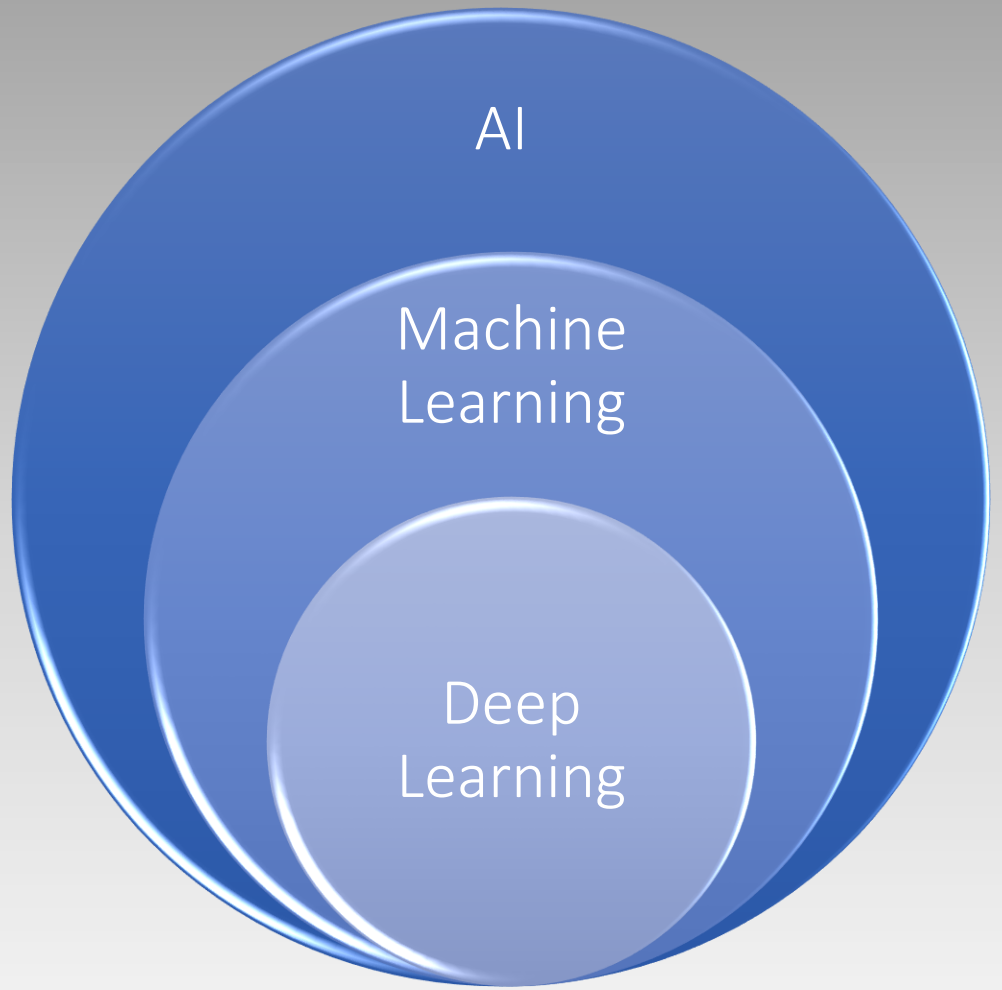
AUDITING ARTIFICIAL INTELLIGENCE

AI is changing the world

- Trading large volumes of stocks.
- Make recommendations based on user behavior.
- Process MRI scans to identify tumors
- Operating self-driving cars.
- Monitor and predict potential violations of law and regulations.

Many buzz words

What do they mean?



The Role of Internal Audit in Artificial Intelligence

From The IIA's AI Framework

For organizations that use AI, Internal Audit should consider AI as part of its risk assessment and consider whether to include AI in its risk-based audit plan.

For organizations exploring AI, internal audit should be actively involved in AI projects from their beginnings, providing advice and insight contributing to successful implementation.

For organizations that have implemented some aspect of AI, internal audit should provide assurance on management of risks related to the reliability of the underlying algorithms and the data on which the algorithms are based.

Internal audit should ensure the moral and ethical issues that may surround the organization's use of AI are being addressed.

Like the use of any other major system, proper governance structures need to be established and internal audit can provide assurance in this space.

