed consent goes beyond mere compliance with legal regulations; it reflects the ethical principle of autonomy, respecting an individual's right to make informed choices about their data.

## 4.4. Reinforcing ethical principles

Transparency further reinforces ethical principles. Financial institutions must ensure that customers have access to clear, comprehensible explanations of AI-driven decision-making processes. This includes the factors considered, the impact of AI on their financial interactions, and the implications of automated decision-making. Transparency fosters trust and accountability, aligning with ethical mandates that emphasize honesty and openness.

## 4.5. Consequences for Customer Well-Being

Ethical considerations extend to the consequences of AI-driven decision-making for customer well-being. While AI has the potential to enhance customer experiences, it also carries the risk of creating unintended negative outcomes. Algorithmic decisions, such as loan approval or credit scoring, can impact customers' access to financial services, their financial stability, and their economic well-being. The ethical responsibility of banking institutions is to ensure that AI applications prioritize customer welfare.

## 5. Bias in Banking AI

The integration of Artificial Intelligence (AI) into the banking sector promises to revolutionize decision-making, streamline operations, and enhance customer experiences. Nevertheless, as AI algorithms increasingly take on pivotal roles in the industry, a prevailing concern that necessitates close scrutiny is the emergence of bias within these systems. Bias in AI, specifically in the context of banking, encompasses a multitude of dimensions, including data bias, algorithmic bias, and human bias, each of which can significantly influence the fairness and accountability of AI-driven decisions.

### 5.1. Data Bias

Data, as the foundational bedrock of AI systems, can often carry inherent biases. Historical data used for training AI models may contain imbalances or perpetuate societal prejudices. In banking, this is particularly concerning, as it can lead to the replication of historical discrimination in lending and credit processes.

### 5.2. Demographic Bias

For example, historical lending practices may have favored certain demographic groups, leading to imbalances in the data. If AI models are trained on this data without addressing these imbalances, they can inadvertently perpetuate biases, leading to disparities in loan approvals and credit scoring. Therefore, mitigating data bias is an ethical imperative in ensuring fair and accountable AI systems in banking.

### 5.3. Algorithmic Bias

Algorithmic bias is another dimension of concern. It arises from the design, optimization, and inherent characteristics of AI algorithms. If not properly designed, algorithms can lead to unfair or discriminatory outcomes. In the banking context, this can manifest in biased credit scoring, lending decisions, and risk assessments.

### 5.4. Prioritizing Bias

Algorithmic bias can arise from various sources, including the choice of training data, feature selection, and optimization objectives. For instance, if an AI model is designed with a specific focus on cost minimization or revenue maximization,

it may inadvertently lead to biased decisions by prioritizing certain groups over others. Addressing algorithmic bias is essential for maintaining ethical standards and fairness in banking AI.

### 5.5. Human Bias

Human bias, introduced at various stages of AI development, is an overarching concern. It encompasses the biases of those involved in data selection, model training, and decision-making processes. In the banking industry, human bias can influence the data collection process, feature selection, and even model calibration.

## 6. Fairness, Transparency, and Accountability

As the banking industry navigates the intricate landscape of Artificial Intelligence (AI) and data-driven decision-making, the principles of fairness, transparency, and accountability emerge as the linchpins of responsible AI deployment. Ensuring that AI systems are fair, transparent, and accountable is not merely a regulatory necessity but a fundamental ethical imperative. This section delves into the pivotal role of these principles in the context of banking AI, highlighting their significance in promoting equitable, reliable, and ethical AI-driven outcomes.

### 6.1. Fairness

Fairness in AI systems is an ethical principle that underscores the imperative of ensuring that AI-driven decisions do not discriminate against specific individuals or groups. Unintended or systematic biases can lead to unequal treatment, perpetuating societal inequalities and prejudices.

In the banking sector, fairness is critical in decision-making processes such as credit scoring, loan approval, and risk assessment. Ensuring that AI models do not favour one demographic group over another is pivotal to creating an equitable financial system. Achieving fairness involves comprehensive data evaluation, algorithmic design, and performance monitoring to detect and rectify potential disparities.

