Artificial Intelligence: Implementing the AI Toolkit Into Internal Audit

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Artificial Intelligence & Machine Learning Are Changing the World

#ShiftHappens
AI is neither good nor evil. It’s a tool.
It’s a technology for us to use.

Oren Etzioni
CEO Allen Institute for AI

“The field of artificial intelligence is pushing new boundaries.”
Judy Woodruff
Current Tools and Methodologies are Ineffective

- 43% Fraud caught by mistakes and tips
- 3% Fraud caught by analytics
- Median months to detect fraud: 14

Source: ACFE, 2020
AI Mission: Uncover Errors & Anomalies in Data

“Known” vs. Unknown”

Rules Based Analytic Solutions
What we see & know
~$200B annually

AI / Machine Learning
Financial loss due to human error or by intent is surging is
~$4T annually

Source: Association of Certified Fraud Examiners (ACFE), Institute of Internal Auditors (IIA)
Every day we create 2.5 quintillion bytes of data \((10^{18})\)

90% of the world’s data was created in the last 2 years

The current trend indicates data is doubling every 18 months

Leveraging this data is a big problem…

because the only people who can surf this wave are known as data scientists…which CPAs are not.
It’s All The Buzz….

<table>
<thead>
<tr>
<th>56%</th>
<th>66%</th>
<th>14%</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>of IA leaders believe technology adoption impacts IA’s value to the organization</td>
<td>of IA leaders view missing risks as a top risk of not improving technology</td>
<td>Of respondents are categorized as “Evolvers” who are advanced in technology adoption</td>
<td>of Evolvers are considered to be providing significant value to the organization.</td>
</tr>
</tbody>
</table>

IA evolvers are a minority…
Only 14% are advanced in their technology adoption.

- 14% = Evolvers are advanced in their technology adoption.
- 46% = Followers are taking notice and following the Evolvers’ technology adoption—but at a slower pace.
- 37% = Observers have basic or no technology use.

Source: PWC 2018  State of the Internal Audit Profession Study
It’s All The Buzz....

Source: PWC 2019  State of the Internal Audit Profession Study
Polling Question

• Is your Credit Union using AI to assist in your auditing of large populations of data?

• A - Yes
• B - No
Artificial Intelligence

• Delivers:
  • Automated data ingestion
  • Complete data analysis (100% coverage) with AI
  • Improved detection effectiveness
  • High assurance
Artificial Intelligence Auditor: Overview

- Analysis of 100% of transactional data (G/L, AR & A/P, Payroll, Operating Expenses, Loan portfolio origination).
- Transforms IA professionals into an advisor
- Explainable AI to deliver understanding of "why"
- Over 50 algorithms, statistical models and business rules direct targeted
Artificial Intelligence Auditor

- Uses artificial intelligence AND machine learning.
- Purposely built for audit use and exceeding standards.
- An extensible AI platform to support audit & assurance, forensics, and advisory services.
- Detects anomalies, irregularities, and outliers in financial data that are missed with the human eye or a rules-based analytics solution.
- Speed, ease of use, granularity, and completeness
- Greater insight, cost savings, and assurance

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What is Machine Learning?

“Machine learning (ML) is a type of artificial intelligence (AI) that allows software applications to become more accurate in predicting outcomes without being explicitly programmed”

<table>
<thead>
<tr>
<th>Supervised Learning</th>
<th>Unsupervised Learning</th>
<th>Reinforced Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human expert feeds the computer with training data. From that data the computer should learn the pattern.</td>
<td>No expert input, the computer identifies pattern in data and looks for outliers. Particularly useful where the human expert doesn’t know what to look for.</td>
<td>Reinforced learning algorithm continuously learns from the environment in an iterative fashion.</td>
</tr>
</tbody>
</table>

https://searchenterpriseai.techtarget.com/definition/machine-learning-ML
Building a Competitive Advantage / Controlling Costs

• Artificial Intelligence
  • Purpose-built platform for detecting anomalies on financial data with analysis on 100% of the dataset(s)
  • Leverages Machine Learning/AI along with business rules & statistical methodologies
  • Enables financial professionals to move up the value chain & become or continue as advisors
For Internal Auditors

• Analyze financial anomalies by using the latest technology advancements in data science and machine learning AI.

