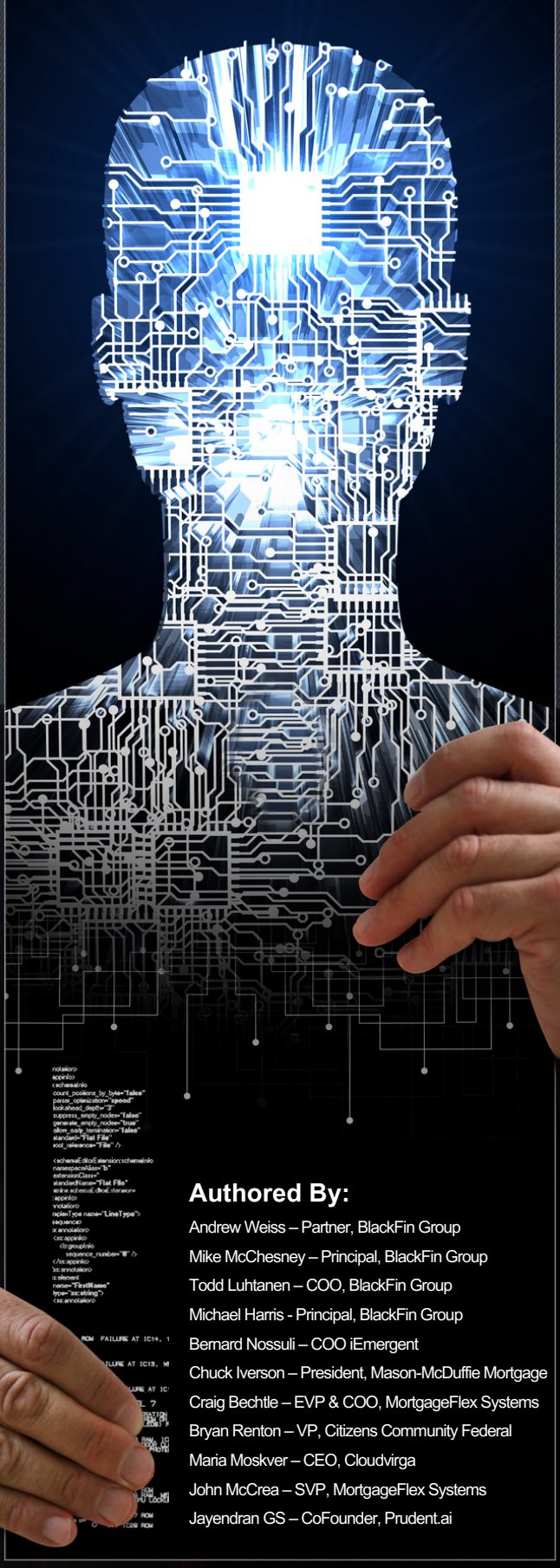
Artificial Intelligence (AI) in Mortgage Banking

White Paper



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EXECUTIVE SUMMARY

Artificial Intelligence (AI) is certainly a hot topic across the world and in the Mortgage Industry. While the base technology has been in existence for decades, recent advances in software and the power of computing hardware has allowed AI to burst into prominence. But what is AI really, are there real benefits to using this technology for the Mortgage Industry, what are the risks, and how should we manage through the complexity? In this paper we will address a definition of AI in the lending context, its potential uses in the Mortgage Industry, potential benefits, possible risks, and proposed guardrails, to inform prospective application of AI for lending.

AI is not a homogenous technology. There are a wide range of types of AI from Generative AI (ChatGPT, for example) through deep learning neural networks to facilitate decision making, to Machine Learning algorithms that can parse and recognize documents. In our view, what distinguishes AI is the ability to address situations that are not precisely like the ones it has previously addressed. There are also technologies that are frequently lumped in with the AI label, rule-based systems for example, that do not fall within the definition of AI. Understanding what the technology is will be the first step in determining its appropriate application.

