Business Application – Acquisition, Development & Implementation

(Chapter - 5 : DISSA Course) **- RPA + AI**

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Technology Coverage- Chapter 5

- RPA – Key apps
- RPA vs AI
- Hyperautomation
- Neural networks
- NLP
- Voice Synthesis & Recognition
- ML
- Cognitive thinking
- AI system overview

Technology – lever for change

"At least 40% of all businesses will die in the next 10 years... if they don't figure out how to change their entire company to accommodate new technologies."

— John Chambers, Executive Chairman, Cisco System

RPA – Capabilities

Robots are…

Computer coded software

- Non-invasive, zero change integration on target system and security
- Operate on top of other existing software

Mimic interactions of users

- Record and automate user interactions with one or more software applications
- Interact with the user interface (UI) of existing applications in the same way that an everyday user would

Work cross-functional and cross-applications

- Are entirely technology agnostic and can be used with any application (e.g. ERP, DB, MS Suite, ASCII file, structured PDF, thin clients such as Citrix)
- Use a central repository for easy management of automation scripts and processes

Enable the automation of repetitive, rule-based processes

- Build workflows with dynamic decision/branch points and loops for scaling (up/down)
- Ability to granulize processes into smaller components to allow reusability

RPA – Input & Output

What can it do?	What does it need?
• Match invoices to PO's	• Electronic documents
• 'Read' contracts	• Structured Data
• Continuously check if transactions are still 'in compliance'	• Rules-based processes
• Send and receive messages	• Reprogramming when circumstances change
• Compare records or tables across multiple applications	• User access rights across applications
• 'Learn' how to respond to events or occurrences	• Programming on how to deal with events or occurrences
• Automate activities across an end-to-end process	• Re-engineering of processes to efficiently apply the 'bot'

RPA in Accounts (SAP ERP)- Case Study

- How to use RPA to automatically upload invoices to Sharepoint website to be paid.
- **Process flow**
- *Priya works in Accounts Receivable, she's responsible for uploading her company's invoices to a Sharepoint website for their customers to pay.*
- *She normally processes each invoice manually, which takes 5-10 minutes per invoice depending on the customer.*
- *In current-state (pre-RPA) process, she has to separate Excel files from xml files (in a folder created automatically by SAP),*
- *zip the xml files (invoices) &*
- *upload these invoices to a Sharepoint website for their customers to access.*

SAP –ERP process

- *SAP automatically saves invoices to a specific network folder, depending on customer.*
- *Priya opens Explorer & navigates to the folder created for today's invoices.*
- *She selects all xml files, being sure to not choose any Excel files.*
- *She zips these xml files into one folder.*
- *While Windows zips the folder, she waits.*
- *When folder is zipped, she navigates to appropriate website to upload files.*
- *She logs into the website.*
- *She uploads the newly created zip folder containing invoices to be paid.*
- **Tedious work, performed by multiple employees every day for numerous customers.**
- *50+ clicks required before RPA.*

Post –RPA : UiPath

1. *SAP automatically saves invoices to a specific network folder, depending on customer.*
2. *Priya starts the **UiPath AR robot.***
3. *UiPath asks Priya to choose the correct folder for today's invoices (folders change daily).*
4. *UiPath then automatically navigates to the folder that she has chosen.*
5. *UiPath searches for and then selects all xml files.*
6. *UiPath zips all xml files to one folder on the desktop.*
7. *A pre-set delay allows Windows enough time to zip the folder (zip time depends on number of files).*
8. *UiPath navigates to company's invoice site, logs in with Priya's username & password, chooses "upload file" , uploads zip folder full of invoices.*
9. *After uploading, UiPath deletes zip folder from the desktop to reduce desktop clutter.*

- Above steps (1-9) = few clicks button , saving avg of 7 mins per invoice

RPA Usage

Industries	% of RPA Solutions
Banking, Financial Services & Insurance	51 %
Business Process Outsourcing (BPO)	14 %
Manufacturing – Consumer Packaged Goods (CPG)	7 %
Professional, Legal & Accountancy Services	7 %
Retail Trade	7 %
Technology (IT, Internet, SAAS)	7 %
Utilities	7 %

RPA vs AI

- **AI + RPA: Enabling End-to-End Automation,** support complex use cases
- Enables robotic workforce with more human like capabilities,

❑ Reading, by utilizing OCR (Optical Character recognition) & text analytics.

