



NATIONAL INSTITUTE OF TECHNOLOGY (RAIPUR)

Department of Computer Science and Engineering

Enhancing Credit Risk Prediction Accuracy with Integrated Machine Learning, Deep Learning, and Blockchain Solutions

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Motivation & Integration

Motivation for Enhancing Credit Risk Prediction

Enhancing Credit Risk Prediction with Advanced Techniques



Lack of Transparency in Traditional Models

01

Traditional credit scoring models often lack transparency and exhibit biases, limiting the accuracy and fairness of credit risk assessments.

Utilizing Advanced ML and DL Techniques

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The aim is to enhance credit risk prediction accuracy by leveraging advanced Machine Learning (ML) and Deep Learning (DL) techniques such as Artificial Neural Networks (ANN) and Long Short-Term Memory (LSTM).

Blockchain Integration for Enhanced Framework

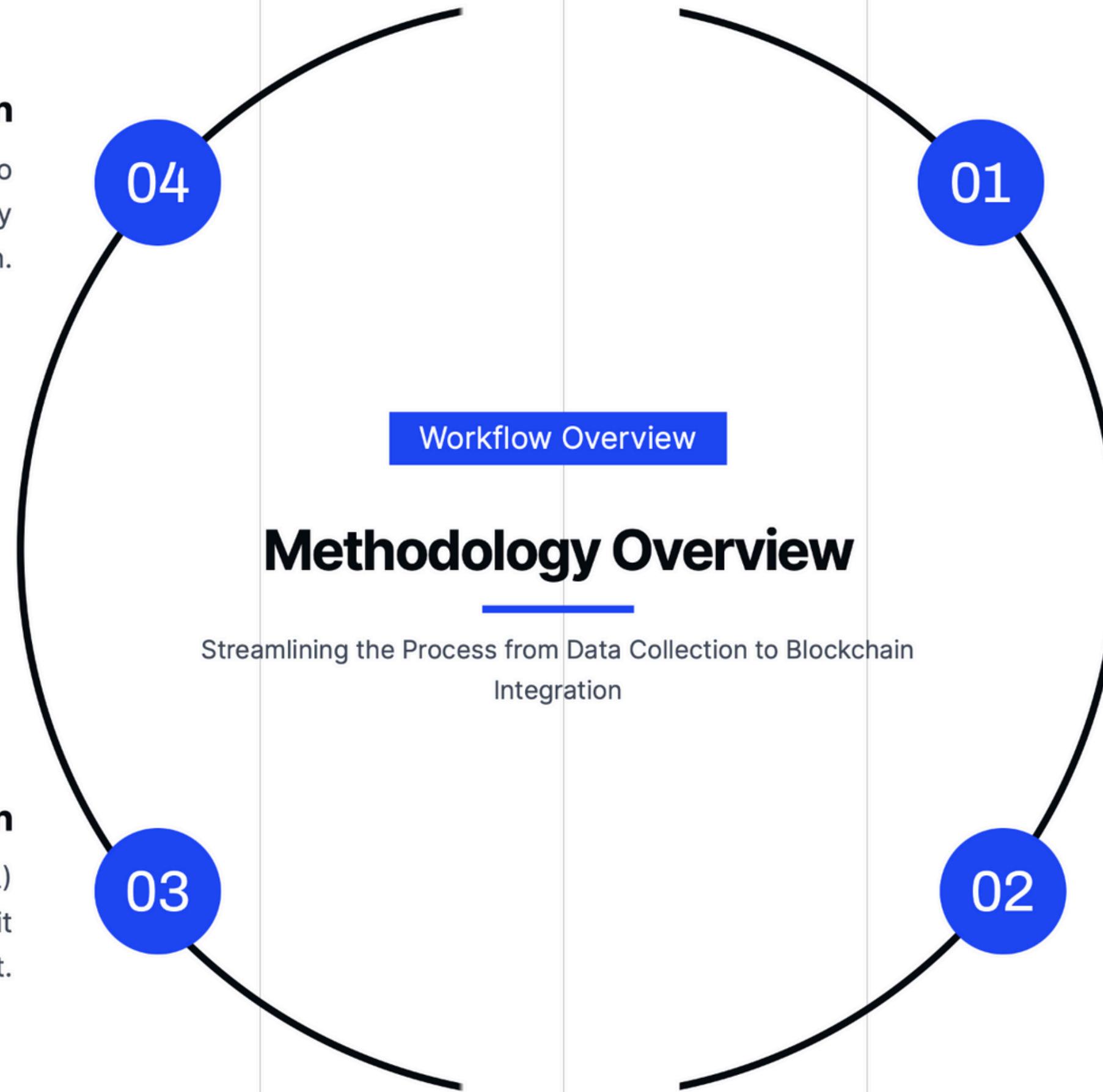
03

Integration of blockchain technology offers a decentralized, transparent, and secure framework, ensuring data integrity and providing a trustworthy ecosystem for credit risk prediction.

Methodology Overview

Streamlining the Process from Data Collection to Blockchain Integration

Workflow Overview



Blockchain Integration

Integrated blockchain technology to enhance data transparency and security in credit risk prediction.

Data Collection

Utilized Kaggle dataset for obtaining relevant credit risk prediction data.

Model Creation

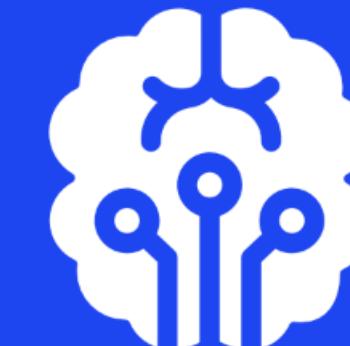
Developed both Machine Learning (ML) and Deep Learning (DL) models for credit risk assessment.

Data Cleaning and Plotting

Performed data cleaning tasks and generated insightful plots to visualize data distributions and relationships.

Handling Missing Values

Utilize `df.isnull().sum()` to identify and address missing data points effectively.



Examining Data Distribution

Leverage `df.value_counts()` to gain insights into the distribution of data across variables.

Removing Redundant Variables

Eliminate unnecessary variables that do not contribute significantly to the analysis or model performance.

