

# AI + Blockchain can be the one-two punch in a lights-out digital mortgage

by

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## Abstract

Artificial Intelligence (AI) and blockchain are two of the most groundbreaking technologies of our era, with AI reshaping our understanding of cognition and problem-solving, and blockchain revolutionizing our perspectives on money, ownership, and value. Both are increasingly intertwining in our daily lives, despite being in their early phases of widespread adoption

An emerging area of innovation looks to take advantage of the best of what these technologies can offer, combining attributes of both AI & blockchain. While AI brings automation, sophisticated predictive analytics, and generative content abilities, there is a lack of transparency - outputs cannot be blindly trusted. That's where blockchain comes in: offering truth, transparency and data provenance.

In this paper, we offer a high-level view on what these two technologies do well independently, and where they could be even better *together*. While the AI and blockchain developer communities have generally been isolated from one another, we see the ability for the tools to complement each other and offer a more complete solution for the mortgage industry. We are still grappling with these ideas ourselves, and our hope is that by offering an initial view on this subject we will spark even more creativity to drive our industry forward.

## Mortgage Technology - Recap of Known Frictions

Within the mortgage industry, there are four well-known frictions that create opportunity:

1) **Disparate Data Sets:** Numerous technology components and data sets aid the movement of a mortgage loan asset through the production & servicing business processes – CRM systems, Point-of-Sale systems (POS), Loan Origination (LOS), fulfillment Systems and more.

2) **Disparate Transaction Systems:** Typically, the same transaction data for a loan being funded is entered/managed in multiple systems across counterparties in a highly intermediated ecosystem.

3) **The “checker checking the checker” problem:** Data verification and due diligence is a vital component of the mortgage ecosystem yet is highly manual and expensive.

4) **Paper:** The mortgage industry continues to be a paper-based industry, with ~90% of mortgages originating with paper promissory notes despite more than 20 years of push to adopt electronic documents.

These four frictions can be addressed by leveraging AI and blockchain tools as a one-two punch. Together, they jointly have the potential to reduce discrepancies between disparate data sets and transaction systems (1 and 2), automate the validation of borrower information and disseminate the information securely to relevant parties (3), and eliminate the need for paper entirely (4), delivering that ever-elusive digital mortgage

## Artificial Intelligence

Google defines Artificial Intelligence as *“a field of science concerned with building computers and machines that can reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze”*.

Artificial intelligence has been making steady inroads into the mortgage industry keeping with broader financial services adoption. In the mid-late 1990s we saw a proliferation of knowledge-based expert systems form the foundation of many of our automated underwriting systems (Desktop Underwriter, for example).

Over the past decade, breakthrough innovations in AI, especially in machine learning use-cases like vision, language and voice were enabled by the availability of enormous amounts of digitized data, and the computing power to harness that data.

While there has been tremendous progress, we have significant work ahead of us in terms of governance, compliance, and oversight to get it right and scale it in a way that drives a positive impact in our industry.

Some of the more common use-cases of AI in our industry are in the following areas:

- Chatbots for customer service
- Doc and image recognition & process automation
- Task / Workflow automation
- Advanced data & analytics and marketing
- Fraud prevention

- Content Generation for marketing

## Blockchain

Blockchain is newer, relative to AI, and has not yet been adopted at scale by any of the largest mortgage players. In fact, many in our industry flippantly refer to blockchain as “a solution looking for a problem.” But this reductive phrase ignores the fact that the basic underlying components of blockchain tech are being rapidly embraced by the mortgage industry. Simply defined, *Blockchain is a secure database shared across a network of participants, where up-to-date information is available to all participants at the same time (McKinsey).*

MIT Sloan unpacks this powerful concept as follows: *On a blockchain, transactions are recorded chronologically, forming an immutable chain, and can be private or anonymous depending on how the technology is implemented. The ledger is distributed across many participants in the network — it doesn't exist in one place. Instead, copies exist and are simultaneously updated with every fully participating node in the ecosystem.*

Considering the mortgage industry, where, on a given loan there are 10-15 individuals managing 16-20 data sets, 100+ documents, within 20-30 technology systems, across numerous counterparties wiring funds back and forth - the mortgage value chain is ideal for a blockchain-like solution.