❑ Listening, by utilizing NLP (Natural Language Processing) & Voice Analytics.

❑ Communicating by using chatbots, both text & voice enabled.

- RPA uses structured inputs & logic,
- AI uses unstructured inputs & develops its own logic.
- RPA = the beginning of AI in an enterprise.

Hyperautomation

- *extension of legacy business process automation beyond confines of individual processes.*
- *Combining AI tools with RPA,* ***hyperautomation*** *enables automation for virtually any repetitive task executed by business users*
- **Gartner :** RPA enriched by AI & ML = core enabling technology of hyperautomation

Computers versus humans

- Computer can do better than humans
- Adding a thousand four-digit numbers
- Drawing complex, 3D images
- Store & retrieve massive amounts of data
- Humans can do much better =

Computer would have difficulty:
- identifying the cat,
- matching it to another picture of a cat.

Human vs. Computer

	Human Brain	Computer
Speed	Neurotransmitters travel at about 1000 ft/second	Electrons at speed of light
Memory	Roughly 100 billion neurons - about 50 trillion bits	Super computers approach this limit
Connectivity	Each neuron connected to 1000 others (roughly)	Perhaps 100 parallel processors

AI

'Artificial intelligence is the science and engineering of making intelligent machines, especially intelligent computer programs.' – John McCarthy, father of AI

