AICML Machine Learning Proficiencies

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What is Machine Learning?

- Machine Learning provides means to learn from large data, interpret the trends in the data and **adapt to the data** as opposed to static programs

Learn from experience – Adapt to environment

machine learning

- Medical image analysis
- Filtering data for analytics
- Control robot in unknown environment

NOT machine learning

- Accounting program
- Querying a database
- Control welding robot in manufacturing

Select AICML Methodologies - Overview

- **Data Analytics & Visualization** (structured, semi-structured & unstructured data)
- **Natural Language Processing** (NLP)
- **Semantic/Contextual Search**
- **Social/Information Networks & Behavioral Analysis**
- **Artificial Intelligence & Robotics**
- **Informatics**
- **Game Theory & Opponent Modeling**
- **Pattern Recognition**
- **Imaging**
- **Fraud Detection**
- **Process Optimization & Improvement**

Select AICML Methodologies - Utilization

- **Data Analytics & Visualization (structured, semi-structured & unstructured data)**
  - Data analytics is applied to data for defining pattern identification, associations, classification, clustering and prediction about the future
  - Visualization is applied to the results of data analytics to better understand the results in visual form
  - Structured data is organized in an explicit pre-defined data model
  - Semi-structured is organized in a less rigid data model that could be implied
  - Unstructured is information that is not in a pre-defined model and can consist of text (i.e., Word documents, etc.) or non-text (i.e., images, etc.)
- **Natural Language Processing (NLP)**
  - Provides the ability to interpret, translate and understand both written and spoken languages and derive insights
  - Can interact with humans including nuances of human interaction

Select AICML Methodologies – Utilization

- **Semantic/Contextual Search**
  - Can deduce the semantic/contextual meanings from data that includes both words and numbers so analytics can be derived

- **Social/Information Networks & Behavioral Analysis**
  - Used to model relationships in data
  - Can determine interactions as well as actions between entities such as people, proteins, infectious diseases, crime networks, telecommunications participants, etc.
  - Identifies how groups are formed, which elements are important (i.e., leaders, followers and outliers) and what are the important relationships

Select AICML Methodologies – Utilization

- **Artificial Intelligence**
  - Man machine interfaces (i.e., human nerve endings controlling computers and equipment.)
  - Modelling, interpreting and exhibiting emotions
- **Robotics**
  - Intelligence to recognize objects, environment, location and planning movements
  - Control and manipulation of machines and objects
- **Informatics**
  - Study of complex systems and information including structure, algorithms, behaviors and interactions
  - Examples are health, geographic/spacial, business intelligence, materials and engineering

Select AICML Methodologies – Utilization

- **Game Theory & Opponent Modeling**
  - Game theory is used in dynamically (real-time) changing environments to identify scenarios, responses & strategies to or collaborations with opponents and/or partners
  - Optimization of decisions within a competitive environment
  - Modeling of opponents can be utilized with complete or incomplete information

- **Pattern Recognition**
  - Utilized to find patterns where none are evident either because they are non-obvious or the data is too massive to comprehend
  - Useful with complete or incomplete data
  - Classification of data
  - Can be supervised (training data available) or unsupervised (no training data is available) learning

Select AICML Methodologies – Utilization

- **Imaging**
  - Currently applied to radiology (MRI) to find regions of interest as well as changes in shapes and size of features within the image
  - Can also predict changes in images
- **Fraud Detection**
  - Identifying collusions between non–evident parties
  - Detecting environments that are at risk of fraud
- **Process Optimization & Improvement**
  - Elasticity of pricing
  - Coordination and timing of processes
  - What if scenarios
  - Inventory management

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