Applicable Standards

IIA Standard 1210: Proficiency (Excerpt)

Internal auditors must possess the knowledge, skills, and other competencies needed to perform their individual responsibilities. The internal audit activity collectively must possess or obtain the knowledge, skills, and other competencies needed to perform its responsibilities.

1210.A3 – Internal auditors must have sufficient knowledge of key information technology risks and controls and available technology-based audit techniques to perform their assigned work. However, not all internal auditors are expected to have the expertise of an internal auditor whose primary responsibility is information technology auditing.

AI Competencies

- Know how AI works.
- Understand the risks and opportunities AI presents.
- Determine whether AI outcomes are as expected.
- Be capable of recommending or taking corrective action if needed.

The IIA's AI Framework

The Framework is comprised of six components, all set within the context of an organization's AI strategy.

Components:

- AI Governance
- Data Architecture and Infrastructure
- Data Quality
- Measuring Performance of AI
- Human Factor
- Black Box Factor

Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy

Argued that poorly rendered algorithms reinforce discrimination and widen inequality.

Solution: Algorithmic audit.

Human Factor

Relevant Ethics Objectives and Activities or Procedures

- **Engagement or Control Objective(s):** Provide assurance that outcomes of the organization's AI activities are free from unintended biases.
- **Activities or Procedures:** Review the intended results of the AI activities (strategic objectives) and compare with actual results. If a variance is detected, determine if bias is the cause.

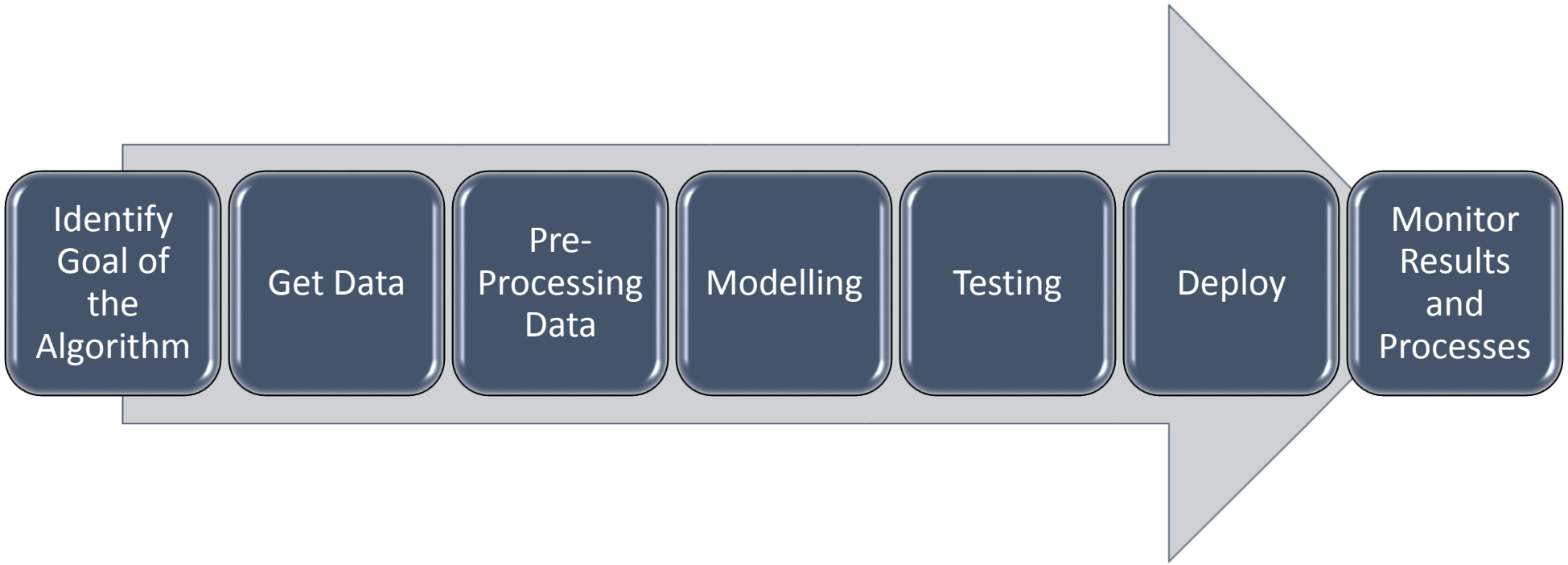
Auditing AI

What would it cover?