• Enhance the auditor’s capacity to ingest, process and analyze financial data (thousands/millions of transactions) empowering risk professionals with faster results and deeper insights to identify and perform an audit with a greater level of assurance.
Augmenting Internal Auditing With Machine Learning AI

Risk Based Scoring of Every Transaction

- **Domain Expertise & Business Rules**
  - Integrity tests, fraud framework, standard fraud analytics

- **Statistical Methods**
  - Benford’s law, regression, 3-digit testing

- **Machine Learning**
  - Humint Scoring, SOS, rarity, outlier detection, reinforced learning

- **Cross Correlation**
  - Sanction Lists, Credit Databases, proprietary negative database

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Critical Value Propositions

• Risk reduction
  • Every transaction (100%) is reviewed and scored, not just a sample

• Grow the scale of audit scope
  • Increase the capacity of your team to handle more audit due to efficiency enhancements
Polling Question

• Which audit area would benefit most from using Artificial Intelligence as an auditing tool?

A – Loan Origination
B – General Ledger
C - Accounts Payable/Expenses
D – File Maintenance
Practical Uses Internal Audit

• Large credit union datasets: Evaluate for anomalies
  • Check sequences
  • Journal entries and reversals – GL Detail
  • Payroll modifications
  • Loan origination database (consumer, real estate, commercial)
• Fraud and forensic projects
• Expediting or reducing human labor intensive tasks
Reasons to Implement AI

• Improve operations and lower costs
  • Quality decision making
  • Increase scope and coverage without adding head count
  • Optimize processes

• Address a threat or risk
  • Fraud detection
Fraud Detection

• Use historical records to learn “normal” transactions and GL entries
• Pattern recognition with records to detect anomalies using control point indicators
  • Duplicate transaction
  • High dollar value
  • Last 3 digits
  • Manual entry
  • Material value
  • Reversal
  • Reversed
  • Sequence gap
  • Suspicious keyword
  • Weekend entry
  • Zero-dollar entry
Fraud Detection

• “Flag” transactions for internal auditors for specific review
  • GL Analysis completed
    • Over 880,000 transactions evaluated
    • 277 high risk transactions identified

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
<th>Percentage of Ledger</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Risk</td>
<td>$1.20B</td>
<td>277 transactions (0.0%)</td>
</tr>
<tr>
<td>Medium Risk</td>
<td>$43.42B</td>
<td>40,538 transactions (4.6%)</td>
</tr>
<tr>
<td>Low Risk</td>
<td>$27.81B</td>
<td>848,194 transactions (95.4%)</td>
</tr>
</tbody>
</table>
### Sample high risk transaction and control point triggers

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>MindBridge score</th>
<th>Type</th>
<th>Effective date</th>
<th>Monetary value</th>
<th># of entries</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019-04-01-00-00-0...</td>
<td>54.8%</td>
<td>GLJE</td>
<td>Apr 1, 2019</td>
<td>$1,051,808.00</td>
<td>2</td>
<td>✔</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Account ID</th>
<th>Account name</th>
<th>Effective date</th>
<th>Memo</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>72450</td>
<td>ACCRUED INTEREST RECV.C...</td>
<td>Apr 1, 2019</td>
<td>CC Interest Accrual MC</td>
<td>$0.00</td>
<td>$1,051,808.00</td>
</tr>
<tr>
<td>10550</td>
<td>INT LINES OF CR-MASTERCA...</td>
<td>Apr 1, 2019</td>
<td>CC Interest Accrual MC</td>
<td>$1,951,808.00</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

- **Control points**
  - **High Monetary Value**: This transaction contains 2 entries above the top 2% of monetary values within the ledger.
  - **Manual Entry**: This transaction was entered manually into the accounting software.
  - **Reversal**: This transaction appears to be a reversal of one or more transactions: 2019-03-31-00-00-00-GLJE-619436-0-1.
  - **Reversed**: This transaction appears to be reversed by one or more subsequent transactions: 2019-03-31-00-00-00-GLJE-619436-0-1.
  - **Suspicious Keyword**: This transaction contains 2 entries that have suspicious keywords in the memo field: Accrual.
  - **Rare Flows**: This transaction contains monetary flows which are unusual for this ledger.
  - **Expert Score**: This transaction contains a monetary flow that was identified as high risk by domain experts.
  - **Flow Analysis**: Monetary flows for accounts in this transaction are unusual.
Internal Audit: Loan Origination

• Use Machine Learning/Artificial Intelligence
  • Rules-based loan policy compliance (DTI, Credit Scoring, loan pricing)
  • Approval parameters and internal controls
  • 100% loan coverage
  • Continuous auditing
Policy Tests

Pass-Fail Count per Test for Activated Mortgages Jan-Oct 2019

- Application-Approval-Funding time within policy
- Disbursement time before approval time
- Segregated duties
- Loan pricing within policy
- Amortization within policy
- DSRs within policy
- Lending limits within policy
- Credit scores within policy
- Credit Bureau Obtained
- Income Verified