There are a myriad of potential uses of AI in the Mortgage Industry in each step of the process from a twinkle in the Borrower's eye, throughout the Origination process, onto Servicing, Default Servicing, to Asset sales and disposition. There are three types of applications that are most relevant in our industry:

large data set analysis

document and image processing

customer service and Borrower education

Each of these types have nuanced applications across the Mortgage lifecycle, and may accelerate the process, reduce costs by eliminating manual tasks, and increase business volumes by expanding our reach to new markets.

But achieving these potential benefits is not without material risks. Since so many of the Generative and Machine Learning AI applications are based on consuming historical data, the risk of encoding bad data, redlining for example, is very real. Additionally, the regulatory environment is uncertain, partly driven by this risk. Perhaps the most obvious risk is the potential for a large investment without achieving offsetting benefits, a pattern that the Mortgage Industry has witnessed many times before.

There are strategies that will allow Companies to manage around these risks. Not every Company has the scale to take advantage of AI for each potential application. Certain applications are inherently less risky, and less likely to be a focus for regulatory concern. Recognizing that constructive application of AI will require some specialized management focus will be crucial, both to ensure appropriate implementation and to ensure that the organization and it's customers and partners trusts the technology sufficiently to garner the benefits of speed and labor savings. Furthermore, as many AI uses depend on information to build its models, curation and subsequent auditing of that data will be vital.

AI is hard to ignore, not only because of the intense hype, but also because of its immense potential. By safeguarding that Borrowers are not unfairly disadvantaged, through careful management oversight and thoughtful applications, then the benefits of increased productivity and expanded effectiveness can be truly delivered.

BACKGROUND AND INTRODUCTION

Before we address the opportunities and cautions about the use of AI in mortgage lending, some background and context of the industry is important. Mortgage lending and financial services are heavily regulated, even more so after the financial crisis of 2007-2009. And after the unprecedented low-rate environment during the Covid pandemic, rates rose at a faster pace than in previous mortgage cycles, causing **industry volume to fall 50%** from the 2021 peak. Even with a historically healthy market forecast for 2024 of $1.9 trillion in originations, the industry is struggling to balance capacity to volume, and to achieve profitability.

Industry employment is down roughly 20% and will continue to be driven by the rate environment and its resulting volumes. But a drop in employment totals of that magnitude highlights the industry's historic labor challenge. Employment volatility is a longstanding characteristic of the industry through business cycles dating back to the S&L crisis of the 80's. The industry has historically struggled to ramp up headcount and capacity in rapidly expanding markets (e.g. in 2021, processors making 100k pay and getting sign on bonuses) and has been behind the curve in optimizing capacity and expenses in the downside of the business cycle.

The industry has lacked the level of automation necessary to absorb the rate/volume volatility and has historically responded to cycles by adding labor. The ever-increasing cost to originate loans reflects that fact. Lenders frequently comment on the lack of ROI on technology as costs have risen, even if much of that increase can be attributed an increase in sales compensation. Additionally, the regulatory requirements can lead to a risk averse culture that leads to multiple manual review steps in the origination process and expensive, redundant, non-scalable, error prone processes. Many new technologies have been hyped with great promise to drive efficiency, productivity and decreased cost to originate but in some cases have increased expenses without corresponding productivity benefits. Examples of these hyped technologies have included not fully integrated front end systems, automated document processing, automated underwriting systems (AUS), automated workflow, internet and web based portals and application processing, and e-closing.

Sensitivity to the impact on industry employment has followed the introduction of new technologies in mortgage lending. **Will AUS replace the need for underwriters? Will POS and web based customer portals eliminate the need for LOA's? Have these technologies supported a flexible, responsive business model allowing lenders to rapidly respond to volatile business cycles?** As we consider the future impacts of AI, including on industry employment, this background is important context.

