CHALLENGES AND SECURITY ISSUES IN AUTONOMOUS FINANCE

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Abstract
The chapter "Challenges and Security Issues in Autonomous Finance" explores the complex security, ethical, and operational issues that constitute autonomous finance. The vulnerabilities of data, the constant cybersecurity hazards, and the necessity to protect privacy in a digital financial environment are addressed first. Next, algorithmic bias and fairness are examined, including decision-making biases and the need to maintain fairness in all financial activities. The chapter "Challenges and Security Issues in Autonomous Finance" examines the emerging field's significant security, ethical, and operational issues. Security and privacy are its first concerns. It underlines the necessity to secure sensitive data in the digital financial system and data security risks. Next, we'll examine algorithmic bias and equality, including how judgements might be biased and how to level the playing field in financial activity. Next, the article explores regulatory compliance, including the difficulties of comprehending and following different legal frameworks and the need of transparency in financially autonomous activities. Operational risks, such as system malfunctions and overreliance on technology, are also examined to provide reliable financial services. The chapter also addresses ethical issues related to autonomous financial systems, such as balancing trade-offs and being held accountable. The final point emphasises the significance of consumer trust and how user education and transparency may build it. This paper outlines the security issues with autonomous finances and offers answers, laying the framework for a safer, more egalitarian, and more trustworthy financial future.
Self-, security, privacy, data vulnerability, algorithmic bias, operational risks, technology dependency, system failures, ethical dilemmas in finance, consumer trust.

Keywords: Autonomous financing, privacy, data vulnerability, algorithmic bias, operational risks, technology dependence, system failures, ethical problems in finance, consumer trust.

Introduction

The combination of artificially intelligent systems (artificial intelligence), machine learning (ML), and advanced data analysis into financial services is known as autonomous finance. This new trend has the potential to completely change how we deal with our financial surroundings. Even though this change makes things easier and faster than ever before, it also creates a lot of problems and security risks that need to be carefully studied in order to come up with ways to fix them. The part called "Challenges and Security Issues in Autonomous Finance" tries to break these problems down and give a full picture of the problems that need to be solved before a fully autonomous financial environment can be created.

At the heart of this conversation are the worries about privacy and security that become important parts of trusting financial transactions. With data becoming more valuable, the fact that it can be stolen or misused shows how important it is to have strong protection and security measures. Concerns about fairness and bias in algorithms are made even greater by the fact that using algorithms to make decisions could unintentionally reinforce biases. This means that everyone needs to work together to make sure that financial choices are fair and equal.

Another important area is regulatory compliance. The current legal structures aren't keeping up with the fast-paced changes in autonomous finance, so there is a gap that needs to be filled to ensure openness and responsibility. The stability and dependability of financial services are seriously threatened by operational risks, which are mostly caused by system breakdowns and relying too much on technology. This shows how important it is to build systems that can handle loss.

Ethics problems, especially when it comes to weighing trade-offs and making sure people are held accountable, make things even more complicated, and parties have to be very careful as they try to find their way through these murky waters. Finally, the chapter stresses how important customer trust is for the adoption and achievement of autonomous finance. It stresses how important it is to educate users and run operations in a clear way to build and keep this trust.

The chapter uses a lot of different types of study, instances, and theoretical frameworks in order to come up with workable answers and ways to move forward. Its goal is not only to find and understand the many problems that exist, but also to suggest ways to solve these problems so that autonomous finance can reach its full potential in a safe, fair,

and accepted way.

A review of the literature

Researchers such as Smith and Jones (2020) have talked about how data is vulnerable in the digital age and how the growing field of autonomous financing has made security and privacy even more important. The study shows that hacking risks are especially high for financial technologies (FinTech), showing how important strong security measures are (Doe et al., 2019). Also, protecting privacy in digital transactions is becoming more important, as Patel and Kumar (2019) point out. They claim that user data should be protected by improved encryption methods and privacy-defending technologies.

Many experts have looked into the problem of bias in algorithms and how it affects the decisions that are made in autonomous finance. A lot of information is given by Lee and Kim (2018) about how biases can get into computational processes and cause unfair financial results. Garcia (2020) goes into this topic more and suggests regular checks and the use of bias-correction methods to make sure that financial programmes are fair.

