

Artificial Intelligence in Decision Making

Objectives:

- Describe how to apply AI to decision making using data
- Define the use of AutoML to support decision making
- Explain the importance of understanding data and how it can potentially drive bias in business decisioning

Application to Signature Assignment

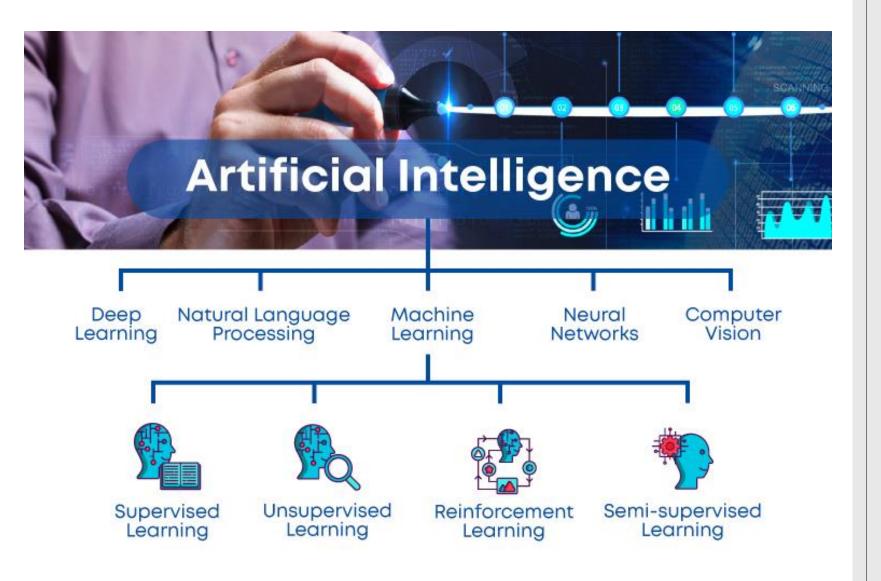
- Part 1: For this assignment, you will explain the requirements, rules, or recommendations that can lead to a successful implementation of embedded analytics in the context of building, reporting, and using Business Intelligence in a commercial operation. The final product should be able to serve as a "whitepaper" for professionals who are interested in, yet completely new to embedded analytics and Business Intelligence.
 - Be sure to address (not necessarily in this order):
 - Why data decisioning so important to guiding organizational leadership
 - The strategic planning activities that need to take place in the context of building, reporting, and using Business Intelligence in a commercial operation
 - Some common tools to use for Business Intelligence and how they can be used
 - The role of models, user interface, culture, and design in a quality system
 - The role of data scientist or data analyst in organizational decision making
 - How to use utilize an organization's data assets to drive decision making
 - How the fourth industrial revolution is important to data analytics and business intelligence.
 - How to apply BI concepts to decision making in the fourth industrial revolution
 - How AI can be applied to decision making using data
 - How to avoid bias in business decisioning
- <u>Part 2</u>: Condense your paper into a <u>presentation</u> of no more than 10 slides. The presentation should be able to be used as a guide to individuals who are completely new to embedded analytics and Business Intelligence.

Define "Artificial Intelligence"

Write your definition in the chat

Some Definitions

- "Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind." (https://www.ibm.com/cloud/learn/what-is-artificial-intelligence)
- "algorithms...designed to make decisions, often using real-time data."
 (https://www.brookings.edu/research/what-is-artificial-intelligence/)
- "The capability of a machine to imitate intelligent human behavior." (https://www.forbes.com/sites/bernardmarr/2018/02/14/the-key-definitions-of-artificial-intelligence-ai-that-explain-its-importance/?sh=5455020d4f5d)



What Makes Al Work?

ML and AutoML

- Machine learning is a field of artificial intelligence that uses statistical techniques to give computer systems the ability to "learn" (e.g., progressively improve performance on a specific task) from data, without being explicitly programmed.
- AutoML automates common machine learning steps that are often repetitive and involve a good amount of trial and error on the path to producing quality machine learning models.
- AutoML means automated machine learning. It gives enterprises the power to train and deploy thousands of models to fit the needs of various customers and industries through an automated approach.
- The process of automating the end-to-end process of applying machine learning to real-world problems.

