

Carnegie Mellon University Africa
Certificate I: Understanding AI and Machine Learning in Africa

Course AIML02: AI and Machine Learning in Africa

Module 3: AI Business Strategy
Lecture 1: Artificial Intelligence for the Real World

Welcome to Module 3 of AI and Machine Learning in Africa, a course which provides an overview of the relevance of AI and machine learning to Africa and their potential to solve economic and social problems.

While Modules 1 and 2 focused exclusively on material that is specific to Africa, Module 3 takes a more general look at what is involved when developing a business strategy for AI. We return again to Africa-specific concerns in Module 4.

There are four lectures in Module 3, each of which is based on articles published in the Harvard Business Review, drawing out the insights in each one.

In the first lecture we will summarize the key points of an article by Davenport and Ronanki (2019): "Artificial Intelligence for the Real World."

We begin by explaining the relationship between artificial intelligence and cognitive technologies.

We then identify three types of AI

1. Process automation
2. Cognitive insight
3. Cognitive engagement

before introducing a four-step framework for integrating AI technologies

1. Understanding the technologies and their capabilities
2. Creating a portfolio of projects
3. Launching pilots
4. Scaling up

We will finish up by summarizing what we have covered and providing the details of the article that you should read to consolidate what you have learned.

After watching and listening to this lecture, you should read the original article, take notes, and then go through this lecture again to consolidate the messages in the article.

We have four learning objectives, so that, after studying the material covered in this lecture, you should be able to do the following.

1. Identify three important business needs that AI can support.
2. Summarize a four-step strategy for adopting AI.
3. Explain why companies perform better by taking an incremental approach, rather than a transformative approach, to adopting AI in their businesses.
4. Explain why it is often a better business strategy to focus on augmenting human capabilities with AI, rather than replacing them.

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"Artificial Intelligence for the Real World."

Slide 2 Earlier in this course, in Module 1, Lecture 1,

we noted that the developments in artificial intelligence over the past sixty-five years have ushered in what John Kelly at IBM refers to as the cognitive era, superseding the tabulating era and the on-going programming era.

Slide 3 We also noted that, in 1960, J. C. R. Licklider predicted a symbiotic partnership between humans and computers.

Slide 4 Today, this symbiotic partnership is being realized through AI and machine learning.

The key idea here is that AI both amplifies and extends human cognitive abilities, improving our existing skills and also giving us new ones.

Slide 5 The target article by Davenport and Ronankin takes up this theme, referring to cognitive technology as "next generation artificial intelligence".

Slide 6 To set the scene for the points that they make in their article, Davenport and Ronankin contrast two exercises to use AI to support business needs.

The first is a “moon shot” project launched in 2013 by the MD Anderson Cancer Centre to use AI to diagnose and recommend treatment plans for certain forms of cancer using IBM’s Watson cognitive system.

Recall that we already met Watson in the first course AIML01, in Module 1, Lecture 3. You should review that lecture again if you don't.

The project was put on hold in 2017 after costs exceeded \$62 million and before the system had even been used on patients.

Slide 7 To set the scene for the points that they make in their article, Davenport and Ronankin contrast two exercises to use AI to support business needs.

In the same period, the IT group at the center also used cognitive technologies to do much less ambitious jobs

- Make hotel and restaurant recommendations for patients’ families,
- Determine which patients needed help paying bills,
- Solving staff IT problems.

with more promising results

- Increased patient satisfaction,
- Improved financial performance,
- Decline in time spent on tedious data entry by the hospital’s care managers.

Slide 8 A survey 250 executives who are familiar with their companies’ use of cognitive technology shows that three-quarters of them believe that AI will substantially transform their companies within three years.

Slide 9 A study of 152 projects in almost as many companies also reveals that highly ambitious moon shots are less likely to be successful than “low-hanging fruit” projects that enhance business processes.

Slide 10 It is useful for companies to look at AI through the lens of business capabilities rather than technologies.

- Slide 11 AI can support three important business needs:
- process automation: automating business processes,
 - cognitive insight: gaining insight through data analysis,
 - and cognitive engagement: engaging with customers and employees.
- Slide 12 Of the 152 projects studied by Davenport and Ronanki,
- the most common type was the automation of digital and physical tasks
 - typically back-office administrative and financial activities
 - using robotic process automation technologies
- (here by robot we don't mean a physical robot, we mean a software bot or software agent).
- Slide 13 Typical tasks include
- transferring data from e-mail and call center systems into systems of record
 - for example, updating customer files with address changes or service additions;
 - replacing lost credit or debit cards, reaching into multiple systems to update records and handle customer communications;
 - reconciling failures to charge for services across billing systems by extracting information from multiple document types;
 - and using natural language processing to read legal and contractual documents to extract provisions.
- Slide 14 Process automation is the least expensive and easiest to implement of the cognitive technologies.
- Typically gives a quick and high return on investment.
- It's also the least "smart" in the sense that these applications aren't programmed to learn and improve.

- Slide 15 Process automation tasks don't necessarily displace humans.
- Replacing administrative employees was neither the primary objective nor a common outcome of the 71 projects surveyed.
- Slide 16 The second most common type of project uses algorithms to detect patterns in vast amounts of data and interpret their meaning.
- Slide 17 Typical tasks include
- predicting what a particular customer is likely to buy;
 - identifying credit fraud in real time and detecting insurance claims fraud;
 - analyzing warranty data to identify safety or quality problems in automobiles and other manufactured products;
 - automating personalized targeting of digital ads;
 - and providing insurers with more accurate and detailed actuarial modeling.
- Slide 18 Cognitive insights provided by machine learning differ from those available from traditional analytics in three ways:
1. They are usually much more data-intensive and detailed.
 2. The models typically are trained on some part of the data set.
 3. and the models' performance improves over time.
- Slide 19 Cognitive insight applications are typically used to improve performance on jobs only machines can do.
- and they're not generally a threat to human jobs.
- Slide 20 Projects that engage employees and customers using natural language processing chatbots, intelligent agents, and machine learning are the least common type in the study.