Data Cleaning Process

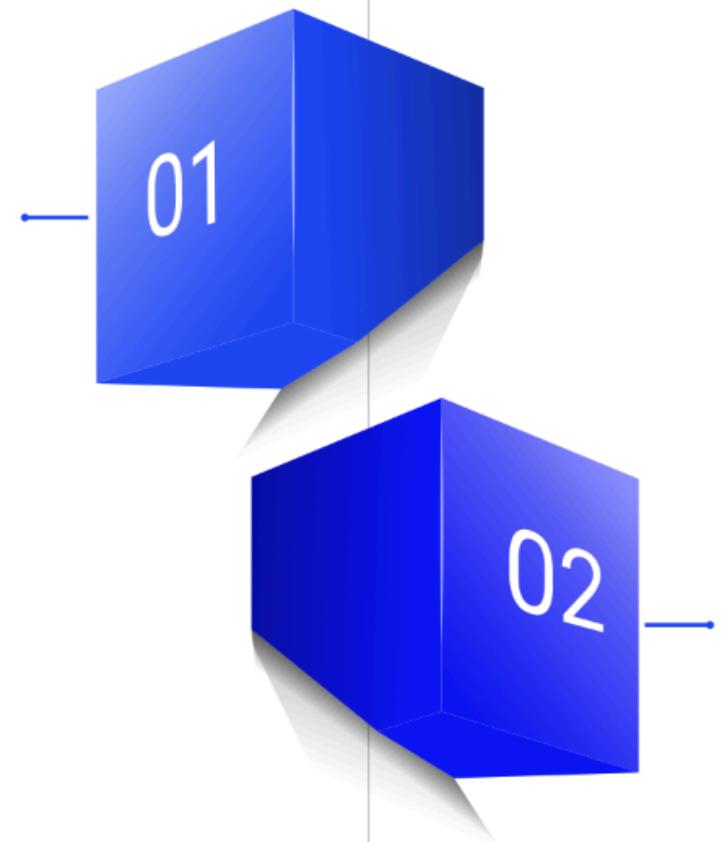
Essential Steps to Ensure Data Quality

Data Plotting and Visualization

Exploring Feature Relationships through Visualizations

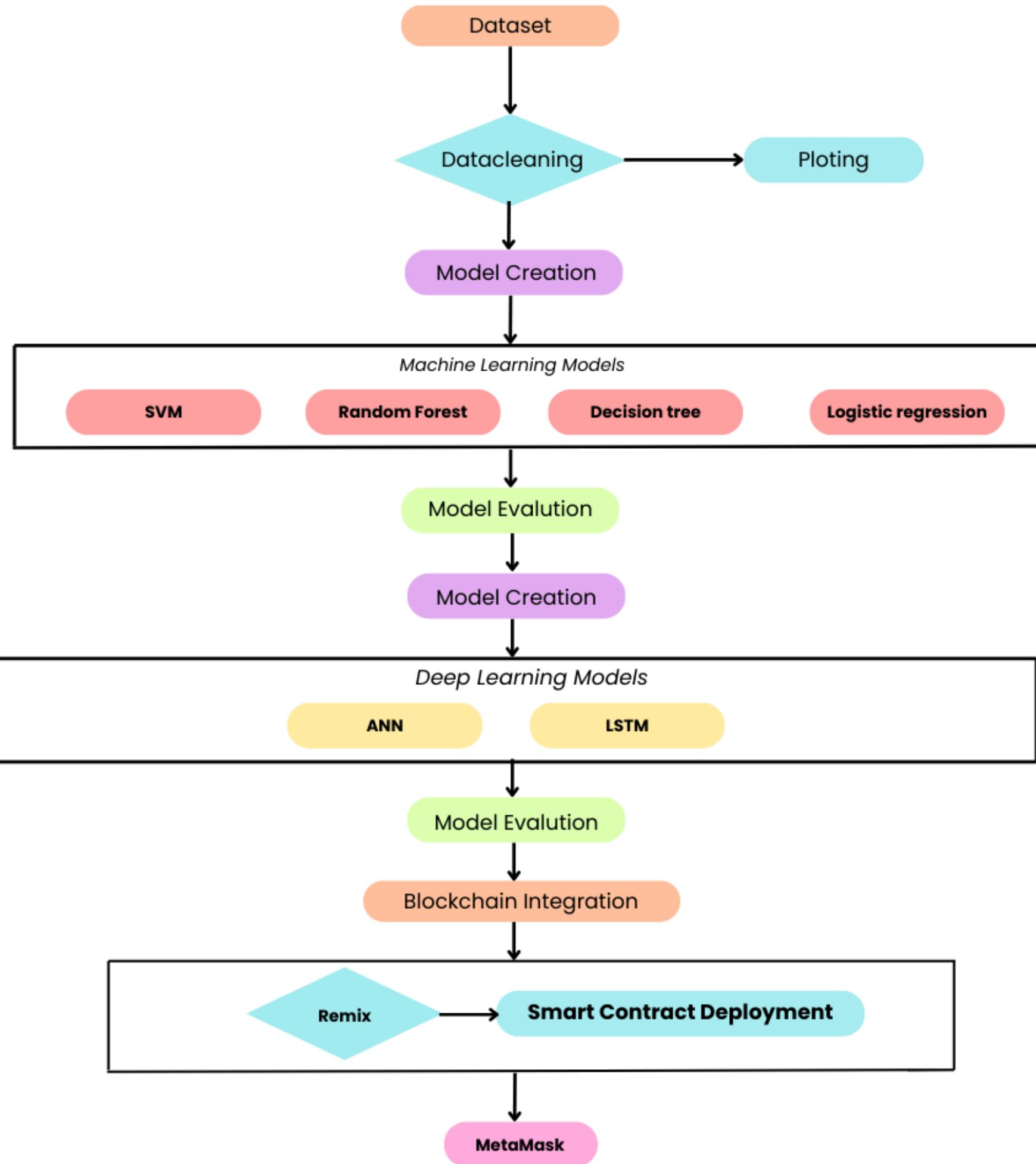
Age vs. Income

Plotting age against income to analyze any potential correlation or patterns between age groups and income levels.