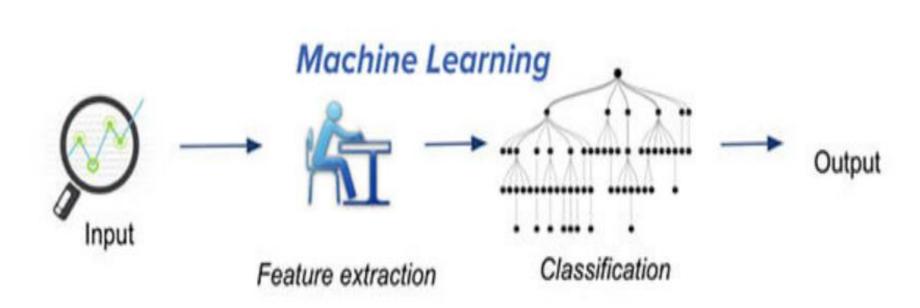


1. Identify Business 2. Collect Data 3. Label Data **Problem & Expected Value** Combine all relevant data from Supervised machine learning multiple sources into a single file requires labelled data for which Identify what you are trying to and ensure all data is collected you know the ultimate outcome. understand or solve and at the same unit of analysis. the impact it will have on your Example: Whether the customer bottom line. Example unit of analysis: Each row has purchased this product in the represents an individual customer. past 12 months. Example: Which customers are most likely to purchase a product Example sources: Social media, if you include them in your next product reviews, purchase trends, marketing campaign? and shopping cart behavior. Example data points: Number of products purchased, previous responses to marketing campaigns, whether they follow you on social media. 5 TO 10 DAYS Steps that can be automated 6. Determine Model 5. Split Dataset 4. Extract Features **Evaluation Criteria** Manually partition the data into Transform raw data into features training, validation, and holdout that will act as inputs for the Decide on an accuracy metric and threshold based on data science 1 DAY TO expertise. Example: Randomly sort customers Example: Changing the customer's into one of the partitions or split date of birth into the customer's Example: Choose a metric the data by time - e.g. use data age at time of purchase. Rate@Top5% to select the best collected from 2 years ago as the customers rather than low-ranked training set and data from last year leads who would not qualify for as the validation set. inclusion in the campaign. 5 TO 10 DAYS 9. Deploy Model 7. Train Models 8. Analyze Model Outcomes Iterative process that refines Explore the results, think critically Integrate model outcomes into about whether they make sense, the model's performance on the business processes. training dataset from Step 5. and uncover insights that will WEEKS TO Example: Deploy the model that improve business processes. MONTHS MONTHS Example: A trained decision tree identifies customers who are likely model finds ways to split the data Example insights: Patterns that to purchase your product and adds that most accurately explain the determine which customers are them to relevant future marketing target outcomes. likely to respond to the marketing campaigns. campaign's message. *May require return to Step 2 or 4.

The Traditional Process to Develop a Model

The only automated task is Training

(https://www.datarobot.c om/wiki/automatedmachine-learning/)



Traditional machine learning uses hand-crafted features, which is tedious and costly to develop.

https://www.merkleinc.com/blog/dispelling-myths-deep-learning-vs-machine-learning



AutoML

"AutoML focuses on two aspects – Data acquisition and prediction. All the steps that take place in between these two phases will be abstracted by the AutoML platform. Essentially, users bring their own dataset, identify the labels, and push a button to generate a thoroughly trained and optimized model that's ready to predict."

(https://www.forbes.com/sites/jan akirammsv/2018/04/15/why-automl-is-set-to-become-the-future-of-artificial-intelligence/?sh=407ff059780a)



The AutoML process after uploading a dataset and choosing the target variable for the business problem (https://www.datarobot.com/wiki/automated-machine-learning/)

Al and Decision Making

- Strategic decisions are extremely valuable and important, yet infrequent or "low volume," decisions that guide
 the direction of an organization. Not repeatable, not candidates for AI.
- Tactical decisions are business decisions that are made repeatedly during the course of business and involve data and analysis by officers, executives, and other personnel in management and knowledge positions (Taylor, 2012)
 - Examples of tactical decisions include (but are not limited to) deciding on: staffing levels to implement, discounting, sales and marketing strategies to use, allocation of work assignments to particular groups and people, and which purchases to make (Latham, n.d.).
 - Repeatable, candidates for AI.
- Operational decisions are daily business decisions that happen every time a business process or transaction occurs.
 - For example, an operational decision is made every time an order is placed, a customer makes a purchase, a credit card transaction is approved, an insurance claim is made, etc.
 - Highly repeatable, ideal candidates for AI.
- Micro decisions are a special kind of operational decision that focuses on one customer at a time and aims to personalize an interaction with that individual.
 - Highly repeatable, high volume—ideal candidate for Al.

