



SOCIETY OF
RESEARCH
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So You Want to Leverage AI for Research Administration?

Where to Start and What to Know Ahead of Time

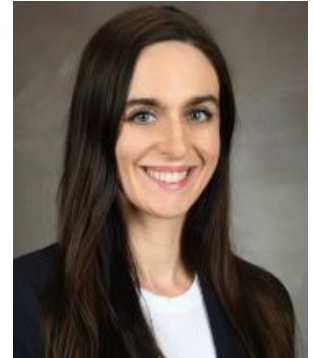
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AGENDA

1. Introduction to AI and Business Applications
2. Machine Learning Basics
3. AI Strategy
4. AI and Organizations: Building an AI Team
5. The Future of AI in Research Administration

LEARNING OBJECTIVES

- To orient participants to the identification of goals and objectives to be addressed in an AI integration.
- To outline the necessary steps and collaborative effort required to design, train, and implement an AI model in research administration.
- To enable participants to diagnose institutional readiness for AI, identify educational resources for staff adoption, and how to set realistic milestones to achieve following the implementation.

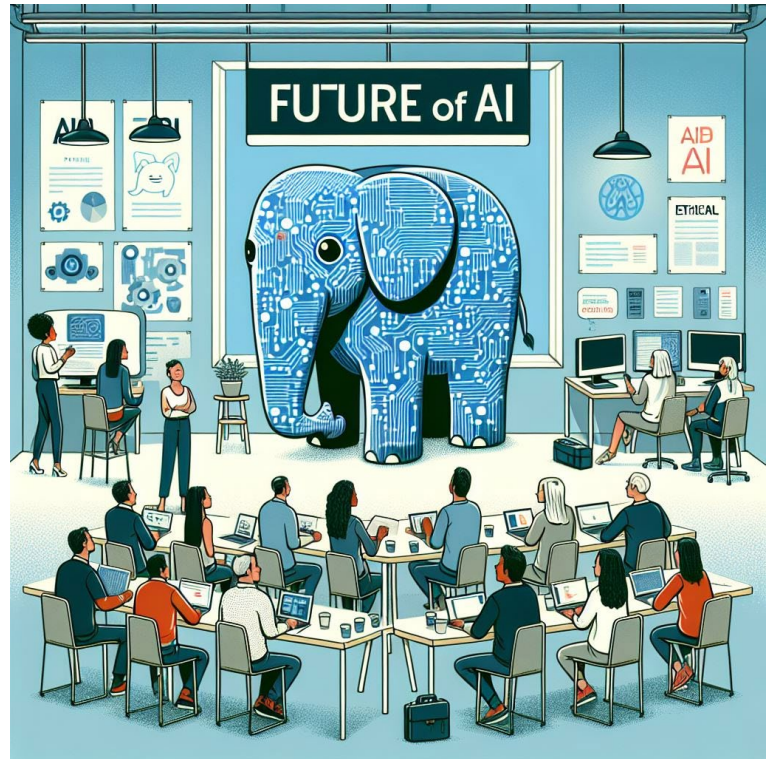
Introduction: AI and Business Applications

What is all the hype about?



The Elephant in the Room

- Terminator future: The long-held fear related to AI is the emergence of intelligent machines that will eventually surpass human intelligence.
- Immigrants from the future (*The Economist* 2014 article): People are worried about being replaced either by other people or machines.
- Automation on the rise: More and more factories are replacing workers with machines and enjoy increased productivity as a result. A 2023 report by Goldman Sachs found that AI could replace up to 25% of jobs.



Notable AI Technologies

Computer Vision: An image recognition and generation AI system

Natural Language Processing: A language recognition and generation AI system

Automated Decision Making/ Reinforcement Learning: An AI system that perceives the world, chooses an action based on what it sees, and repeats that process over and over until it achieves that goal.

AI in Business Applications

- AI approaches are especially good at solving “well-defined” problems.
- Some industry sectors and business functions are more ripe than others for adopting AI solutions.
- The AI sweet spot between solvable problems and ripe sectors implies a near-term time horizon in which the benefits can be achieved.

Well-Defined Problems

Optimization: AI maximizes a result based on a complex set of constraints.

Search: A mapping or clustering problem, making connections between what is looked for with the body of work.

Perception: AI imitates human abilities, and in some cases, makes them superpowers.

Prediction: A form of classification problem, sometimes called pattern recognition.

Ripe Industry Sectors

- Optimization: Whether it's cost reduction or productivity gains, learning systems will be able to improve the efficiency of most business functions. *Industries Include: **Agriculture, Manufacturing, and Supply Chain Logistics***
- Transformation: Leveraging the qualities of AI to do things that were not possible before. Typically, this means using AI in tandem with people, working closely together. *Industries Include: **Healthcare providers, Pharma, Sales, Customer Service, Finance Sector, Fraud Detection, Cyber Security***
- Reinvention: The basic structure and economics of the sector is fundamentally changed. *Industries Include: **Transportation, Retail, and Consumer Marketing***

AI-Enhanced Efficiency in Research Administration

Automating Routine Tasks: AI can handle repetitive administrative tasks such as scheduling meetings, managing emails, and processing travel reimbursements.

Enhancing Compliance and Security: AI can help monitor compliance issues in real-time, such as data management and security, and research fraud.

Facilitating Better Decision-Making: AI tools can analyze large datasets to provide insights and support decision-making processes.

Supporting Research and Innovation: AI can aid in developing new tools and methodologies for research administration.

Machine Learning Basics

Business Analytics: How Can AI Be Used to Help You in Research Administration?