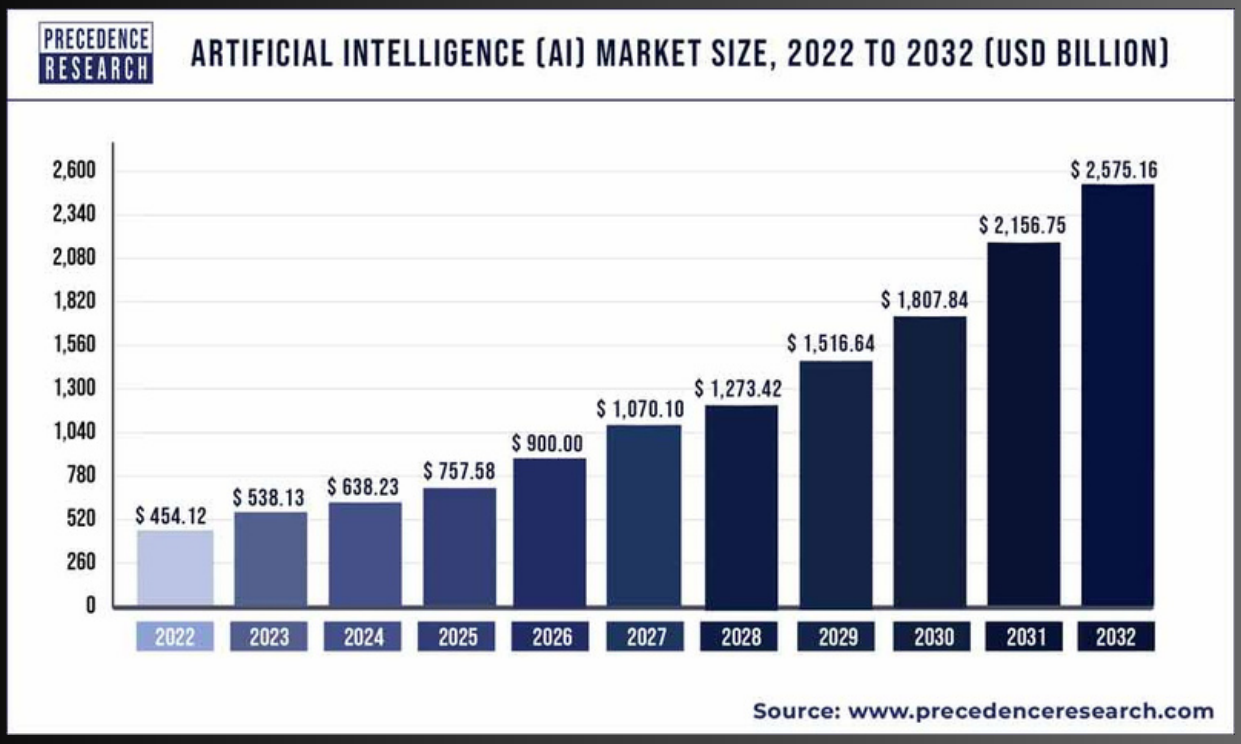
Many forecasters predict that AI will transform the nature of work itself. Some predict that across all industries workers will face possible job replacement and elimination.

> **"Will AI be transformative or will it just be another over-hyped technology?"**

Many of the factors that have hindered automation and technology benefit realization in our industry remain, particularly the regulatory requirements. Yet, we are an industry ripe for disruption, given the lack of automation and the heavy reliance on specialized, costly labor. How will we be impacted by the effects of a rapidly changing set of technologies driving change across everything in our daily lives? An assessment of the impacts on industry employment are beyond the scope of this paper. That being said, while we don't know the answers to these questions today, the industry should prepare to capture the benefits of the possible changes for all players - borrowers, lenders, vendors, investors, and employees before a wave of change overtakes our ability to respond.

The introduction of ChatGPT in November of 2022 brought about a flurry of public interest in a technology that had been around for decades, Artificial Intelligence (AI). Suddenly, everything was AI powered from bifocal prescriptions to critical business decisions. But what is the true impact of the AI revolution on the Mortgage Industry?

An article published by the IMF states: “The money flowing into AI from financial and other enterprises underscores the new priorities. Sales of software, hardware, and services for AI systems will climb 29 percent this year to $166 billion and top $400 billion in 2027, according to International Data Corp. Financial sector spending will more than double to $97 billion in 2027, with a 29 percent compound annual growth rate—the fastest of five major industries—according to the market researcher.” There is little doubt that the impacts of AI technology are and will be pervasive.