But unlike artificial intelligence, blockchain technology has not yet become embedded in the mortgage lifecycle (or our daily lives). Broadly, the most visible use case is cryptocurrency, and, with recent high-profile crypto company meltdowns and negative commentary by regulators, the underlying technology itself seems to have been unfairly perceived as “guilty by association”.

Once you get past the hype, the function of a blockchain is simple: it tracks ownership and value in real time, in a way that is secure, in a disintermediated fashion. And smart contract code creates what is essentially “programmable money.” In financial services, where every participant in a transaction collects a fee, the elimination of intermediaries and real-time settlement of a blockchain solution has the potential to reduce the cost to transact dramatically. Early adopters in space are already finding ways to leverage blockchain to do just that.

Use cases for the mortgage industry:

- Simple tracking of ownership of a tokenized asset such as a mortgage
- Real-time settlement in an exchange of value between two or more parties
- Permissioned access to real-time servicing data

- Holistic digital assets where the entire loan documents, data and ownership are accessible to all parties with interest in the loan

## Where can AI + blockchain best deliver?

### **Two-pronged approach to borrower data validation**

- While AI can identify workflow exceptions in near-real-time, blockchain can help validate and fetch/store underlying data to resolve exceptions instantly. With income calculations for example, AI can help speed-up the process of reading, harvesting and computing income from paystubs, tax returns and more. Then blockchain tools can quickly confirm the underlying sources as being authentic – delivering a one-two efficiency punch for our industry. This validated package of data can then be associated with a tokenized electronic mortgage record which can be passed (on a blockchain) to permissioned parties such as a warehouse lender or an investor in the asset, in an instantaneous fashion. This would enable a truly end-to-end fully digital process (zero paper) and would reduce the time for a loan package to make its way through the secondary market, from weeks down to seconds in real time.

### **Where AI generates Deep Fakes, Blockchain validates authenticity**

- A growing concern with respect to AI is the proliferation of deep fakes, and IP theft. AI-detection software and watermarking exist today as tools, but they are considered unreliable, and it is exceedingly difficult to figure out whether or not material was generated by artificial intelligence or by a human. Blockchain technology, with its roots in data provenance and proofs is a great solution-set for AI practitioners worried about deep fakes and IP theft. As it becomes even easier to “fake” documents and data with newer AI tools, we expect data provenance to become even more important.

The mortgage industry already is familiar with this use case, using “tamper evident seals” on documents like eNotes. We expect other use cases, for example, appraisal images or property inspection images used in AVMs could be stamped with a cryptographic seal and stored as an asset on a blockchain, which could be securely accessed by an approved participant in the network.

### **KYC / AML Use-Cases**

- For regulated financial services entities, a risk of using decentralized finance (DeFi) systems is the anonymity of actors: how does one conduct KYC checks in a public, permissionless

blockchain system, for example, where anyone can join? AI excels at finding abnormal patterns in what seems to be normal data. AI can complement DeFi systems in helping flag financial malfeasance exploiting blockchain anonymity (sources of funds for example). AI can also help bridge and trace blockchain user activity with other data sources in triangulating potential identity issues.

### **Mitigate AI data and model transparency issues**

- AI models in general, and Deep learning models in particular require substantial amounts of training and testing data. These data sources can be hard to manage, due to inherent volatility, poor tagging and labeling and consequently potential loss of traceability. Blockchain can help track ML data sets & models more efficiently by creating unique digital fingerprints for each iteration of the data set and the algorithm and enabling immutable and audit ready model governance artifacts. Similarly, model contributors that publish multiple model versions may experience the same issues with tagging, model version management etc., which amplify transparency issues with machine learning models. Blockchain can help with the necessary tracking & tracing of data sets used to build the models, as well as track the models themselves on what version/iteration of a model was built on exact sets of data – greatly improving replay/rebuild reliability necessary for validation

### **Accelerate Responsible AI Model Development**

- Developing high quality AI models requires high quality data. Blockchain's strengths with managing data (and by extension, models) can help create better AI model development platforms that can be shared across collaborators. Certified data sets by agencies or regulators can be published on a blockchain – and accelerate responsible AI innovation.