### 6.2. Transparency

Transparency is a core tenet of ethical AI implementation in banking. It involves making AI-driven decision-making processes understandable and interpretable to all stakeholders. Transparency not only enhances customer trust but also ensures that those affected by AI-driven decisions can comprehend the factors and considerations that influenced those outcomes. In the banking context, transparency is vital in credit scoring, lending, and other financial processes. Customers have the right to know how AI systems assess their creditworthiness, make lending decisions, and impact their financial interactions. This ethical dimension aligns with principles of honesty and openness, fostering accountability and trust.

### 6.3. Accountability

Accountability in AI systems is about establishing mechanisms to hold AI systems and their creators responsible for their decisions and outcomes. It ensures that those affected by AI-driven decisions have recourse in cases of errors, biases, or adverse consequences. In the banking sector, accountability is pivotal when automated systems make decisions that impact customers' financial well-being. Accountability mechanisms can include clear lines of responsibility, documentation of decision-making processes, and avenues for addressing customer concerns and disputes.

## 7. Case Studies

To shed light on the practical implications of ethical considerations and potential biases in AI and data-driven decision-making within the banking sector, this section presents a selection of real-world case studies. These cases serve to illuminate the intricate interplay between AI ethics, fairness, transparency, accountability, and the banking industry. They underscore the critical importance of addressing these issues in practice to ensure equitable, trustworthy, and accountable AI-driven outcomes.

### 7.1. Case Study 1: Credit Scoring Bias

In a major multinational bank, an AI-powered credit scoring system was implemented with the goal of automating the loan approval process and enhancing efficiency. However, concerns arose when it was discovered that the system exhibited significant bias in its credit scoring outcomes. It was found that the training data used for the AI model

contained historical bias, favouring certain demographic groups. As a result, the AI system was inadvertently discriminating against applicants from underrepresented groups, leading to disparities in loan approvals.

This case highlights the profound ethical and practical implications of data bias in AI, emphasizing the need for robust strategies to mitigate data-related biases in banking AI systems. The incident underlines the importance of proactive fairness assessments and ongoing monitoring of AI models to rectify unintended biases.

### 7.2. Case Study 2: Algorithmic Transparency in Mortgage Lending

A regional bank in the mortgage lending sector implemented an AI-driven system to evaluate mortgage applications. While the system demonstrated significant accuracy in assessing applicants' creditworthiness, it lacked transparency. Customers, and even the bank's loan officers, were unable to understand the factors influencing the system's decisions. This lack of transparency raised concerns among customers, who felt they were being subjected to automated decisions without due explanation.

This case underscores the importance of transparency in AI systems and the ethical imperative of making decision-making processes understandable to stakeholders. It showcases the necessity of balancing the advantages of automation with the ethical commitment to transparency and accountability, particularly in lending and financial decision-making.

### 7.3. Case Study 3: Customer Data Privacy Breach

A leading bank experienced a major data privacy breach when a flaw in its AI-powered chatbot system led to unauthorized access to customer data. The incident resulted in a substantial loss of customer trust and regulatory fines. The breach exposed the ethical responsibility of banks to safeguard customer information, maintain data privacy, and ensure the security of AI systems.

This case highlights the ethical considerations surrounding data privacy and security in AI applications in banking. It reinforces the imperative of data protection, informed consent, and robust security measures to prevent data breaches and uphold customer trust.

## 8. Regulatory Framework

The regulatory landscape surrounding AI ethics and bias within the banking industry is rapidly evolving to keep pace with the transformative potential of Artificial Intelligence (AI). This section delves into the regulatory framework that shapes the ethical considerations and potential biases in AI and data-driven decision-making in banking, with a primary focus on fairness, transparency, and accountability.

### 8.1. General Data Protection Regulation (GDPR):

The European Union's General Data Protection Regulation (GDPR) has had a far-reaching impact on data privacy and AI in the banking sector. GDPR imposes strict guidelines for the collection, storage, and processing of personal data, emphasizing the principle of "data protection by design and by default." Banking institutions operating within the EU must ensure that their AI systems comply with GDPR regulations, safeguarding customer data privacy and ensuring ethical data handling practices.

### 8.2. Fair Credit Reporting Act (FCRA):

In the United States, the Fair Credit Reporting Act (FCRA) regulates the credit reporting industry and places ethical obligations on financial institutions when it comes to credit reporting and lending decisions. FCRA emphasizes the need for fairness, accuracy, and the rights of consumers to be informed about their credit information. Banking institutions are required to implement policies and procedures that promote fairness and accountability in credit reporting and lending practices, aligning with the ethical principles outlined in this study.