Slide 21 Typical functionality includes

- Intelligent agents that offer 24/7 customer service, fielding queries from password requests to technical support questions.
- Intelligent agents that answer employee questions on topics including IT, employee benefits, and HR policy.
- Personalized recommendation systems for retailers and health providers.

Slide 22 Cognitive engagement apps are not currently threatening customer service or sales rep jobs.

In most of the projects studied, the goal was to handle growing numbers of employee and customer interactions without adding staff.

Slide 23 Summarizing the business benefits of AI, more than half of the 250 executives surveyed said the primary goal was to use AI to make existing products better.

Only 22% of respondents mentioned reducing the number of employees.

Slide 24 The article presents a four-step framework for integrating AI technologies that can help companies achieve their objectives, whether the projects are ambitious moon shoots or business-process enhancements.

The four steps are

1. Understanding the technologies.
2. Creating a portfolio of projects.
3. Launching pilots.
4. Scaling up.

Slide 25 Before embarking on an AI initiative, companies must understand which technologies perform what types of tasks, and the strengths and limitations of each.

Rule-based expert systems and bot-based (that is, agent-based) process automation, for example, are transparent in how they do their work, but neither is capable of learning and improving.

Deep learning is great at learning from large volumes of data, but it's very difficult to understand the models it creates and uses and the manner in which they are created.

This "black box" issue can be problematic in highly regulated industries such as financial services, in which regulators insist on knowing why decisions are made in a certain way.

Slide 26 Companies will need to leverage the capabilities of key employees, such as data scientists, who have the statistical and big-data skills necessary to learn these technologies.

A critical factor for success is willingness of employees to learn.

Slide 27 Build relationships with external service providers if the company doesn't have employees with data science or analytics capabilities.

Recruit expert in-house talent if it's planned to implement longer-term AI projects.

Having the right knowledge and skills is essential.

1. Create a pool of experts.
2. Make available to high priority projects.
3. Eventually dedicate groups to business functions.
4. But maintain a central coordination unit.

Slide 28 The next step in launching an AI program is to systematically assess needs and capabilities to determine the areas of the business that could benefit most from cognitive applications.

and then develop a prioritized portfolio of projects.

- Slide 29 The first area of assessment identifies the opportunities:
- Bottlenecks in the flow of information can suggest opportunities for implementing cognitive insights.
- Scaling up the use of existing knowledge can suggest others.
- Inadequate resources to make strategic use of the data that the company collects can suggest yet more.
- Slide 30 The second area of assessment identifies and evaluates the use cases in which cognitive applications would generate substantial value and contribute to business success.
- Prioritize the use cases:
- which offer the most short- and long-term value
- which offer the opportunity to create competitive advantage.
- Slide 31 The third area of assessment identifies the appropriate AI techniques to deliver the required functionality.
- Slide 32 Remember, when selecting pilots that
- "It's wiser to take incremental steps with the currently available technology while planning for transformational change in the not-too-distant future."
- Slide 33 Step 3: launch the pilots.
- The gap between current and desired AI capabilities is not always clear.
- Consequently, to assess capabilities and minimize risk, companies should create proof-of-concept pilot projects for cognitive applications before rolling them out across the entire enterprise.
- The next lecture is devoted entirely to this topic.

Slide 34 Choose pilots that have high potential business value.

Avoid "injection" of projects by senior executives who have been influenced by technology vendors.

These often fail, significantly set back the organization's AI program.

Slide 35 Be prepared to redesign workflows to accommodate the division of labor between humans and the AI application.

This is necessary to ensure that humans and machines augment each other's strengths and compensate for weaknesses.

Slide 36 Merely automating existing processes won't necessarily take full advantage of the capabilities of AI and improve the process.

Slide 37 Rolling out a cognitive pilot organization-wide is not trivial.

- It requires collaboration between technology experts and owners of the business process being automated.

- It requires integration with existing systems and processes.

Why? Because cognitive technologies typically support individual tasks rather than entire processes.

Integration is a major challenge.

Slide 38 Make sure business process owners discuss scaling considerations with the IT organization before or during the pilot phase.

Slide 39 Companies may face substantial organizational change-management challenges.

Slide 40 Summarizing the challenges of deploying AI, executives identified several factors that can stall or derail AI initiatives,

ranging from integration issues to scarcity of talent.

Slide 41 We leave the final words to the authors of the article.

"Cognitive systems perform tasks, not entire jobs ... Most cognitive tasks currently being performed augment human activity".

Successful AI business strategies to deploy cognitive technologies recognize this.

To summarize:

1. AI supports three types of business application: process automation, cognitive insight, and cognitive engagement.
2. The deployment of AI can be carried out in four steps: understanding the technologies, creating a portfolio of projects, launching pilot projects, and scaling up pilots to organization-wide applications.
3. Integration of the AI application into the current business processes is a major challenge.
4. Successful business strategies recognize that most cognitive tasks currently augment rather than replace human activities.

Here is the article on which this lecture is based. Please take the time to read it and then review this lecture again.

Davenport, T. H., and Ronanki, R. (2019). Artificial Intelligence for the Real World, Harvard Business Review, January – February, pp. 108 – 116.

<https://hbr.org/2018/01/artificial-intelligence-for-the-real-world>