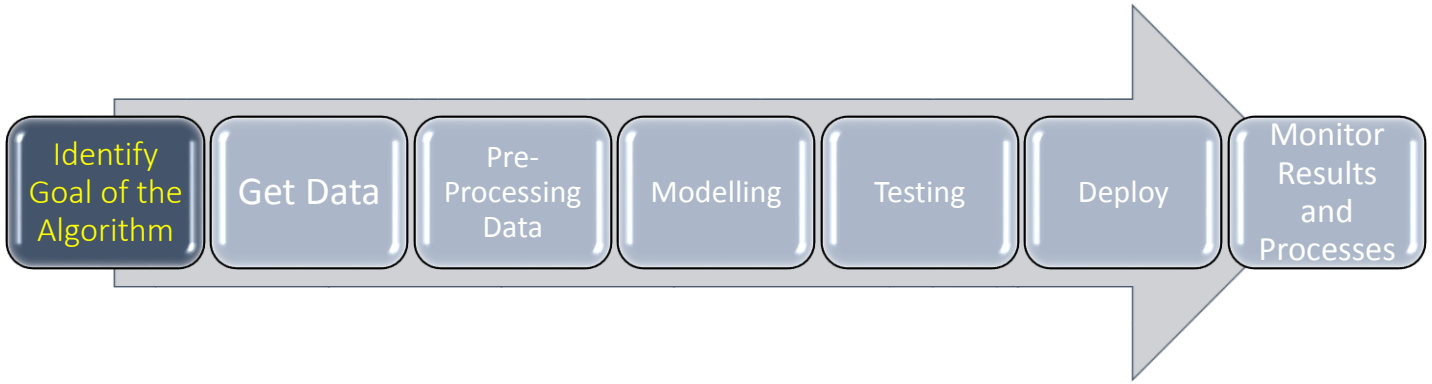
What can and cannot be audited?

What would an AI audit cover?

Identify audit elements through the general AI processing pipeline:



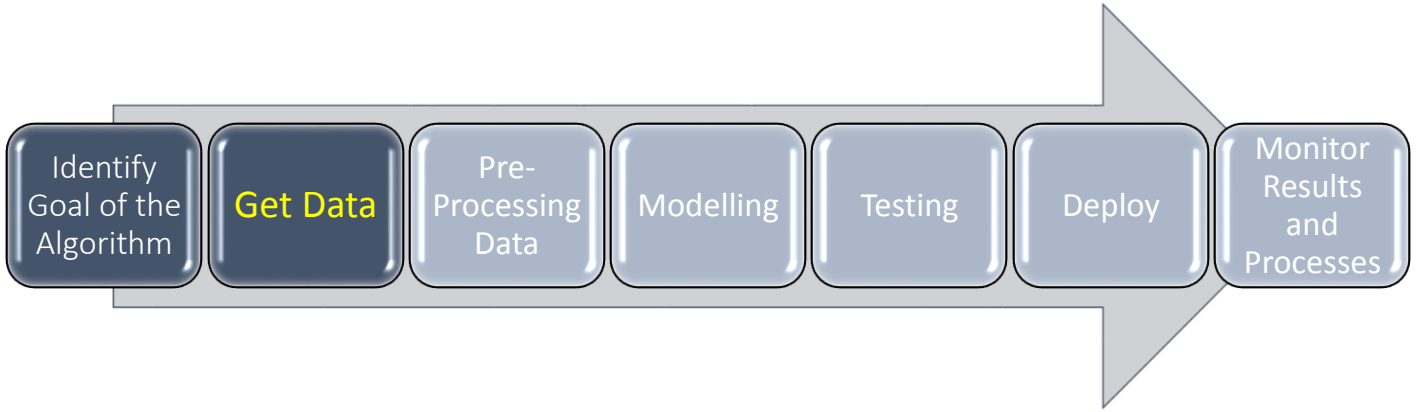
What would an AI audit cover?