Historically despite heavy reliance on technology, the Mortgage Industry has not been at the cutting edge of technological innovation. Will this newfound capability allow our industry to finally take advantage of the powerful capabilities to make originating and servicing mortgages more customer friendly, cheaper to manufacture and service, and deliver more benefits to our collective customers? Or will this be just another “flash in the pan” situation which has the potential to drive up costs without delivering tangible benefits? Will some of the dire scenarios of AI supplanting jobs come to pass? What about the potential dangers presented by a technology that might not be able to be fully accountable for the information it produces or the decisions it renders, and will the mortgage regulatory environment overly burden the acceptance of AI?

These are examples of the kinds of questions the Mortgage Industry Artificial Intelligence Working Group set out to address. By pulling together a cross section of participants in the Mortgage Industry, from Lenders to technology providers to experts in Origination and Servicing, the Working Group is attempting to add frameworks and order to an unpredictable environment with a focus on the practical and actionable.

Our goal is to develop thoughtful and useful guidance for the Mortgage Industry on how to take advantage of the burgeoning AI Technology safely and securely.

To fully address our goal, we recognized the need to delve into the following issues:

Definition: Artificial Intelligence - AI - is an acronym that is being thrown around in the media a lot these days; many people in our industry do not really have a good definition of what AI is to be able to know if it is something relevant to their businesses.

Uses in the Mortgage Industry: The unbounded hype has AI changing everything. Like all technologies, it is most likely that AI will be good for some things, and not for others. Determining the characteristics of a business function in the Mortgage Industry that will be affected, positively or negatively by AI and can be enhanced with AI will be important to define and address.

Benefits: There is no reason to spend the money and intellectual capital on AI unless there are material benefits to the Mortgage Industry. When the Uses in our industry are understood, the benefits can be recognized and the beginnings of a “business case” can be made.

Risks and Necessary Guardrails: AI brings significant risks, including perpetuating negative patterns of the past such as red-lining, risks of not being able to be sure if an AI generated response truly represents your firm, risks of staff using AI instead of following internal procedures, lack of auditing the results as well as risks of a lack of transparency. Guidance on the use of AI in the Mortgage Industry must include the discussion of the guardrails necessary to keep our Customers safe and secure, deliver value to them, and ensure compliance with all regulatory requirements.

DEFINITION AND TYPES OF AI:

It is challenging to develop one encompassing definition of AI. Any workable definition would include the ability for a computer to perform tasks that involve judgment, reasoning, and/or perception, and learning. Computers have long been able to perform repetitive operations following preprogrammed actions or logic. What distinguishes AI is the ability to address situations that are not precisely like ones it has previously addressed; to be able to go beyond what a developer has foreseen the computer will get as an input or produce as an output.

There are six primary types of AI addressed in this document:

1. **Machine learning:** This type of AI involves training an algorithm on a large dataset to recognize patterns and make predictions. It does not rely on predefined rules, but instead learns from the data.

2. **Deep learning:** A subset of machine learning, deep learning involves training neural networks to recognize patterns and make decisions. It is particularly good at handling complex data, such as images or speech.

3. **Natural language processing:** This type of AI enables computers to understand, interpret, and generate human language. It is used in applications such as chatbots, voice assistants, and language translation.

4. **Generative AI:** Complex models that can generate high-quality text, images, or other content based on the data they were trained on. ChatGPT is a leading example of Generative AI.

5. **Expert systems:** Expert systems are AI programs that emulate the decision-making ability of a human expert in a particular domain, such as medicine or finance. They use an ever-changing knowledge base set of facts and rules to make decisions or provide advice. The technology at the core of Expert Systems is the Neural Network - patterned after the way human brains work.

6. **Cognitive computing:** This type of AI is designed to simulate human thought processes, including reasoning, learning, and problem-solving. It is used in applications such as fraud detection and risk assessment.

Many of these broader categories have subcategories that are emerging in various industries but we have chosen to focus on what we see as the most impactful in lending.

There are two technologies sometimes included in the broadest usage of AI that have been excluded because they do not meet the top-level definition:

Rule-based systems

This type of AI is based on a set of predefined rules or logical statements. The system processes the input data according to these rules to produce the output. There is an explicit outcome based solely on the executed logic and every possible outcome is predetermined.