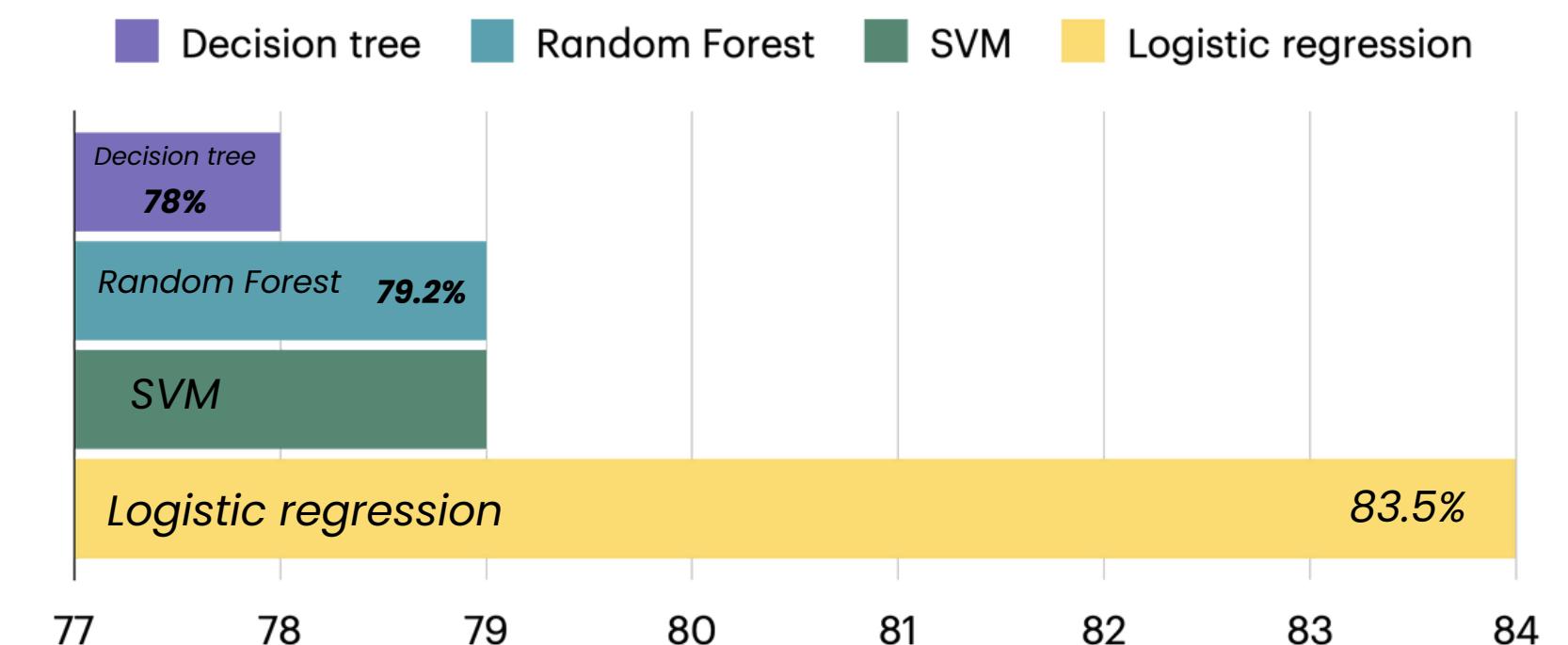
Age vs. Debt-to-Income Ratio

Visualizing the relationship between age and debt-to-income ratio to identify any trends or insights regarding financial health across age categories.



Machine Learning Models

	TP	FP	Recall	Precision	Accuracy
Decision tree	18	10	0.47	0.64	78%
Random Forest	17	7	0.45	0.71	79.2%
SVM	12	3	0.32	0.80	82%
Logistic regression	20	5	0.53	0.80	83.5%



LSTM Accuracy Improvement

Initial accuracy of 50% improved significantly to 95% using Long Short-Term Memory.