Key considerations

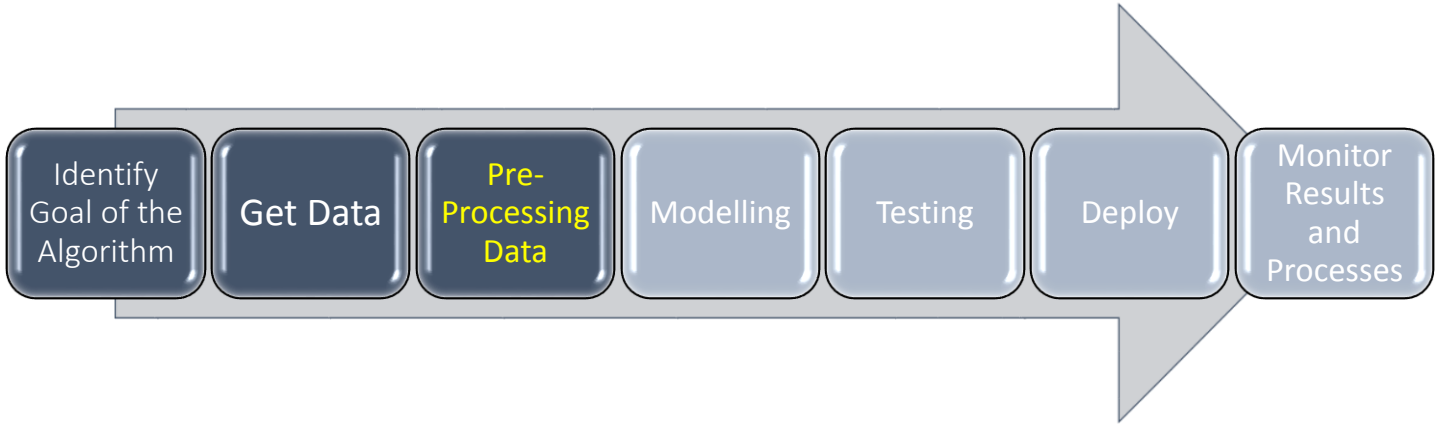
- What other algorithms have been applied to attain similar goals and what are the potential problems associated with these algorithms
- What factors are key to determining the outcomes of the algorithms
- Regulatory constraints in achieving the goal with and without applying AI

What would an AI audit cover?



- Where did the data come from?
- Were data used in training the model/machine consistent with those from the original data sources.
- Were the data sources from a reliable entity
- What are the potential inconsistencies or other problems with the data sources such as changes in methodology for capturing data over the years and quality issues of legacy systems.
- What criteria were used to select the data
- Are there other similar data sources not selected to train the model/machine

What would an AI audit cover?



- How were missing values imputed
- What were the criteria applied for removing missing values
- How were the training and test datasets selected (random stratification, cross validation, etc.)
- How was the data standardized

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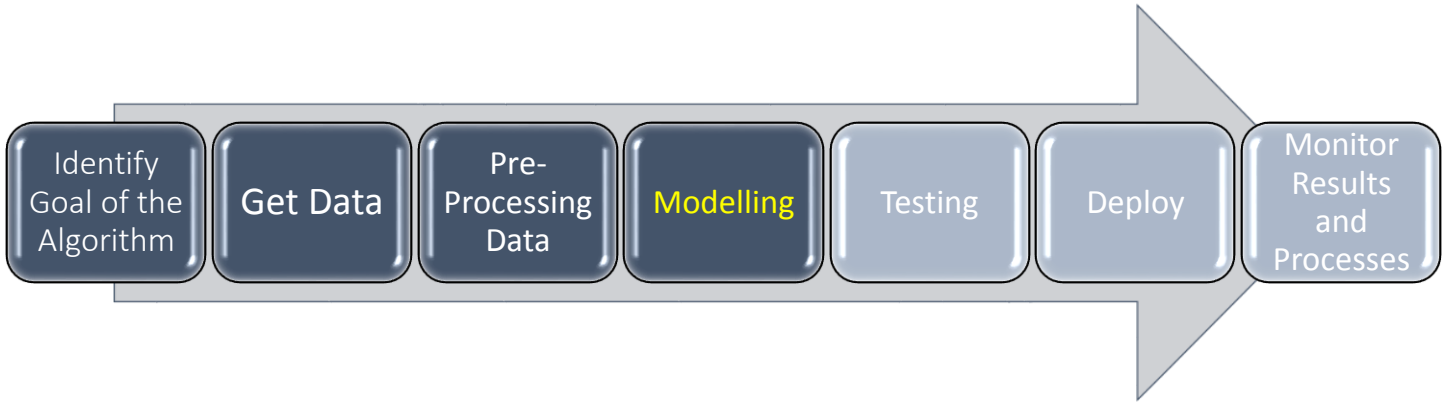