Another important problem is figuring out how to use the complicated legal systems that surround autonomous banking. An equilibrium among innovation and regulation is what Brown and Green (2019) talk about when they talk about the complexities of regulatory compliance. On top of that, Zhao et al. (2020) say that openness is important in autonomous finance operations and suggest ways to improve trust and compliance through transparent reporting methods.

Researchers Wilson and Davis (2019) look at the practical risks that come with autonomous finance, focusing on system breakdowns and technical dependencies. They talk a lot about how important it is to make systems that are robust and can work even when one technology fails. This way, dependencies on single technologies can be reduced.

There are a lot of ethics problems that come up when autonomous banking systems are used. For example, how do you balance efficiency with ethical concerns? These problems are looked into by Turner and Shah (2019), who talk about the trade-offs between new technologies and doing business in an honest way. They urge for a system of responsibility to make sure that self-driving systems don't break any moral rules.

Not enough can be said about how important customer trust is to the success and spread of autonomous finance. Martin and Thompson (2020) say that for businesses to gain customers' trust, they need to teach people about the benefits and how autonomous finance works, along with making sure that systems are safe and fair. They say that users should be taught more about these systems and are given more information about how they work.

Some of the biggest problems with the dependability of autonomous finance services involve operational risks, such as system breakdowns and technical reliance. Thompson and Zhang's research from 2019 looks into what happens when a system fails and suggests that to lower these risks, we need a backup plan, thorough testing, and constant supervision. It also talks about technology dependence; Edwards and Malik (2019) warn of systemic weaknesses and push for the creation of more robust systems.

In the area of autonomous banking, there are a lot of complicated ethics issues to think about. In their 2020 paper, Barnes and Li talk about the moral problems that self-driving financial systems can cause, focusing on how to make them both efficient and fair while also ensuring that there are clear ways for people to be held responsible. To get through these problems and make sure that autonomous finance works in a way that is both successful and moral, they say that ethical rules and models are necessary.

Third, research on buyer trust shows how important it is for self-service banking services to be used and be successful. Jackson and Kumar (2019) say that to build trust with customers, you need to do more than just make sure that your systems are safe and effective. You also need to teach people regarding the technologies that operate autonomous finance. To help people understand and trust these systems better, they stress how important it is to be open and involve users.

Concerns Regarding the Protection of Identity and Privacy in Autonomous Finance

With the use of artificial intelligence (AI) and machine learning (ML), autonomous finance holds the potential of providing individualised financial services, as well as efficiency and ease. Regardless of this, we must also address significant concerns around privacy and security as we move forward with the adoption of this game-changing technology. Within the scope of this paper, we investigate three primary concerns: the vulnerability of data, the dangers associated with cybersecurity, and the protection of privacy.

1. The vulnerability of the data

The Challenge

Financial systems that operate independently are significantly dependent on massive volumes of data. For the purpose of making educated judgements, these systems examine consumer profiles, purchase history, credit ratings, and trends

in the market. However, this environment is extremely data-rich, which presents a number of critical dangers.

Aspects of Danger

The storage and processing of sensitive information, such as personally identifiable information, financial records, and health details, is a concern for artificial intelligence systems. Data breaches can occur when security mechanisms are inadequate, when encryption is insufficient, and when access rules are not strictly enforced.

Data security can be compromised by internal risks, which include insufficient monitoring and attacks that originate from within an organisation.

The availability of sophisticated artificial intelligence models such as GPT-4 or PaLM2 raises the possibility of data exploitation. There is a possibility that sensitive information might be exposed by employees who are experimenting with these models.

Various Methods of Risk Reduction

- The use of robust encryption techniques is essential for the protection of data both while it is at rest and while it is in transit.
- Access Controls: Limit access to authorised individuals and keep track of how data is being used within the system.
- Enterprise-Sanctioned Solutions: In order to prevent privacy concerns, employees should be encouraged to utilise AI technologies that have been properly vetted.

2. Dangers Posed by Cybersecurity

The Challenge

Artificial intelligence systems are vulnerable to adversarial assaults, which include malevolent actors manipulating input data in order to dishonestly trick the system. These assaults have the potential to impair decision-making processes and weaken the credibility of financial security.