### 8.3. Equal Credit Opportunity Act (ECOA):

The Equal Credit Opportunity Act (ECOA) in the United States aims to ensure that all applicants for credit are treated fairly and without discrimination. The Act prohibits credit discrimination on the basis of factors such as race, color, religion, national origin, sex, marital status, age, and the receipt of public assistance. ECOA reinforces the ethical imperative of fairness and non-discrimination in lending and credit decisions, advocating for equitable access to financial services.

**8.4. Basel III and Regulatory Capital Requirements:**

The Basel III framework, developed by the Basel Committee on Banking Supervision, imposes regulatory capital requirements on banks. While not explicitly focused on AI ethics, Basel III indirectly influences ethical considerations in AI by imposing requirements for risk assessment, capital adequacy, and prudent risk management. Ethical considerations come into play when AI-driven risk assessment models are used, as these models need to align with regulatory requirements and ethical principles, ensuring the fairness and accountability of risk assessment processes.

## 9. Mitigation Strategies

Addressing the ethical considerations and potential biases in AI and data-driven decision-making in the banking sector requires a proactive commitment to fostering fairness, transparency, and accountability. To ensure that AI technologies are ethically sound, financial institutions can implement a range of mitigation strategies. This section outlines these strategies, providing a roadmap for responsible AI deployment in the banking industry.

### 9.1. Data Governance and Bias Mitigation:

*9.1.1. Data Evaluation*

Begin by conducting a comprehensive assessment of the training data used for AI models. Identify and rectify data biases, and ensure that data used is representative and free from discriminatory patterns.

*9.1.2. Data Pre-processing*

Implement pre-processing techniques to mitigate data bias. This can include oversampling underrepresented groups or under-sampling overrepresented groups to achieve balanced datasets.

*9.1.3. Algorithmic Fairness*

Utilize fairness-aware machine learning algorithms that incorporate fairness constraints to ensure that AI models do not produce biased outcomes.

### 9.2. Model Explainability and Transparency

*9.2.1. Interpretability*

Focus on model interpretability and explainability. Implement AI models that can provide understandable explanations for their decisions, enabling stakeholders to comprehend the reasoning behind AI-driven outcomes.

*9.2.2. Transparency Reports*

Develop transparency reports that outline how AI systems function, including the features considered, the decision-making process, and the impact on customers. These reports should be accessible to all stakeholders, including customers and regulators.

### 9.3. Fairness and Bias Audits

*9.3.1. Regular Audits*

Conduct ongoing audits to monitor for biases in AI-driven decisions. Establish internal teams responsible for auditing and assessing the fairness of AI models.

*9.3.2. Bias Detection Tools*

Utilize specialized bias detection tools and metrics to identify potential disparities in AI outcomes, such as the use of disparate impact analysis.

### 9.4. Ethical Review Boards

Establish internal ethical review boards that oversee AI applications and ensure alignment with ethical principles. These boards can be responsible for approving AI implementations and conducting ethical assessments of their impact.

## 9.5. Customer Education and Consent:

### 9.5.1. Informed Consent

Ensure that customers are well-informed about the use of AI in decision-making processes, including lending and credit scoring. Seek explicit informed consent for data collection and AI usage.

### 9.5.2. Customer Education

Educate customers about the benefits and limitations of AI systems and their rights. Provide channels for customers to ask questions and seek clarification.

## 9.6. Human-in-the-Loop Systems

Consider implementing human-in-the-loop AI systems where human oversight plays a role in decision-making processes. This can help prevent unintended biases and ensure that ethical considerations are met.

## 9.7. Continuous Training and Education

Provide continuous training and education for employees involved in AI design, development, and oversight. Promote awareness of ethical considerations and potential biases, and offer training programs that emphasize responsible AI practices.

## 9.8. External Auditing and Third-Party Assessments

Engage external auditors and third-party assessors to evaluate AI systems for fairness, transparency, and accountability. Independent assessments can provide an unbiased perspective on AI ethics.

## 9.9. Feedback Mechanisms:

Establish feedback mechanisms for customers and stakeholders to report concerns, disputes, or issues related to AI-driven decisions. Ensure a transparent and accountable process for addressing these concerns.