- What other AI techniques have been considered, what are the outcomes and reasons the techniques were not selected
- What were the criteria used and assumptions made in refining the algorithms
- Were the algorithms coded from scratch
- Do the algorithms use preexisting computer programming packages and, if so, how reliable are these packages

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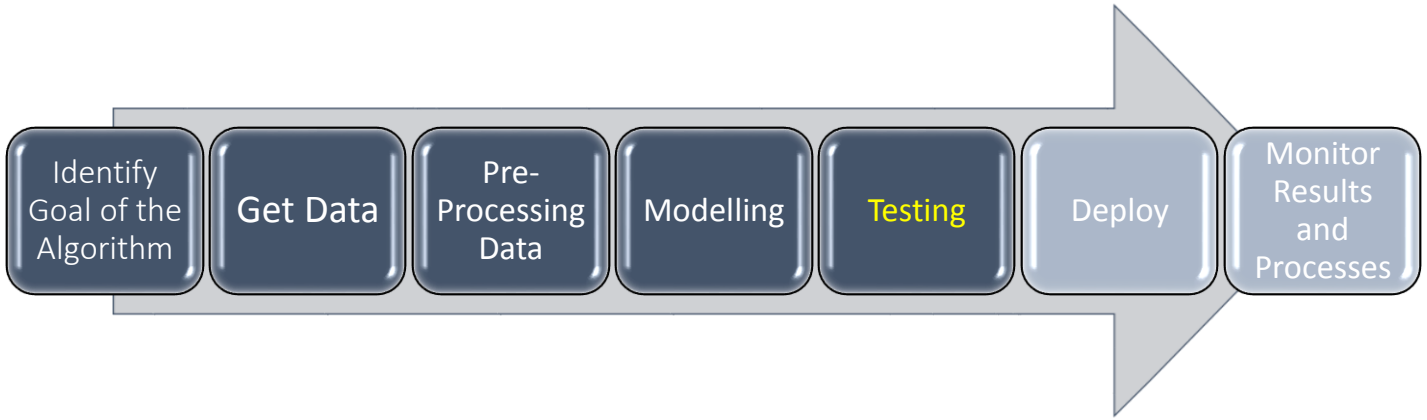

- What metrics were used to test the accuracy of the model
- Were the outcomes generated from the algorithms sensitive to minor changes in modelling features

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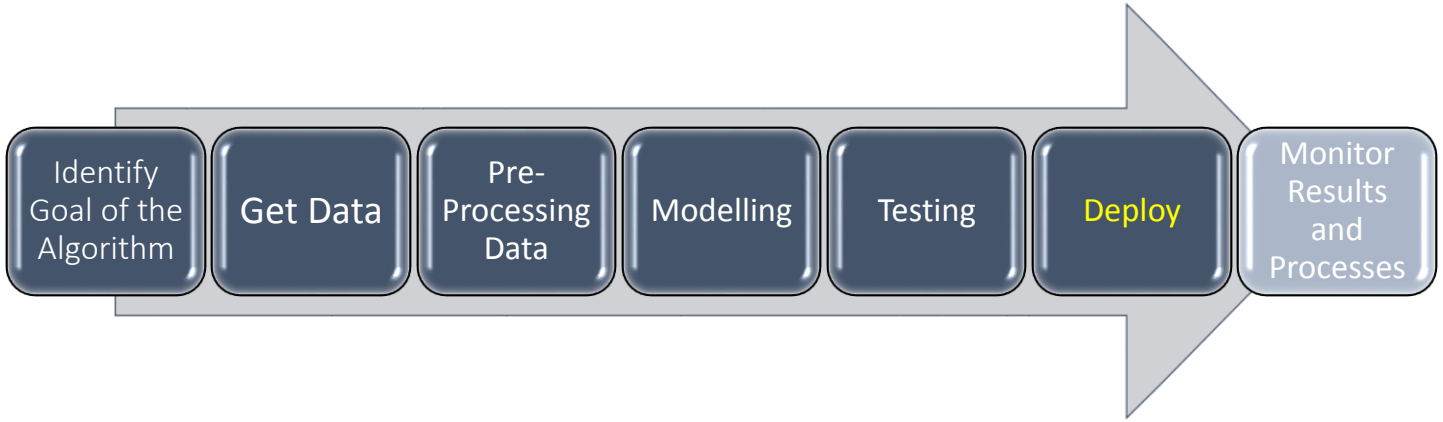