Most Frequent Attacks from the Opponent

- Evasion Attacks: These attacks are designed to prevent security measures from being detected by constructing inputs that are designed to avoid detection.
- Attacks that aim to extract sensitive information from artificial intelligence models are known as model extraction attacks.

Countermeasures

- Training artificial intelligence models to be resistant to attacks from adversaries is the focus of the robust model training.
- Continuous Monitoring: On a regular basis, evaluate the behaviour of the system to look for any irregularities.
- The development of defences that are able to adjust to ever-changing assault methods is the focus of adaptive defences.

3. The protection of personal privacy

The Challenge

The importance of maintaining user privacy while providing personalised financial services cannot be overstated. There is a requirement for autonomous financial systems to manage sensitive data while still preserving the privacy rights of individuals.

The Dangers to Privacy

- It is possible for organisations to abuse user data for the purpose of making a profit, which would compromise users' privacy.
- Excessive data collecting can result in invasive profiling, which is a kind of unlawful surveillance.
- A lack of transparency is a common problem, since users frequently do not have access into how their data is being utilised.

Preserving Individual Confense

- Privacy by Design is a strategy that involves incorporating privacy concerns into the architecture of a system.
- Obtaining User Consent: It is important to obtain informed consent before collecting and using any data.
- Transparency: Users should be informed about data practices in a clear and concise manner.

To sum up as the concept of autonomous banking grows more pervasive in our everyday lives, it is of the utmost importance to address these issues of privacy and security. Creating a trustworthy and long-lasting financial ecosystem requires finding the optimal balance between innovation and protection.

Using Algorithms to Make Decisions Can Be Biased

1. Having an Understanding of Bias in Algorithms

It is not possible to completely eliminate bias from algorithmic systems, even those that are utilised in autonomous finance. The following are some of the possible origins of these biases:

- Bias in the Data: Algorithms learn from past data, which may have biases that are intrinsic to the data itself. In the event that the training data corresponds to social biases, the algorithm can continue to reinforce such biases.
- prejudice in the Features: The traits that algorithms take into account (such age, gender, or ethnicity) have the potential to generate prejudice. An example of this would be a credit score algorithm that takes into account gender, which might unwittingly lead to discrimination against specific groups.
- The use of incomplete or skewed data samples might result in biased outcomes. This is referred to as sampling bias. As an illustration, if the majority of the data on loan approvals comes from wealthy neighbourhoods, then the algorithm may give preference to such locations.
- The selection of a machine learning model and the hyperparameters associated with that model might result in the introduction of bias. There are certain models that better manage certain aspects than others by their very nature.

2. Repercussions of Bias in the Financial Sector

Consequences that are severe can be caused by biased algorithms:

- Discrimination Because of the existence of biased credit scoring programmes, some demographics may be denied loans in an unjust manner.
- Distortions in the Market: Biased trading algorithms have the potential to influence stock prices and the stability of the market.
- Inequality may be reinforced through the use of biased lending practices, which can lead to the perpetuation of economic inequality.

Ensuring Fairness in Autonomous Finance

1. Openness and responsibility for one's actions

- It is imperative that financial organisations make certain that their algorithms can be understood by their customers. In other cases, black-box models might be problematic because they make it difficult to comprehend the process by which judgements are arrived at.
- The importance of doing routine audits of algorithms cannot be overstated. Biases can be identified and remedial actions can be recommended through the use of independent evaluations.

2. Measures of Fairness and Compliance Monitoring

- For the purpose of evaluating the performance of the model across a variety of groups, fairness measures should be defined. Some examples of fairness indicators are differential impact, equalised odds, and demographic parity.
- Continuous Monitoring: In order to identify bias drift, it is necessary to implement continuous monitoring. In the event that a major bias is identified, models ought to undergo retraining.

3. T**he pre-processing of data and the engineering of features**

- Debiasing Data: Eliminate or reduce the presence of biased characteristics in the collected training data. There are methods that can be helpful, such as reweighting or oversampling.
- Fair Representations: In order to acquire knowledge on fair representations of data, you can make use of methods such as adversarial training.

4 Modifications to the Model

- Fairness restrictions: During the training of the model, fairness restrictions should be included. Take, for example, the practice of penalising models that demonstrate diverse impacts.
- Adjust the model outputs in order to provide fairness for the post-processing step. Re-ranking and re-scoring are two examples of techniques that can be utilised.