Model Performance

Deep Learning Model Creation and Evaluation

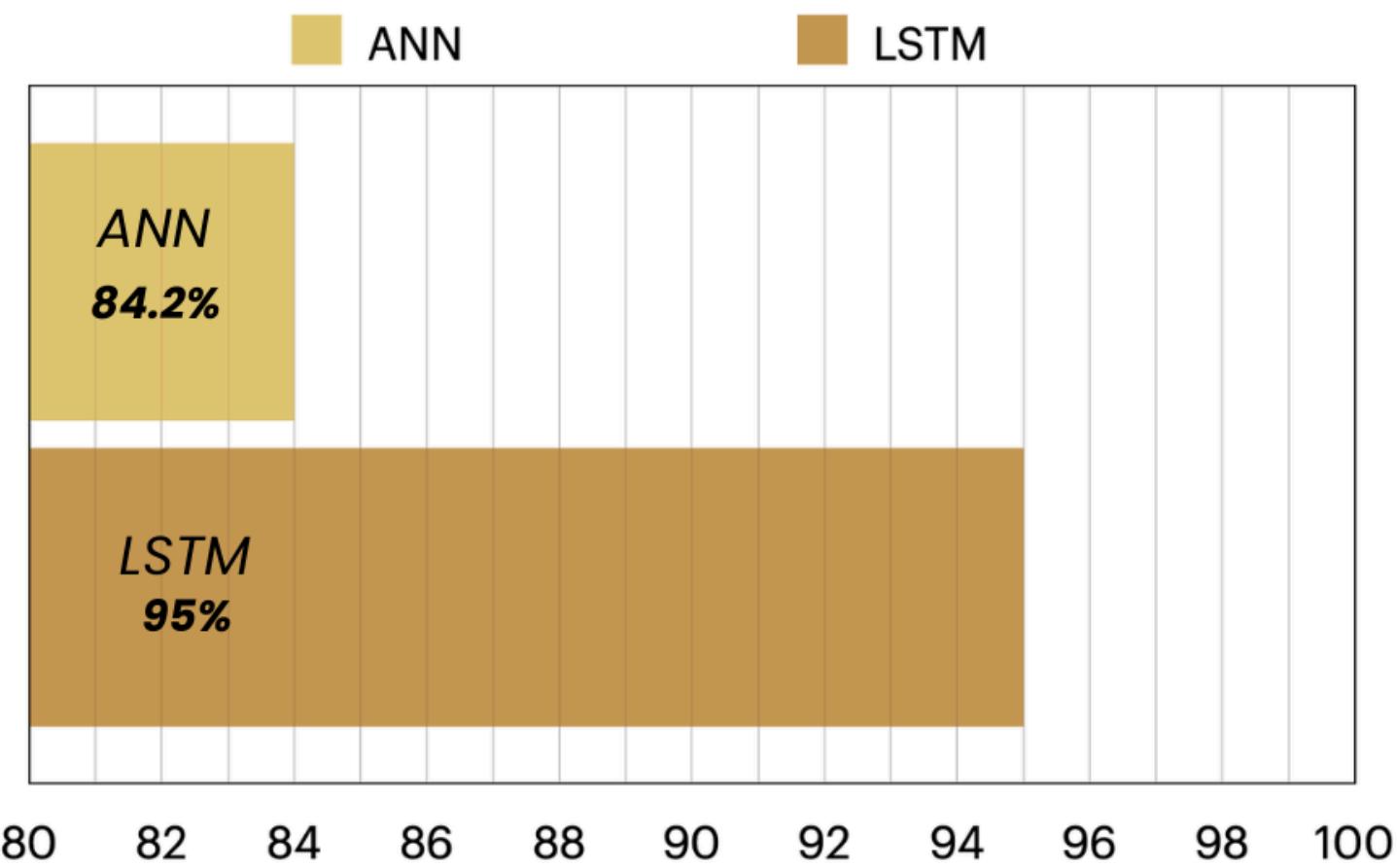
Improving Credit Risk Prediction Accuracy

Artificial Neural Network (ANN) Accuracy

Achieved an accuracy of 84.2% in credit risk prediction.