- How was the model moved to production and did it involve third parties
- Was there a review of accuracy after implementation of the algorithms by a third party
- Do the algorithms accomplish the goal set at the start of the process

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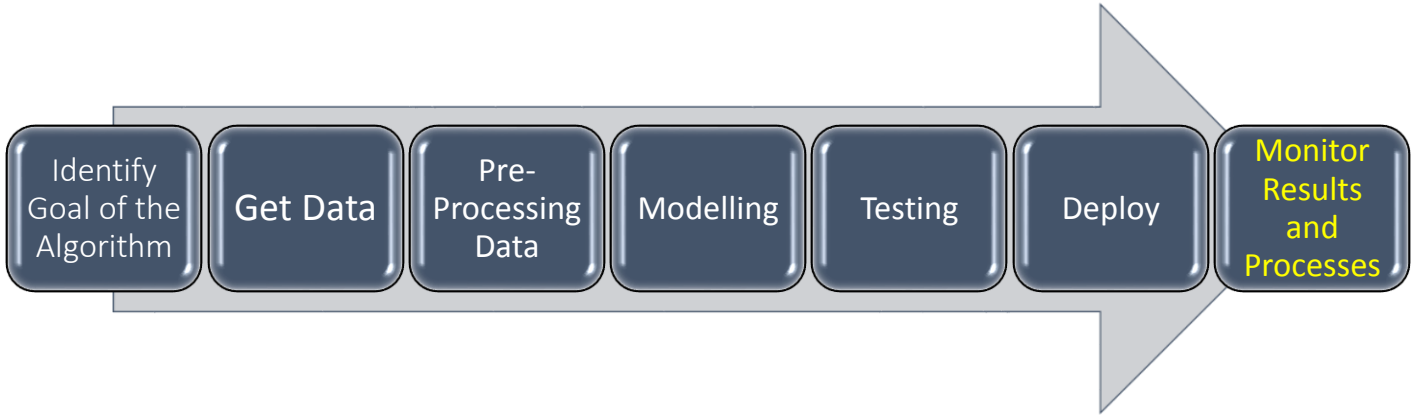

- Does the entity has proper structures, process, and procedures in place to direct, manage and monitor the AI activities
- What actions have the accountable parties taken at each stage of the process pipeline to ensure the AI activities comply with relevant laws and regulations, consistent with the organization's goal, and maintain an appropriate level of ethical and social and responsibility

When the Algorithms Are 'Black Boxes'

What can and cannot be audited?

- Machine learning algorithms generally *are* *not* black boxes.
- Deep learning algorithms generally *are* black boxes.
- When the algorithms are black boxes, auditing the elements associated with the rest of the 6 stages in the processing pipeline becomes even more critical.

New York State Experience

USING AI IN INTERNAL AUDIT

New Digital Era- Big Data

- Mobile
- Cloud
- Social
- Internet of Things

Audit Risk Identification Example:

New York State Tax Department- Case Identification and Selection System

Input: Tax Return Along with Data from Taxpayer Filing Histories, Employer Information, External Sources

- Applies business rules that may indicate questionable or fraudulent return.
- Apply predictive models to determine the probability of fraud.
- Return is classified, given a score, and compared to other returns.
- Workflow rules determine what action is taken.

Audit Risk Example: Audit of New York State Department of Health Restaurant Inspections-Detection of Food Bourne Illnesses

Input: Social Media that Originates In and Around New York State

- Geo Tag initial data from users (identify restaurant visits).
- Track users for five days, download information and analyze and score social media of users using machine learning.
- Rank restaurants based on sickness scores from social media.
- Restaurants exceeding threshold are reviewed.

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