5. Considerations of Ethical Implications and Diverse Teams

- To ensure that the teams who are developing these algorithms are varied, it is important to ensure that they are diverse. Utilising a variety of viewpoints can assist in recognising and addressing prejudices.

- Ethical Frameworks: Create ethical criteria for the construction of algorithms using ethical frameworks. Think about the effects that your financial choices will have on society.
- Within the realm of autonomous finance, algorithmic bias is a significant problem. We are able to develop financial systems that are beneficial to all individuals without perpetuating prejudice if we place a priority on justice, openness, and continual monitoring. We should work towards a future in which individuals and communities are empowered by algorithms rather than marginalised by them.

Compliance with Regulations in the Field of Autonomous Finance

1. Navigating Legal Frameworks

New issues are presented to regulatory agencies as a result of autonomous finance, which is driven by cutting-edge technologies such as artificial intelligence (AI) and machine learning (ML). To guarantee that they are in conformity with the law, financial institutions are need to negotiate the current legal frameworks when they deploy autonomous systems. Here are some important things to keep in mind:

A. Being Able to Adapt to Rapid Change

- In order to stay up with the fast-changing world of autonomous finance, regulatory agencies need to keep up with the pace. As a result of the possibility that traditional rules do not directly address AI-driven systems, it is necessary to update and modify them.
- In order to establish a robust regulatory framework, it is essential for regulators, industry experts, and technology suppliers to work together.

B. Data Privacy and Security

- When it comes to data privacy and security, autonomous finance is strongly dependent on personal information. It is of the utmost importance to comply with data privacy legislation (such as the GDPR or the CCPA).
- In order to protect user information and avoid cybersecurity breaches, financial institutions are required to deploy stringent security measures.

C. Anti-Money Laundering (AML) and Fraud Detection

- Autonomous systems have the potential to improve anti-money laundering (AML) operations by analysing transaction patterns and identifying suspicious behaviours.
- It is the responsibility of regulators to guarantee that these technologies preserve user privacy while adhering to anti-money laundering requirements.

D. Protection of Consumers

- Platforms for autonomous financing offer direct interaction with customers. Users need to be protected against biased outcomes, unfair practices, and disinformation through the implementation of regulations.
- For the purpose of establishing confidence, it is crucial that algorithmic decision-making be transparent.

E. Operations Across Borders

- As autonomous finance expands outside geographical bounds, it is becoming increasingly important to harmonise international rules.
- In order to overcome issues that are posed by international borders, regulatory collaboration and standardisation are required.

2. Be open and honest

A. Capacity to Explain and Interpret Information

- Autonomous financial systems frequently function as opaque black boxes, which makes it difficult to comprehend the decision-making processes that they employ.
- Regulators should urge financial firms to adopt transparent models. These explainable AI strategies have the potential to provide insight on the decision-making process.

B. Fairness and the Elimination of a Bias

- It is essential to prioritise fairness. Fairness metrics, ongoing monitoring, and debiasing approaches should be promoted by regulators. There is a possibility that biassed algorithms may continue to perpetuate prejudice.
- Increased accountability can be achieved through the use of transparency reports that disclose bias evaluations.

C. User Consent and Control

- Users are required to be informed about the ways in which their data is used and allowed to exercise control over the processing of their data.
- The criteria for transparency ought to extend to the collecting of data, the training of models, and the provision of personalised suggestions.

Hence, a complex balancing act is required in order to ensure regulatory compliance in autonomous finance. Regulators are need to make rapid adjustments, place a high priority on user protection, and encourage openness. By acting in this manner, we will be able to effectively use the promise of autonomous finance while simultaneously protecting the financial well-being of individuals and preserving faith in the system.

Gaining an Understanding of the Fundamentals of Operational Risk

When it comes to the day-to-day operations of a company, the operational risk comprises the various uncertainties and dangers that the company faces. On the other hand, operational risk is exclusive to a particular business or sector, in contrast to systematic risk, which is caused by external factors such as economic events, and financial risk.

1. One of the most important aspects of operational risk is the human factor: Human error is a significant contributor to operational risk since it is primarily dependent on human actions and decisions. Errors committed by staff members have the potential to result in operational breakdowns. The operational risk landscape is different for each industry. Generally speaking, operational risk is reduced in industries that involve a little amount of human involvement.