Business Decisions Suitable for Al

- Repeatable
- Nontrivial
- Defined and measurable business impacts
- Suitable for automation (Taylor, 2012)

7 Business Decision Types Suited to Automation

- 1. Determining customer eligibility for A service or product
- 2. Validating transactions or customers
- 3. Calculating prices for products and specific customers at a specific point in time
- 4. Assessing the risk inherent in a particular customer or transaction
- 5. Identifying fraud or abuse
- 6. Identifying opportunities to cross-sell or up-sell to specific customers (Taylor, 2012)



What ethical issues are associated with the use of AI?

Al: Ethical Issues

10 QUESTIONS TO ANSWER BEFORE USING AI IN THE PUBLIC SECTOR

ASSUMPTIONS

What assumptions is the Al based on and what are their limitations and potential biases?



ETHICS

What assessment has been made of the ethics of using this AI?



OBJECTIVE

Why is the AI needed and what outcomes is it intended to enable?



DATA

What datasets is / was the Al trained on and what are their limitions and potential biases?



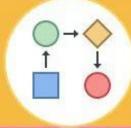
OVERSIGHT

What human judgement is needed before acting on the Al's output and who is responsible for ensuring its proper use?



USE

In what processes and circumstances is the Al appropriate to be used?



INPUTS

What new data does the AI use when making decisions?



EVALUATION

How, and by what criteria, will the effectiveness of the AI be assessed, and by whom?



https://cdofromhel.fi/2019/06/12/the-ethics-of-using-artificial-intelligence-in-city-services/

- 1. Over reliance on machine-led decisions without disclosure in the banking sector
- 2. Collecting and processing patients' personal data in AI algorithms without consent
- 3. Biased/unclear recommendations from an Al-based system for diagnosis/care/treatment
- 4. Over reliance on machine-led decisions without disclosure in the insurance sector
- 5. Citizens objecting to use of facial recognition technology by police force for mass surveillance
- 6. Limiting access/discriminatory pricing of services/products due to consumers' race/gender, etc. (originally part of the company's target group)
- 7. Discriminatory pricing of insurance policies due to consumers' demographic profiles
- 8. Processing patients' personal data in AI algorithms for purposes other than for which it was collected
- 9. Customers demanding reasoning/clarity behind a decision taken by an Al algorithm to deny credit
- 10. Citizens objecting to the collection and use of their personal data such as biometrics by an AI system



https://www.businessinsider.in/tech/news/artificial-intelligence-in-2020-needs-to-be-about-ethics-in-india/articleshow/72935214.cms

Activity

- Review the reading, "Healthcare, Artificial Intelligence, Data and Ethics a 2030 Vision"
- Address in groups:
 - What strategies do the authors recommend to ethically and responsibly develop and deploy AI?
- Share with class

Case Study



 COMPAS (Correctional Offender Management Profiling for Alternative Sanctions), a case management and decision support tool developed and owned by Northpointe (now Equivant) used by U.S. courts to assess the likelihood of a defendant becoming a recidivist.

Read

- Read "When an Algorithm Helps Send You to Prison" (NY Times, 10/26/17)
 - https://www.nytimes.com/2017/10/26/opinion/algorithm-compas-sentencing-bias.html
- Reflect in groups:
 - What ethical issues related are evident in this case study?
 - Imagine you are Timothy Brennan, Northpointe founder and CEO, and you wanted to make sure you were doing all you could to address any possibility of your COMPAS AI software exhibiting and amplifying biases within the US criminal justice system/
 - How would you go about organizing a Northpoint response to evaluate and address the fairness of COMPAS software while still protecting customer and investor confidence, as well as the intellectual property associated with your advanced AI product?
- Share with class

Week 6

- Present your Signature Assignment in class
- Other end-of-course activities