Machine Learning Basics

Descriptive Analytics:

Used to capture natural patterns or phenomena in the data. Such patterns can highlight outliers such as fraud or waste.

“What did happen?”

Predictive Analytics:

Reflect on the intuition behind learning from examples. Based upon the past, predictive analytics, attempt to forecast the future.

“What will happen?”

Prescriptive Analytics:

Suggests the actions one should take based on insights derived from data analysis.

“What should happen?”

Descriptive Analytics

- Clustering: where the model assigns observations or reports to groups to group based upon the similarity of their variables (example: market segmentation).
- “Cluster” or “Group” we are not physically moving anything, we are conceptually reassigning them to different groups.
- Clustering can also highlight outliers.
- Use distance equations to compute quantitative measures of cluster coherence such as the intra- or the inter-cluster distances.
- We can also measure the “goodness” of clustering using the concept of prediction by treating a vehicle’s cluster membership as a variable. This constructed variable can be used to predict some of the outcome variables.¹⁴

Predictive Analytics

- The goal is to learn to make a forecast from a set of examples, called training data
- Also called supervised learning because the prediction is “learned” by analyzing past examples (training data)
- Binary classification: predicting one of two mutually exclusive, collectively exhaustive outcomes
- Confusion Matrix: captures how the prediction is either correct or incorrect and is used to determine how well the prediction machine works.
- Sensitivity: the number of correct “YES” predictions divided by all the “YES” observations in reality.
- Specificity: the number of correct “NO” predictions divided by all the NO observations in reality.

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Prescriptive Analytics

- Searches for the best combination of decision variables.
- Start by identifying input variables (decision variables).
How much to produce? Which task to perform first? We then select an outcome variable.
- The value of a good prescriptive answer lies not only in the answer itself but also in the robustness of the answer.
- Our role would be to ensure that the applications of digital transformation are actionable and realistic.

Algorithmic Bias

- Algorithmic bias is really about the conscious or unconscious bias of the decision-makers in selecting data and defining variables.
- Must decide what reports to include or exclude from the descriptive analysis.
 - How representative is the sample?
 - How do you decide what report to exclude?
- Help ensure the representativeness of the data sample used in our analysis and apply judgment and domain expertise in identifying and defining the variables to include.

Overfitting

- When the machine is too specific and therefore unable to generalize to unseen examples.
- Solution is cross-validation. Take the labeled training data and create multiple, random test-train splits. Train the model multiple times, once on each of the different test-train splits. Each test-train split produces a slightly different model. Combine all the models into an aggregate that benefits from the various training runs.
- Data scientists focus on measures of evaluation. Need to ensure that the use of predictive analysis is furthering the goals of the business.

AI Strategy

Is Your Organization
Ready for AI?



How is AI Different

- Managing Expectations: inexperienced stakeholders often have unrealistically high expectations of AI projects.
- Computational Power: because of the mathematical intensity of AI techniques, especially neural networks, computational power is a must when pursuing development and implementation.
- Data: AI is data-hungry. AI learning machines require large amounts of data to train.
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- Probabilities: AI systems tend to lack certainty and predictability.
Dealing with uncertainties is a distinctive advantage of AI, but the lack of explainability is particularly challenging in regulated or public policy areas.

Academic Advantage

- Large Institutions hold a substantial advantage because they own their data.
- AI projects should be treated like start-up ventures, which most academic institutions have experience launching.
- Large academic institutions often have established data strategies that will be able to organize the collection and sharing of large data pools across the organization.
- Attracting AI talent is challenging, however, academic institutions have established departments that offer tenure, etc.
- Academic Institutions often have strong ethics boards that safeguard this and other types of research.

AI and Organizations: Building an AI Team

Understanding the
Technological Needs of AI in
Your Organization



Organizational Design Elements

- **Structural changes** can clarify what is valued and who is important for a new strategy. With advances in technologies, organizations may need to consider whether to incubate them in a separate unit to stave off unintended consequences including turnover, breeding uncertainty, and decreased productivity.
- **Semiformal Structure** includes cross-functional teams, committees, and task forces that can act as overlays to the formal structure of an organization helping overcome limitations.
- **Workflow and Decision Rights** are more precise tools than the formal structure. New activities and decisions will be created and existing processes to be revised or eliminated.
- **Control Rights** include approving others' choices and monitoring progress and outcomes. These rights should be given to leaders who can understand and resolve tradeoffs across decisions and can adjudicate between competing interests across the institution.

Leading Organizational Change

- **Reactive Change**: trying to close a performance gap—the gap between what is and what should be.
 - In general, more easily implemented vs. proactive change.
- **Proactive Change**: closing an opportunity gap-the gap between what is and what could be.
 - Will require “innovators” to reach critical mass of adoption followed by mass implementation.

Tools to Improve Organizational Effectiveness

- Conduct interviews or focus groups or simply observe how people are changing their behavior (these efforts can be time-consuming).
- Utilize employee engagement surveys (understanding that these methods are susceptible to reporting bias).
- Try to assess “cultural fit” by adoption rate, training willingness, and collaborations.
- Enculturability (the capacity to learn and adapt to a changing culture) may be more important for success than initial cultural fit and this is driven by training and project champions.

The Future of AI in Research Administration

Soft Targets and Low
Hanging Fruit



AI in Research Administration

- AI review of grant proposals to check for proposal guideline restrictions.
- AI generation/update of CVs, biosketches, and other support.
- AI-driven data analytics to review burn rates, milestone completions (RPPRs), and effort management.
- AI-driven chatbots to assist in navigating the grant submission process.
- AI-driven chatbots to assist in approvals of charges to grants (purchases, equipment, travel, etc.).

Thank You

Questions?