Robotics involves creating machines that can perform tasks autonomously, using sensors and actuators to interact with the physical world. There are also software based Robots that perform tasks as if a human were entering commands. In both the case of Rule-based systems and Robotics the inputs, actions, and outputs are predetermined, based on a known set of logic, albeit a potentially very complex set of logic.

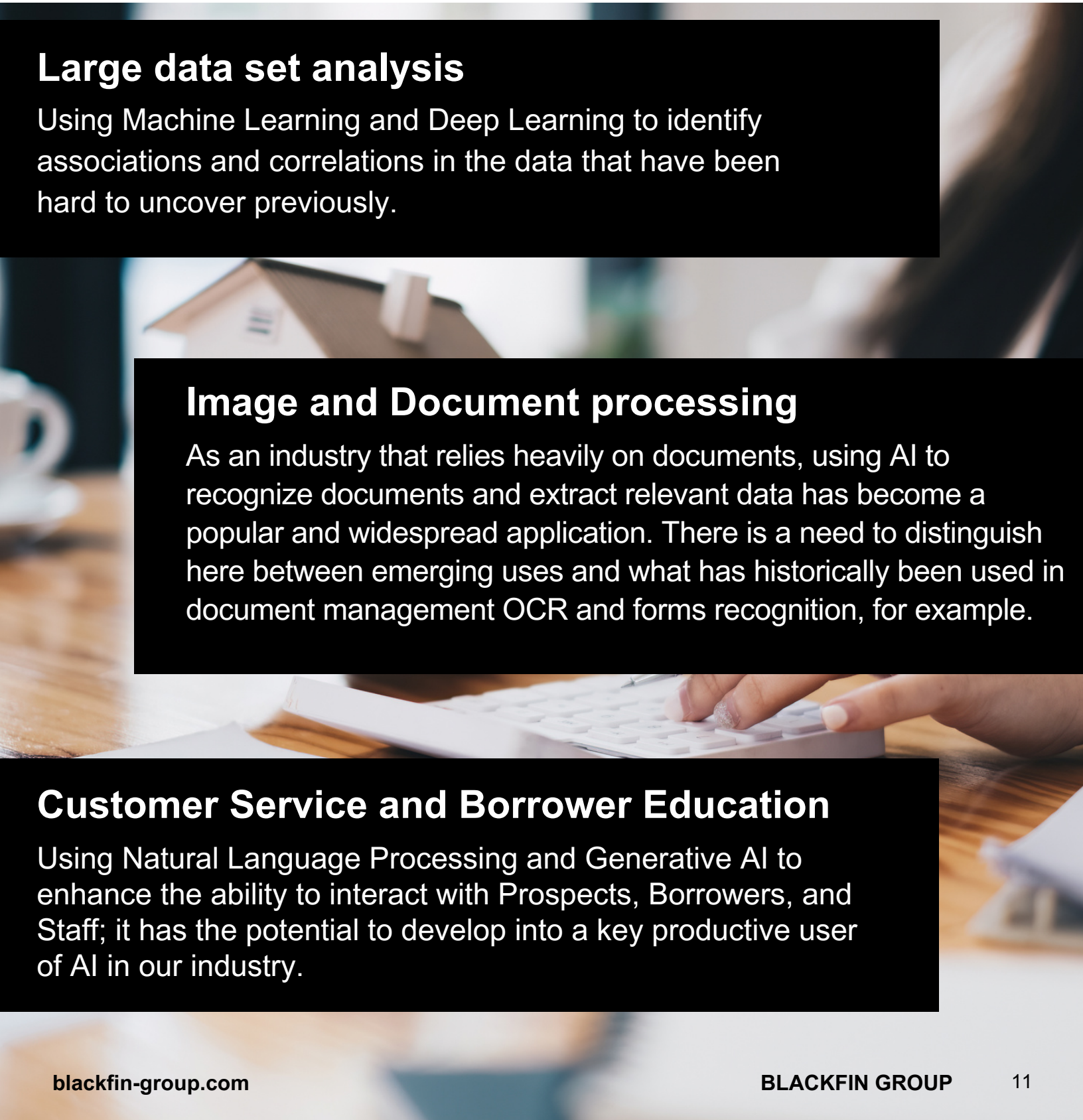
Robotic process automation

The marketing of AI and technology in mortgage has frequently clouded what really is (or is not) AI; every technology company is trying to catch the AI wave. This does not mean that those technologies are inappropriate for the Mortgage Industry or inherently of less value than those that are truly enabled with AI, it is simply that the scope of this document focuses on AI and applications that truly use that technology. Because of the hype around AI, and the fact that many technology providers feel the need to be AI enabled, we have focused some of our effort on distinguishing between the hype and the reality of emerging AI technology.

USES OF AI IN THE MORTGAGE INDUSTRY

It is evident that there are productive uses for AI in the Mortgage Industry; some AI technology is already in use today. To examine the full set of uses the full lifecycle of the industry serves as a framework - from sourcing potential Borrowers to Servicing them, potentially Default Servicing, onto Asset sales and disposition.

There are a few overarching uses that continue to emerge across the whole lifecycle:



Large data set analysis

Using Machine Learning and Deep Learning to identify associations and correlations in the data that have been hard to uncover previously.

Image and Document processing

As an industry that relies heavily on documents, using AI to recognize documents and extract relevant data has become a popular and widespread application. There is a need to distinguish here between emerging uses and what has historically been used in document management OCR and forms recognition, for example.

Customer Service and Borrower Education

Using Natural Language Processing and Generative AI to enhance the ability to interact with Prospects, Borrowers, and Staff; it has the potential to develop into a key productive user of AI in our industry.

SPECIFIC USE CASES FOR AI IN MORTGAGE

Sourcing Prospects	• Analysis of prospective borrower data - Scouring large data sets for patterns, for example:
	  ◦ Average time in a home
	  ◦ New business entrants in a geography
	  ◦ Identify movers, renters, shoppers, life events