- Count

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Control Point Indicator Weighting Rationale: Engine Behind Artificial Intelligence
• Weighting Rationale
  • The weightings behind the transaction overall score were chosen based on a combination of user input and examination of results on real-world data sets.
  • For most CPIs, we assessed a number of factors, such as importance to auditors, likelihood of false positives, and correlation between these CPIs and known misstatements, and assigned them either low or high weighting (5% or 10%, respectively).
• Transaction Overall Score – Control Point
  • Aggregates all control point information for a transaction into a single score.
  • Transactions with higher overall scores are more likely to be of interest during audit scenarios (low to high).
  • Overall score is a weighted average of all active control point scores for a transaction.
  • Thirty (30) control points are used for calculating the overall score, along with their default weights.
### Engine Components: Transaction Overall Score

<table>
<thead>
<tr>
<th>Control Point</th>
<th>Default Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicate transaction</td>
<td>5%</td>
</tr>
<tr>
<td>High dollar value</td>
<td>10%</td>
</tr>
<tr>
<td>Last 3 digits</td>
<td>5%</td>
</tr>
<tr>
<td>Manual entry</td>
<td>10%</td>
</tr>
<tr>
<td>Material entry</td>
<td>0%</td>
</tr>
<tr>
<td>Reversal</td>
<td>5%</td>
</tr>
<tr>
<td>Reversed</td>
<td>5%</td>
</tr>
<tr>
<td>Sequence gap</td>
<td>1%</td>
</tr>
<tr>
<td>Suspicious keyword</td>
<td>5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Point</th>
<th>Default Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekend entry</td>
<td>5%</td>
</tr>
<tr>
<td>Zero dollar entry</td>
<td>5%</td>
</tr>
<tr>
<td>2-digit Benford</td>
<td>5%</td>
</tr>
<tr>
<td>Domain expert score</td>
<td>10%</td>
</tr>
<tr>
<td>Rare monetary flows</td>
<td>10%</td>
</tr>
<tr>
<td>Stochastic outlier selection anomaly score</td>
<td>5%</td>
</tr>
<tr>
<td>Transaction flow analysis score</td>
<td>80%</td>
</tr>
<tr>
<td>Unbalanced debits and credits</td>
<td>5%</td>
</tr>
</tbody>
</table>
Analytic and Machine Learning-Based Transaction-Level Control Points

- 2-Digit Benford
- Domain expert score
- Stochastic outlier selection anomaly score
- Rare monetary flows
- Transaction flow analysis score
Internal Audit Challenges

- Big Data Challenges
- Sampling Practices
- Audit Scope
- Outdated CAAT Tools
- Limited Human Capacity

- Limited Coverage of Internal and Financial Audits
- Undetected Errors
- Increased Liability / Financial Cost

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Polling Question

• What do you see as the biggest challenge to implementing AI in your audit plan?

A – Cost of Software
B – Access to useable data
C – Capacity of IA to follow-up on Flagged Transactions
Visually compelling drill-down functionality provides an opportunity to explore the data at a more granular level, where detailed risk assessments and their explanations are just a click away.
Analysis runs very deep and it’s incredibly comprehensive. Stacked with traditional tests based on domain expertise and business rules, the analysis is also enhanced by statistical methods like regression and Benford’s Law, as well as numerous machine learning algorithms and AI seeded with knowledge from the domain expertise of some of the world’s top CPAs.
Discover New Insights

Analysis brings detailed risk ratings to life and the ability to query the data using patent-pending natural language processing, feeding IA’s ability to understand what is happening beneath the surface and assemble new insights.
Expert-taught AI analysis interrogates the data for errors, machine learning algorithms speed alongside looking for outliers in the data.

AI powered natural language search lets you query the data in mere seconds instead of fighting to script antiquated manual tests.
Value to Internal Auditors

- Help manage risk of fraud (detection) and erroneous financial reporting
- Procedures specifically designed to detect anomalies below the level of materiality
- Testing control system operations
- Distribution of work-load concentration
Value to Internal Auditors

• Deliver forensic research tool that is extremely efficient
• Controls override identification
• Manage rising cost of human resources to expand coverage
• Transaction substantive testing
• Higher confidence level
  - Supervisory Committee
  - Internal audit
  - Board of Directors
  - Regulators
Value Propositions: Why Invest in AI?

- Control risk - minimization or elimination
- Sampling: population samples extension to 100%
- Thought Leadership in credit union industry
- Challenge audit professionals & recruiting
- Innovation and challenge for teams to continue career-long learning
- Data science is the new frontier of risk monitoring
- Audit failure risk reduction
Key Takeaways

The world around us is changing

You need to embrace the change and be educated

Analytics is fueling your competitive future

AI is in all of our futures
Thank You!

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