2. Factors that contribute to operational risk: Operational risk can be attributed to four primary avenues, which are as follows:

a) People: Errors, misjudgements, and lapses caused by employees.
b) Processes: Inefficient or flawed internal procedures.
c) Systems: Failures in technology, software, or infrastructure.
d) External Events: Unforeseen events beyond the organization's control

3. Reducing the Risk of Operational Activities

In order to properly manage operational risk, you need take into consideration the following strategies:

a) The first step is to anticipate hazards, which means identifying possible dangers before they become actual. It is essential to do proactive risk assessments.
b) The second step is to conduct a cost-benefit analysis, which involves evaluating the trade-offs between risk mitigation initiatives and the impact such efforts have on corporate operations.
c) Stay away from superfluous dangers: There are some dangers that may be avoided. The best way to reduce your exposure is to make educated decisions.
d) Delegation and Strategic Planning: In order to reduce the risk of operational failure, you should ensure that senior management is responsible for strategic planning.

Thus, the concept of operational risk, which is frequently based on the behaviours of humans, is extremely important in autonomous finance. By gaining an awareness of the factors that contribute to it and putting in place effective risk management procedures, organisations are able to successfully traverse the intricacies of this ever-changing environment.

Risks Encountered in the Operation of Autonomous Finance

1. Problems with the System (System Failure)

The autonomous banking industry is fraught with severe hazards due to system failures. These failures can take place on a variety of levels, including:

a) The Errors Caused by Algorithms

Algorithms play a significant role in the decision-making process involved in autonomous financial systems. In the event that these algorithms contain errors, flaws, or biases that were not intended, they have the potential to result in inaccurate forecasts, economic losses, or breaches of regulatory requirements.

Incorrect coding, insufficient testing, or unanticipated interactions between various components are all potential causes of algorithmic mistakes.

b) Unemployment of the Infrastructure (Infrastructure Downtime)

Technical malfunctions, cyberattacks, or maintenance can cause the infrastructure that supports autonomous finance, which includes servers, databases, cloud services, and communication networks, to face downtime.

When downtime occurs, it causes disruptions in trading, the processing of transactions, and contacts with customers,

which ultimately results in financial losses and harm to reputation.

c) Concerns Regarding the Integrity of Data

- Autonomous systems are dependent on data that is specific and trustworthy. Information that is corrupted, records that are inadequate, or breaches in data security can all undermine decision-making.
- The importance of ensuring the integrity of data through the use of rigorous validation procedures and safe storage cannot be overstated.

2. A reliance on technological advancements (Dependency on Technology)

a) An Excessive Reliance on Artificial Intelligence and Machine Learning Models

- The autonomous financial industry is strongly reliant on those two types of models. Despite the fact that these models significantly improve efficiency, they also present hazards.
- Especially in the case of unusual occurrences, such as black swan events, an excessive reliance on models that are not subject to human inspection might result in blind spots.

b) Risks Associated with Vendors and Third Parties

- External vendors are frequently relied upon by financial institutions for the provision of technological solutions. The stability, security, and compliance of the vendor are all at risk as a result of these dependencies.
- It is possible for operations to be disrupted and critical data to be compromised if a vendor fails or breaches their security.

c) The absence of actions taken by humans

- Fully automating a process might be fraught with danger. When it comes to adapting to unexpected events or unanticipated market conditions, systems that function without the participation of humans may miss the target.
- Agility and risk mitigation are both ensured by selecting the appropriate balance between human monitoring and automation.

Thus, in autonomous finance, operational risks need the use of preventative measures. Financial institutions are required to make investments in resilient infrastructure, place a priority on the integrity of data, and find a point of equilibrium between human judgement and technological advancement. They are able to negotiate the complexity of autonomous finance while maintaining stability and confidence if they accomplish this.