	  ◦ Identify race based on name only
	• Can be used to create access and demonstrate fairness vs bias
	• Identify underserved and underbanked
	• Non traditional credit scoring and income/asset analysis
	• Use of large data sets on regional or national scope
	• Pattern recognition of new elements to identify likelihood to borrow

Loan Officer/ Sale Management - From prospecting to Intent to Proceed	• Analysis of servicing portfolio and life milestones
	  ◦ Generate leads from this data
	  ◦ Combine Servicing data with market and economic data
	  ◦ Scoring of borrower intent based on historical patterns
	• Financial literacy using Natural Language Processing/GPT
	• Income analysis and prequal/preapproval
	• Document and asset management and document to data process

Processing/ Underwriting/ Closing/ Post closing	• Document management and document to data process • Customer support and communication done by back office • Neighborhood Lending Partners (NLP) • Valuations/Property data and trends. Appraisal process • Compliance Validation in Underwriting • Straight Through Processing for low risk loans and fraud detection ◦ Fraud pattern detection (risk scoring) • Deal structuring for qualifying loans that would otherwise be declined • Borrower credit analysis rework/rehabilitation
Compliance:	• Tie AI into document vendors for data recognition • Common compliance engine that includes investor and regulatory requirements • Portfolio compliance analysis and reporting • Fraud detection
Closing and Settlement	• Post-close audit and document analysis – including Investor rules. Prediction of cure times for sellable loans • Best execution modeling
Servicing	• Portfolio – retention and protection pattern recognition • Interactive Voice Response Chatbots – leveraging Large Language Models • Managing Compliance rules • Loss mitigation best next action and outcomes

BENEFITS OF USING AI

The benefits of AI technology can be significant. Generally speaking, there are three classes of benefits from AI technology: efficiency – reducing the cost to manufacture and/or service a Mortgage loan, effectiveness – allowing the technology to do things that are not practical or potentially even possible for humans or other technologies to do, and innovation-changing the fundamental structure or process for manufacturing and/or servicing Mortgages. While there is significant potential for AI to make the Mortgage Industry more efficient and effective, there is little evidence so far that AI can fundamentally transform our industry in the next 5-10 years - there are too many structural and regulatory impediments for that to be the case.