- Thinking humanly
- Thinking rationally
- Acting humanly
- Acting rationally

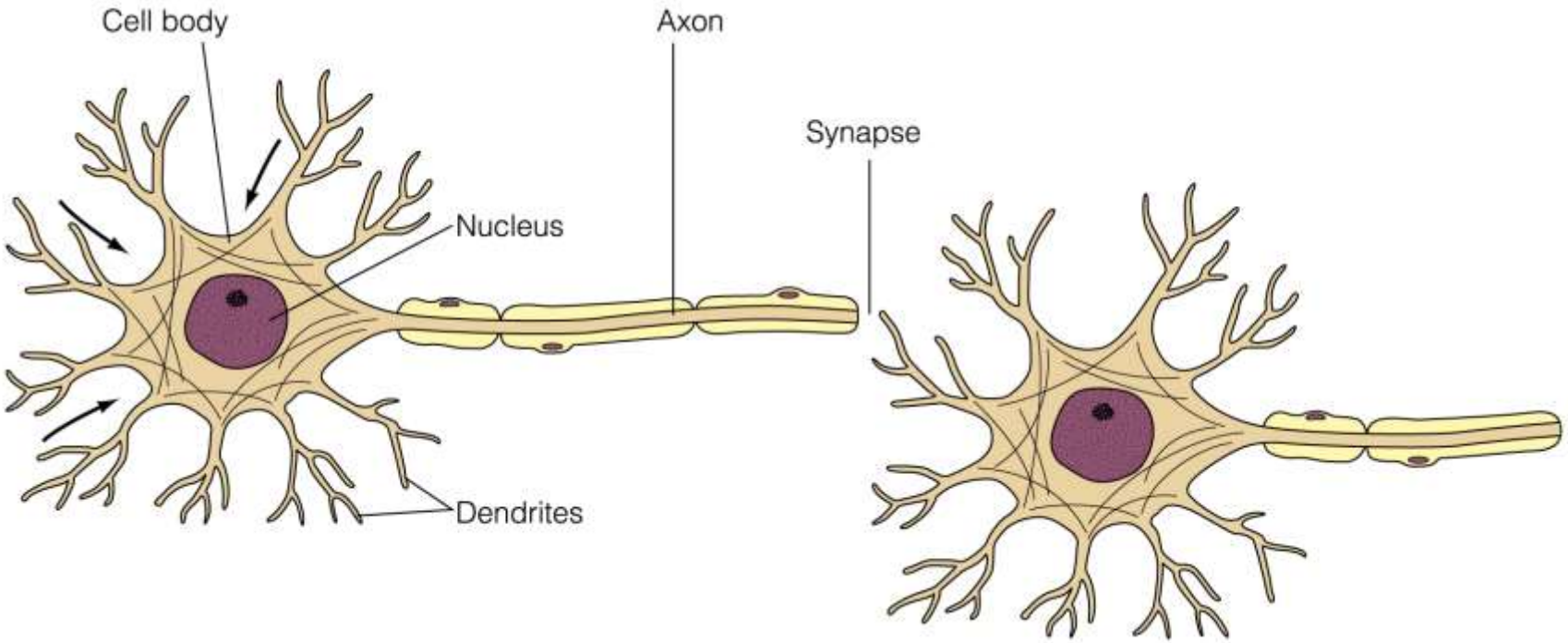
AI : Capabilities

- Pattern recognition
- **Face recognition**: Pose, lighting, occlusion (glasses, beard), make-up, hair style
- **Character recognition**: Different handwriting styles.
- **Speech recognition:**
- **Medical diagnosis**: From symptoms to illnesses
- **Web Advertizing**: Predict if a user clicks on an ad on Internet.

Artificial Neural Network

Artificial neural networks

Computer representation of knowledge that attempts to mimic neural networks of the human body



A biological neuron

Neural network

Biological neuron has multiple **input tentacles** = dendrites

1 primary **output tentacle** = axon

The gap between an axon & dendrite is called **synapse**

- A neuron accepts multiple input signals & controls contribution of each signal

Neural Network

Neuron

A single cell that conducts chemically-based electronic signal

At any point = neuron in either an **excited** state or **inhibited** state

Excited state

Neuron conducts a **strong signal**

Inhibited state

Neuron conducts a **weak signal**

A series of **connected neurons** forms a pathway

A series of **excited neurons** creates a **strong pathway**

As we learn new ideas, new strong neural pathways in our brain are formed

Natural Language Processing (NLP)

• 3 basic types of processing going on during human/computer voice interaction

1. Voice recognition—recognizing human words
2. Natural language comprehension—interpreting human communication
3. Voice synthesis—recreating human speech

Voice Synthesis

Technique 1. Dynamic voice generation

•Computer examines letters that make up a word &

•produces the sequence of sounds that correspond to those letters

•**in an attempt to vocalize the word**

Voice Synthesis

Technique 2 : Recorded speech

Large collection of words recorded digitally & individual words are selected to make up a message

Since words are pronounced differently in different contexts, some words may have to be recorded multiple times

Example, a word at the end of a question rises in pitch compared to its use in the middle of a sentence

Issues – voice synthesis

- mumbling, volume,
- regional accents,
- health of the speaker
- Pitch , resonance

Voice Recognition

Voiceprint

Human *trains* a voice-recognition system by speaking a word several times so = computer gets an average voiceprint for a word

What is Learning?