### **Blockchain efficiency & optimization use-cases**

- AI (like neural network-based machine learning) could also be used to optimize node-level behaviors of a blockchain. In many blockchain implementations – each node is supposed to independently carry a complete copy of the collective ledger....and each node independently validates effects of changes to the ledger. This pattern is at the core of the computational and resource complexity typically attributed to blockchain. There is work out there that looks for AI to “optimize” what needs to be stored at a node – and do so intelligently (8).

## Downsides: Could AI + blockchain together hurt us?

While this paper outlines potential benefits of leveraging AI and blockchain, it is worth also pointing out that these two technologies could work together to cause harm. For example, in the yet to be determined future, could these two technologies lead to the creation of fully artificial and synthetic identities, assets and other artifacts that could threaten our financial infrastructure?

And both technologies have been criticized for being resource intensive. Bitcoin has been a frequent target of climate activists, particularly because of the computationally intensive mining that has a negative energy impact on the environment (many other blockchains are highly energy efficient). AI, with a large reliance on hard-to-find GPUs, has also come under some criticism for being resource intensive. Moving forward, as technology evolves, we will see more environmentally friendly iterations of this solution set.

## Conclusion

Fragmented solutions, un-interoperable platforms and non-standard/proprietary data exchanges are the barnacles created in our industry's journey towards digitization and truly impede our ability to achieve a lights-out digital mortgage. Every participant in the mortgage production and servicing supply-chain has audits and put-back risks needing checkers-checking-checkers. AI offers intelligent automation, inline recognition and reconciliation of data and exception-based workflows. Blockchain compliments AI with better lineage, provenance and truth. This is a one-two punch. Stay engaged, test, learn and iterate!

## Stay Engaged

Our industry will continue to see substantive developments in AI and Blockchain applications. The best way for us to stay abreast of where these technologies can create value, and how best to watch out for pitfalls, is to stay engaged. MISMO and MBA are great resources for our industry to look towards. Through their Communities of Practice, whitepapers, webinars, and events like the AI Forum at the Fall MISMO 2023 Summit and more, these member-led organizations bring the latest thinking in AI and Blockchain to the fore and can be valuable in guiding your exploration and investments in these impactful technologies.

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## About the authors

**Prabhakar “PB” Bhogaraju** has over 20 years of mortgage technology and consulting experience. PB is head of strategy for FinLocker LLC, a consumer home readiness data and analytics platform. Prior to his time at FinLocker, PB held multiple executive leadership positions in product development, data management, and digital business architecture at Fannie Mae. PB is an author and speaker in various industry forums on emerging technology applications for our industry. He founded an emerging technology advisory firm ALE-Advisors, and currently advises several mortgage industry firms on their technology strategy and digital transformation initiatives. PB is a member of the Board of Advisors for the Research Institute for Housing America and Chair of the Certified Mortgage Bankers Technology Committee of the Mortgage Bankers Association.

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Leah is a Senior Advisor of [MISMO](#), leads MISMO’s Emerging Technology Community of Practice, and is a frequent speaker at MISMO, MBA and other mortgage industry events. Leah received her BA from Georgetown University and MBA from New York University’s Stern School of Business.

**Brian Stucky** is a recognized thought leader in decision management and brings three decades of experience designing and implementing business rules and process management systems for both commercial and Federal clients. He has implemented and managed business rule development efforts in a variety of domains including the secondary mortgage market, credit card marketing and processing, mutual fund portfolio analysis, insurance underwriting and risk management, and for various Federal civilian agencies.

In addition, Brian is now in his sixth year as co-chairman of the Mortgage Industry Standards and Maintenance Organization (MISMO) Decision Modeling Community of Practice. His efforts there have resulted in completing the Decision Model and Notation (DMN) standard as an official mortgage industry standard. He also took part in MISMO’s Future State initiative. In January 2021 Brian began serving a two-year term on MISMO’s Residential Governance Committee.

Brian's focus is now on ethical and responsible artificial intelligence for automated decision systems.

***PB, Leah and Brian have been collaborators on a number of emerging technology related topics in our industry. They enjoy working with each other, grappling with hard questions together, and bringing clarity to the chaos that often swirls around emerging technologies and innovation.***