When the focus is efficiency, AI based applications can reduce the manual labor required to manufacture a loan by automating functions like document processing and data extraction, automating complex processes like income analyses, and supporting post-closing. Furthermore, using Natural Language capabilities to better train existing staff, communicating with Borrowers, extending the reach of Loan Processors and/or Customer Service Agents, and supporting Financial Literacy are all examples that have significant potential for productivity and Customer Satisfaction improvements.

It should be noted that for productivity gains to be achieved, AI applications must be trusted; there is no benefit in having an AI based system extract the data from Bank Statements only to have a processor redo the same process manually, for example. It is uncertain whether AI can reduce the need for staff, but the ability to provide better service and/or support more volume with current staffing levels seems likely.

AI driven large scale data analysis can detect patterns and opportunities unlikely to be found through traditional means, yielding more effective operations. Sourcing prospects by combining data from across multiple sources for new insights is one example. This must be done carefully, as described in the Risks and Guardrails section that follows, but the potential for identifying underserved targets and non-traditional borrowers is significant. Additionally, implementing AI to review an institution's operational data and identify opportunities for process improvement is another potential use. As AI begins to proliferate, there will be more and more examples of large-scale data analysis applications.

RISKS AND GUARDRAILS

There are real risks with the unguarded application of AI into the Mortgage Industry. There is significant potential for unintended consequences primarily around two issues: First, if an AI based application produces a result that cannot be traced or explained it may expose the Lender and/or Servicer to regulatory and reputational risk. Second, particularly in the case of Machine Learning based systems, the information used to train the system can contain inappropriate practices such as discriminatory lending that can then be perpetuated by the AI based application.

Systems that are focused on automating critical decisions like Underwriting have tended to be based on known sets of rules (rather than AI derived patterns) and therefore any decision rendered can be traced back to the logic that delivered that decision. Not only does that provide transparency for Borrowers, Lenders, and Regulators but it allows the rules to be changed as business needs and regulations change. There is a significant risk that AI based systems that derive decisions from patterns of data cannot articulate the precise basis for a given decision rather than pointing to the patterns contained in the data used to train the system. The resulting lack of transparency can potentially open the Lender or Servicer up to unwanted litigation and regulatory scrutiny.

Since systems that are based on Machine Learning algorithms are, by definition, only as good as the data they learn from, there is a risk of "learning" bad habits if the data they are trained on contains those bad habits. An obvious example could be Redlining; if Machine Learning based systems are tasked with finding good prospects, and past "good" prospects have been mostly Caucasian upper middle-class borrowers with high credit those are likely to be the kinds of borrowers identified to the disadvantage of other classes of prospects. This type of scenario can be imagined in several applications of AI - from Credit and Income analysis to default Servicing workout plans. Significant examples of this phenomenon have been identified in non-Mortgage applications particularly where ChatGPT has provided answers to questions based on misinformation because of those falsehoods' prevalence on the Internet in general. Also, the fact that people trust AI because it was generated by technology when it may in fact be completely inaccurate complicates the ability to judge if the AI is disadvantaging certain segments of the population.

Additionally, the Regulatory landscape for AI is uncertain at this time. The host of Local, State, and Federal regulatory bodies that are concerned with how AI might negatively affect Borrowers is immense, but they are struggling with the issues outlined above. In many cases they may lack the required technical expertise and experience to understand and properly manage the rapidly emerging uses of this technology because it is changing so rapidly. The Mortgage Industry is used to grappling with new Regulations (rarely happily), but uncertainty around future constraints should drive sensible caution in implementing AI based applications.

PRACTICAL STEPS FOR MOVING FORWARD

So, before implementing AI based systems, Lenders and Servicers need to implement safety measures that allow the benefits of these systems to be realized. Many of the Guardrails needed are an extension of common sense and good Information Technology (IT) governance, and as such will not be foreign to most institutions.

First,

AI systems should not be the province of individuals, but rather under the control of Corporate IT or Risk Management, in partnership with Compliance/Legal. Having a Loan Officer independently use ChatGPT to create marketing documents or Proposals to prospects could represent significant risk to the Lender, while using the same tools in an environment where they can be checked and approved can increase productivity without adding risk.