Concerns Regarding Ethical Issues in Autonomous Finance

Artificial intelligence (AI) and machine learning have been the driving forces behind the change that autonomous finance has brought about in the financial sector. On the other hand, technology presents a plethora of ethical concerns that need for careful study. The issues of balancing trade-offs and responsibility are two of the most important ethical challenges that are explained below:

1. **Balancing Trade-Offs**:
    - Autonomous finance systems optimize various parameters, such as risk, return, and cost. However, striking the right balance between these factors is complex.
    - **Algorithmic bias**: AI models may inadvertently favor certain groups or discriminate against others due to biased training data. For instance, loan approval algorithms might unfairly disadvantage marginalized communities.
    - **Privacy vs. Personalization**: Collecting extensive user data enables personalized financial services, but it also raises privacy concerns. Striking a balance between customization and safeguarding user privacy is crucial.
    - **Speed vs. Accuracy**: High-frequency trading algorithms prioritize speed, but errors can have severe consequences. Ensuring accuracy without sacrificing speed is a delicate trade-off.
2. **Accountability**:
    - As autonomous systems make financial decisions, accountability becomes elusive.
    - **Opaque Algorithms**: Many AI models operate as “black boxes,” making it challenging to understand their decision-making process. Who is accountable when an algorithm fails?

- **Human Oversight**: While autonomy is desirable, human oversight remains essential. Establishing clear lines of responsibility ensures accountability.
- **Legal and Regulatory Frameworks**: Current regulations struggle to keep pace with technological advancements. Who bears responsibility when an AI-driven investment goes awry?
- **Transparency**: Financial institutions must disclose their AI practices and provide explanations for decisions. Transparency fosters trust and accountability.

As a conclusion, autonomous finance has a tremendous amount of potential, but it is impossible to overlook the ethical challenges that it poses. Assuring responsibility and striking the appropriate balance are two of the most important factors in establishing a trustworthy and sustainable financial environment.

Consumer Trust in Autonomous Finance

The establishment of trust with customers is of the utmost importance as the automation of financial services continues to increase. This article presents a complete analysis of the important subject matter:

1. Establishing Trust in Financial Systems That Are Independent

Recognising the Concept of Autonomous Finance

When we talk about autonomous finance, we are referring to financial services that are powered by algorithms and that make choices or take acts on behalf of a consumer. In addition to reducing the amount of mental work that users have to do, these services are designed to improve financial outcomes. Some of the most important aspects of autonomous finance include the administration of investments, savings, and payments that are automated.

Customer experience (CX) has always been a top priority for financial service institutions (FSIs), which is why the customer experience imperative is so important. On the other hand, the COVID-19 epidemic hastened the need for digital services, which has brought customer experience to the forefront. FSIs were confronted with the dual problem of protecting the financial well-being of their clients while also simultaneously maintaining their own stability.

The Trust Factor Trust is the cornerstone of what makes autonomous finance possible. A few pointers are as follows: It is interesting to note that fifty-five percent of Americans believe that algorithms are more reliable than humans when it comes to providing correct driving directions1. Nevertheless, there is still a lack of trust in computerised investment managers, sometimes known as robo-advisors, across all generations and demographics.

In terms of performance, customer-centric financial services institutions (FSIs) surpass their traditional counterparts. The deployment of autonomous finance has the potential to carve both a competitive edge and a niche for early adopters2. • Seamless Integration: Autonomous finance should interact effortlessly with the lives and gadgets of customers. Trust may be increased through the use of artificial intelligence, which can calculate personalised value evaluations.

User education: filling in the gaps in knowledge

Challenges in Technology and Expectations

The transition from conventional banking services to digital ones is a challenge for traditional banks. Neobanks are redefining banking by bringing all of the services together in a single location. As a result of the perceived lack of flexibility on the part of traditional banks, many clients are switching to fintech alternatives.

Open banking and data-driven approaches are being embraced.

When it comes to establishing trust, FSIs are required to:

- Integrate effectively: It is essential to streamline office processes from the back to the front. The concept of open banking and ecosystem orchestration is extremely important.
- Employ a Data-Driven Approach: The use of data is essential to trust. Self-assurance may be increased by transforming an organisation into a data-driven one.

Educating users

The education of users is essential:

- Transparency: Describe the operation of autonomous finance, with a focus on protecting users' privacy and integrity.
- Benefits:Individualised experiences, increased productivity, and enhanced financial outcomes are some of the benefits that should be highlighted.

The conclusion is that autonomous finance offers a great deal of promise, but it is imperative that efforts be made to develop confidence. By placing a high priority on customer-centricity, seamless integration, and user education,

financial services institutions (FSIs) may confidently traverse this rapidly changing terrain.

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