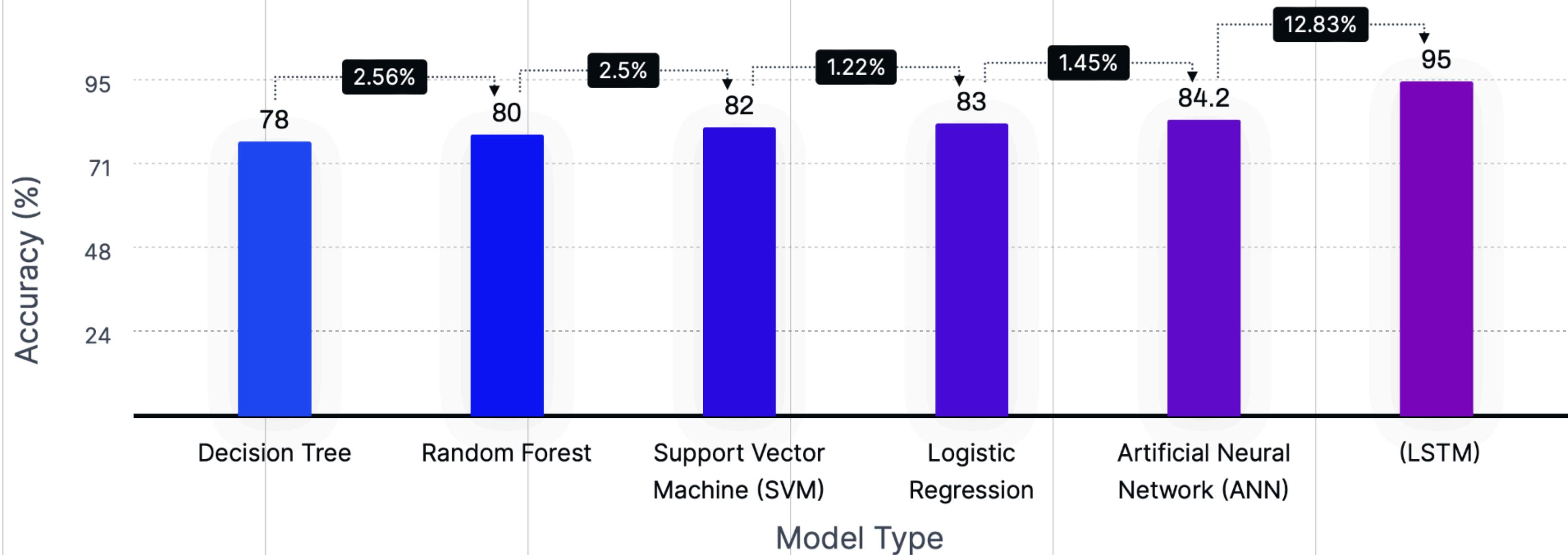
Deep Learning Models graph

	TP	FP	Recall	Precision	Accuracy
ANN	24	8	0.63	0.75	84.2%
LSTM	48	0	0.90	1.0	95%



Model Performance Comparison

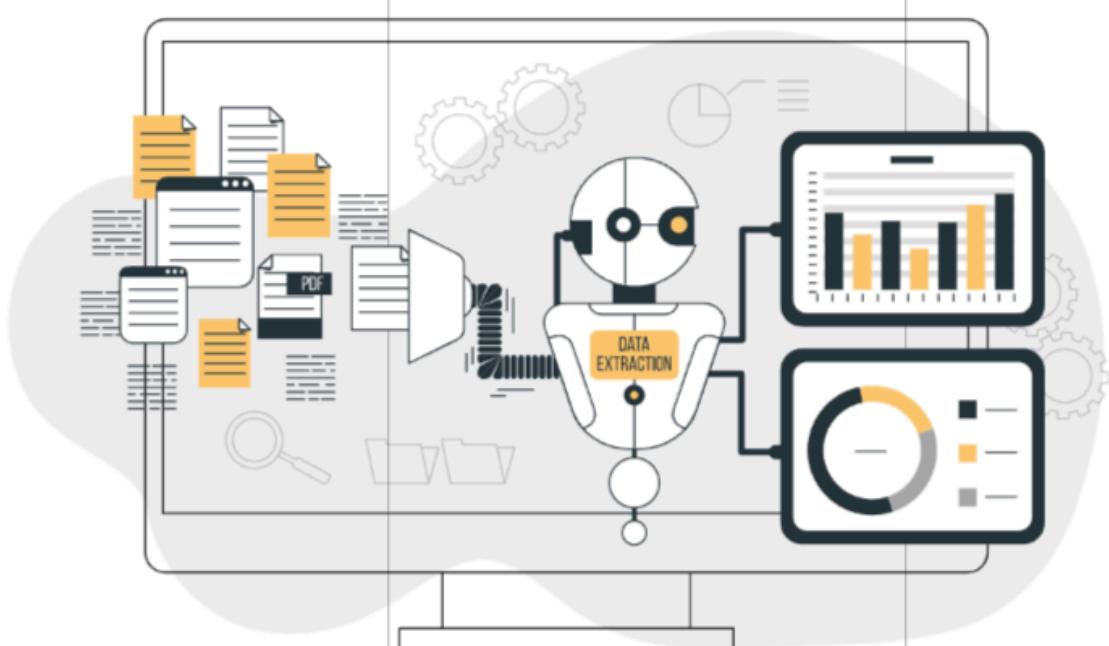
Comparing Accuracy of Machine Learning (ML) and Deep Learning (DL) Models