Secondly,

Carefully curating the data used to train AI systems can prevent the “Redlining” phenomenon described above. If the data used for Machine Learning is known to contain good practices, the applications that use those applications will propagate those good practices. This curation will be an ongoing issue, not something done once and put on a shelf; much of the power of the systems will be derived from their ability to respond to changes in the business environment without requiring the costly and time consuming traditional systems development process, but that benefit will require constant attention and review of the information fed to the AI based system. This evolving and growing curated data must be continuously back tested to ensure that bias isn’t inadvertently introduced.

Third,

There are applications of AI technology that are inherently safer than others. A common use today is document processing, extracting data from documents, and learning new document and data types as the engine is trained over time; there is very little risk to the business as long as the application has been tested to be sufficiently accurate and has provisions for human intervention when the system is unsure (as most of the current vendor offerings do today). Additionally, using Natural language Processing (and translation) to support Customer Service and add efficiency to Customer facing jobs such as Processors, as long as the data sets the applications are working against are appropriately curated. Additionally, using AI driven large scale data analysis can be powerful when in the hands of experts who understand the risk and power of the technology, but the institution must be cognizant of the skills required and be willing to hire and train skilled individuals.

There are tools and practices available to help manage some of the risks of AI. These tools are extensions of good IT practices and testing techniques that have been specialized for AI, including cross validation of results based on known training data and data from multiple sources, analysis of the distribution of results to identify outliers, development of a fixed set of test cases – many of which push the limits of the original intent for the system – to evaluate the systems' response. It must be recognized that these techniques are not cheap, easy, or fast, and Lenders and Servicers will be held accountable by regulators for any failure to use these (or other) safeguards even when the AI powered applications have been supplied by a Vendor.

Additionally, new roles will emerge with the inclusion of AI into the Mortgage Industry's technology landscape, specifically a Lender/Servicer's responsibility for the Governance and Ethics of the AI applications. These roles may be similar to roles present today in many Risk Management organizations, but with so many features and functionalities of AI, it will make these roles even more challenging and significant. The skill sets and experience may also require new organizational models and controls. Every organization will need to assess its own capabilities to add these new skills and roles.

Given the somewhat constrained safe uses of AI and the need for the guardrails listed above, the scale of its use becomes a critical consideration. AI shines when there is volume and becomes very expensive at a small scale. Choosing a Vendor who can demonstrate that they have appropriately constructed and tested their AI models is imperative, but AI usage is the Lender/Servicers' responsibility. The overhead needed to appropriately manage AI along with the fact that this management cannot be readily outsourced to a Vendor reinforces the need for scale to maximize the benefits of AI.

CONCLUSION

AI is much like many technology innovations that have come our way; it has a lot of promise, it can be expensive, it has significant risks, and the hype around it has made it harder to distinguish reality from marketing. All of that is to say that we, as an industry, must carefully evaluate and manage our use of AI, focus on deriving the benefits while avoiding potentially catastrophic risks.

AI is not a homogenous technology – different techniques lend themselves to different applications. AI has the potential to materially improve productivity, especially when used at scale. Furthermore, as our industry expands its access to electronic data on Prospects and Borrowers, AI has the potential, when used correctly, to deliver new insights, and expand our reach into new markets, and achieve our industry's goal of expanding homeownership opportunities.

But, there are real risks inherent in a technology that addresses situations that are not precisely like ones it has previously addressed. There is the ever-present risk that the cost of implementing this new technology will not yield sufficient benefits, there is material reputational and legal risk, and there is the potential regulatory risk.

The one element that may distinguish AI from the other technologies that have been offered to the Mortgage Industry is the speed at which it has recently developed and the incredible increase in its power. AI is hard to ignore, not only because of the intense hype, but also because of its immense potential. By ensuring Borrowers are not unfairly disadvantaged, through careful management oversight and thoughtful applications, then the benefits of increased productivity, expanded effectiveness, and improved stakeholder experience can be truly delivered.