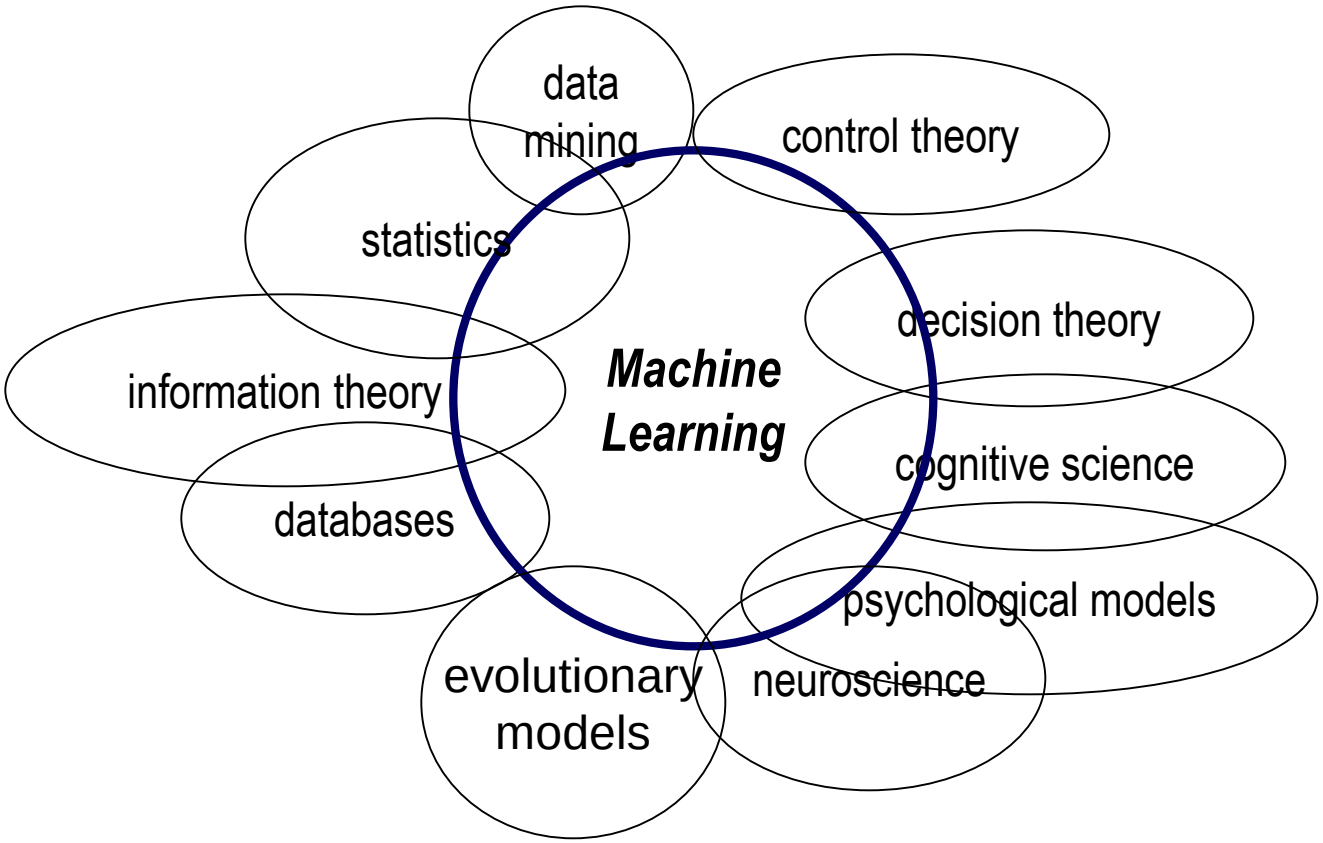
- *"Learning denotes changes in a system that ... enable a system to do the same task … more efficiently the next time."* - Herbert Simon
- *"Learning is constructing or modifying representations of what is being experienced."* - Ryszard Michalski
- *"Learning is making useful changes in our minds."* - Marvin Minsky

*"**Machine learning** refers to a system capable of the autonomous acquisition and integration of knowledge."*

Machine Learning- major avenues

- **No human experts interface**
  - industrial/manufacturing control
  - drug design, astronomic discovery
- **Human expertise- Simulation**
  - face/handwriting/speech recognition
  - driving a car, flying a plane
- **Rapidly changing phenomena**
  - credit scoring, financial modeling
  - diagnosis, fraud detection
- **Need for customization/personalization**
  - personalized news reader
  - movie/book recommendation

ML = Related Fields



Machine learning = primarily concerned with accuracy &effectiveness of the *computer system*.

Intelligent Automation

Combining Computer intelligence with human-like physical capabilities :

- ✓ Visual perception
- ✓ Dexterity
- ✓ Locomotion
- ✓ Sensors
- ✓ Touch capabilities

IS Auditor 's role : to review

1. Advise on improving operational efficiency in front/middle/back office functions- handle data complexity, disparate systems
2. cutting costs, streamline automated processes, migration
3. enhancing overall customer satisfaction across value chain.

3 Levels

Robotic Process Automation

- Screen scraping data collection
- Rules based business process management
- Tactical toolset to automate repetitive tasks
- Cheaper and faster step towards process efficiency

Intelligent Automation

- Data input and output in any format
- Pattern recognition within unstructured data
- Replication of judgment based tasks
- Basic learning capabilities for continuous improvement to quality and speed

Artificial Intelligence

- Natural language recognition and processing
- Dealing with unstructured super data sets
- Hypothesis based predictive analysis
- Self-learning rules continuously rewritten to improve performance

✓**Cognitive Science- how human brains** :
✓Thinks, Reasons,
✓Analyses, Learns, Predicts

Class 1 – Basic Automation (RPA)