Comparing Model Performance: Machine Learning vs. Deep Learning

Deep Learning Models, Particularly LSTM, Outperform Machine Learning Models

Models	Accuracy (%)
Machine Learning Models	78.5
Deep Learning Models	92.3



Functionality

Smart contracts facilitate loan proposals, state management, and credit score tracking.

Tools Utilized

MetaMask and Remix are the primary tools employed for smart contract deployment.

Integrating Blockchain for Enhanced Credit Risk Prediction

Streamlining Credit Risk Assessment with Blockchain Technology

Blockchain Integration Insight

The screenshot shows the Remix IDE's deployment interface. It lists a deployed contract named 'CREDITRISKPREDICTION' with a balance of 1 ETH. Below the list are four buttons: 'completeLoan', 'lockLoan', 'proposeLoan', and 'setCreditScore'. The 'proposeLoan' section contains fields for '_creditScore' (set to 750) and Calldata/Parameters, with a 'transact' button. The 'setCreditScore' section contains fields for '_borrower' (set to def1234567890abcdef12345678) and '_creditScore' (set to 750), with a 'transact' button. The 'creditScores' section shows a value of 0x1234567890abcdef12345678! with a 'call' button. At the bottom is a 'currentState' button.

Blockchain Smart Contract Usage

Steps to Use Blockchain Smart Contracts

Efficient Process for Utilizing Blockchain Technology

The screenshot shows the MetaMask wallet interface. It displays a balance of 48.9991ETH and a transaction history. The history includes three confirmed transactions labeled 'Contract i...' with details like 'Confirmed', '-0 ETH', and 'Jun 10, 2024'. A note at the bottom right says 'You may want to cautiously increase the gas limit if the transaction went out of gas.' The interface also includes tabs for Tokens, NFTs, and Activity, along with buttons for Buy & Sell, Swap, Bridge, and Portfolio.

Deploy Contract

Utilize Remix platform to initialize the smart contract for loan proposals.

Propose Loan using

Submit loan requests by invoking the proposeLoan function within the deployed contract.

Lock Loan using

Secure approved loans through the lockLoan function to prevent alterations.

Complete Loan using

Finalize the loan process by executing the completeLoan function within the smart contract.



Enhanced Security

Decentralized data storage ensures robust security measures by storing data across a network of computers rather than a single centralized location, reducing vulnerability to cyber threats.



Improved Transparency

Utilizing an immutable ledger enhances transparency as all transactions are recorded and cannot be altered, providing a clear and trustable record of credit-related activities.



Increased Trust

Automated smart contracts foster trust by executing predefined actions automatically once specific conditions are met, ensuring the integrity and reliability of credit agreements.



Efficient Credit Scoring

Blockchain enables accurate and reliable credit scoring by leveraging transparent and tamper-proof data, leading to more precise assessments and informed decision-making processes.

Blockchain Benefits in Credit Risk Prediction

Benefits of Integrating Blockchain in Credit Risk Prediction

Enhance Security, Transparency, Trust, and Credit Scoring

Future Initiatives

Future Work: Next Steps in Credit Risk Prediction

Advancing Credit Risk Prediction through Future Initiatives



Enhance Predictive Model Accuracy

Implement ensemble methods to further improve the accuracy of predictive models in credit risk assessment.



Explore Advanced DL Architectures

Investigate advanced deep learning architectures such as transformers to enhance the sophistication and accuracy of credit risk prediction models.



Extend Blockchain Applications

Broaden the use of blockchain technology within financial services to enhance security and transparency in credit risk management.



Conduct Empirical Studies

Execute real-world validation studies to assess the practical applicability and effectiveness of the developed credit risk prediction solutions.