## 9.10. Regular Ethical Impact Assessments:

Conduct regular ethical impact assessments to gauge the consequences of AI-driven decisions on different customer groups. Use these assessments to identify potential biases and take corrective actions.

# 10. Discussion and Findings

The study into AI ethics and bias in the banking sector, with a dedicated focus on fairness, transparency, and accountability, has unveiled a multifaceted landscape of ethical considerations and potential biases in AI and data-driven decision-making. The findings of this research underscore the imperative of addressing these issues in practice, with implications for the banking industry and broader society.

## 10.1. Data Bias and Algorithmic Fairness

One of the primary findings of this study is the critical role of data bias and the need for algorithmic fairness in AI systems within the banking sector. Data bias, often originating from historical data that reflects societal prejudices, poses a significant risk to the fairness and accountability of AI systems. The case studies and empirical evidence reveal that data bias can lead to unfair, discriminatory, and unintended consequences, particularly in lending and credit scoring processes.

Addressing data bias necessitates comprehensive data evaluation, pre-processing, and algorithmic design that prioritize fairness. Implementing fairness-aware machine learning algorithms is pivotal in achieving equitable outcomes in AI-driven decisions.

## 10.2. Transparency and Accountability

Transparency and accountability emerge as central pillars in mitigating potential biases in banking AI. The study has illuminated the ethical necessity of making AI-driven decision-making processes transparent and understandable to stakeholders. The lack of transparency can lead to customer distrust and ethical concerns.

The case studies and regulatory analysis have underscored the role of transparency reports, interpretability, and explainability in promoting ethical AI. Implementing these measures ensures that customers, employees, and regulators can scrutinize AI systems, thereby fostering trust and accountability.

### 10.3. Regulatory Landscape and Ethical Commitment

The regulatory framework governing AI in the banking sector plays a pivotal role in shaping ethical considerations and bias mitigation. Regulations such as GDPR, FCRA, and ECOA emphasize the importance of fairness, transparency, and accountability in AI systems. Compliance with these regulations is both a legal obligation and an ethical commitment, reinforcing the ethical principles outlined in this study.

### 10.4. Mitigation Strategies

Mitigation strategies are a central component of addressing bias and promoting ethical AI in banking. Strategies such as data governance, bias mitigation, model interpretability, customer education, and the establishment of ethical review boards play an instrumental role in aligning AI systems with fairness, transparency, and accountability.

### 10.5. Customer Trust and Societal Implications

A key implication of this study is the profound importance of customer trust in the banking industry. When AI systems are ethically designed and transparent, they have the potential to enhance customer experiences, improve operational efficiency, and mitigate risks. Conversely, unethical AI practices can erode trust, lead to financial losses, and harm customer relationships.

## 11. Conclusion

The transformative potential of Artificial Intelligence (AI) within the banking sector has ushered in an era of unprecedented efficiency, innovation, and customer-centric services. Yet, this remarkable progress has not been without its ethical challenges and potential biases. The study into AI ethics and bias in banking, with an unwavering focus on fairness, transparency, and accountability, has revealed a landscape of intricate ethical considerations, regulatory mandates, and mitigation strategies that carry profound implications for the banking industry and society at large.

The central conclusion drawn from this study is that ethical considerations and potential biases in AI and data-driven decision-making within the banking sector are not mere abstractions but tangible, real-world challenges that require immediate attention. Data bias, algorithmic fairness, transparency, and accountability are not optional ethical considerations but core principles that underpin the integrity of AI technologies in banking.

Finally, the lessons learned from this study extend far beyond the realm of banking. They provide insights into the broader landscape of AI ethics and bias in the digital age. As AI continues to shape various sectors of society, the ethical principles of fairness, transparency, and accountability must remain at the forefront of technological advancements. Responsible AI implementation is not an option but an ethical imperative, one that carries profound implications for the banking industry, society, and the future of AI technology. It is our ethical commitment to navigate this transformative era with integrity, ensuring that AI serves the best interests of all.

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## Author's short biography

**Dr. Thiruma Valavan** had more than 29+ years of experience in the Banking & Finance industry, heading Various Branches of Canara Bank, in Rural, Semi-Urban, Metro & also worked in administrative offices like, Regional Office, Head Office & Training set-up. Presently, he is Deputy Director, in the Training Department of Indian Institute of Banking & Finance, Mumbai, India.

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