- operate **on presentation layer of business applications without interfering** with the underlying IT architecture.
- processes **structured data (spreadsheets, data present in relational databases, etc.), rule-based and transactional tasks** by mimicking human actions.
- **Class 2 – Enhanced Automation (Intelligent Automation)**
- Uses data extraction techniques augmented with ML capability **to ingest unstructured data (scanned document images, PDF and scanned handwritten images)** with a higher **accuracy rate & confidence as compared to OCR**
- **Pattern recognition**

Class 3 – Cognitive Automation (AI)

Uses sophisticated AI technologies :

- **Natural Language Generation,**
- **Speech Recognition,**
- **Computer Vision**, etc., to ingest super data sets , perform cognitive tasks previously done by humans such as:

1. **reasoning,**
2. **perceiving,**
3. **interacting with the environment variables**
4. **and problem solving.**

AI= Duplicate intelligent (human) behaviour in computer systems

- **Cognitive solutions :** *advanced self-learning capabilities, advanced predictive analytics.*
- **Costly to develop and implement**, and **generally require a long lead time.**
- **IS Auditor :** assist in migration, adoption, operation, optimisation

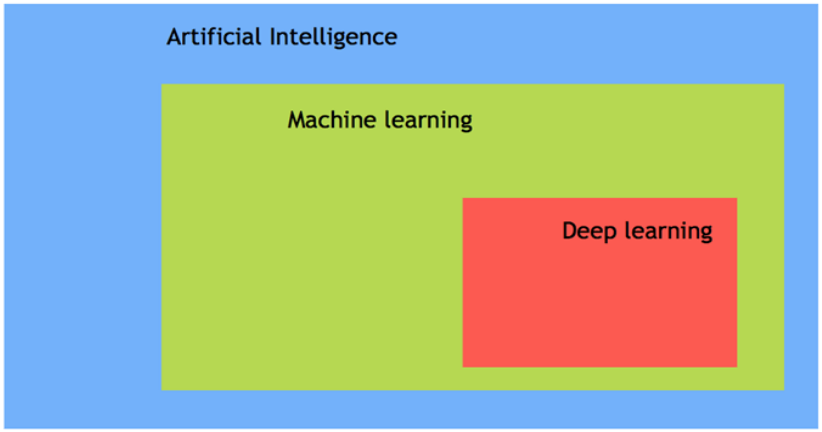
AI, ML, DL

- **AI = study of training machine (computers) to mimic human brain & it's thinking capabilities"**.
- **Benchmark for AI :** human intelligence regarding reasoning, speech, learning, vision & problem solving.
- AI focuses on 3 major aspects(skills):

✓ learning,

✓ reasoning &

✓ self-correction .



- **Machine Learning:** study/process which provides system(computer) to learn automatically on its own through experiences it had & improve accordingly without being explicitly programmed. **ML = application or subset of AI.**
- **Deep Learning:** sub-part of broader family of ML - use of **Neural Networks**(neurons working in brain) to mimic human brain-like behavior.
- DL algorithms focus : **information processing patterns** mechanism to possibly identify patterns just like our human brain does & classifies the information

Illustrations- DL, ML, AI

- AI = computer algorithm which exhibits intelligence through decision making.

❑ **Narrow AI**: machine can perform a specific task better than a human. Current research of AI is here

❑ **General AI**: AI reaches general state when it can perform any intellectual task with same accuracy level as a human

❑ **Active AI**: AI is active when it can beat humans in many tasks

- **AI applications** : Google's AI-Powered Predictions, Ridesharing Apps Like Uber, Commercial Flights Use AI Autopilot, etc.
- ML = AI algorithm which allows system to learn from data.
- **ML applications** : Virtual Personal Assistants: Siri, Alexa, Google, etc., Email Spam & Malware Filtering.
- DL = ML algorithm that uses deep(more than one layer) neural networks to analyze data & provide output accordingly.
- **DL applications** : Sentiment based news aggregation, Image analysis & caption generation, etc.

AI – Nature

- AI improves engineering through automated design generation, enabling lower total cost & lower risk in capital projects
- **Target Results :**

✓ less downtime,

✓ better product quality,

✓ reduced risk,

✓ increased overall efficiency & profitability

- **AI vs Job losses – Estimated net impact**
- Forbes = 75 million jobs displaced by 2022 due to AI
- 133 million new jobs expected to be created,
- net increase of 58 million additional jobs in next 3-4 years.