Diploma in Artificial Intelligence

Python

- Collect, manipulate and mine data sets to meet the organizational need
- Select and apply appropriate artificial intelligence and machine learning techniques and algorithms that meet the needs of a specific operational/business process
- Design and apply data models that meet the needs of a specific operational/business process.
- Develop software applications to manipulate data sets, correlate information and produce reports.
- Create stunning data visualizations with matplotlib, folium and seaborn
- Knowledge about data structures, control structures, creating user-defined functions and lambda expressions in Python

Statistical Modelling and Inference

- Demonstrate understanding of fundamentals of the regression
- Demonstrate understanding of variable selection and penalized likelihood
- Demonstrate understanding of Bayesian regression and its fundamentals.
- Demonstrate understanding of Bayesian computation
- Ability to analyze data and fit linear regression models using Python
- Demonstrate skills in probabilistic supervised and unsupervised learning
- Ability to use graphical models as per the given data science problem
- Ability to use Gaussian processes for regression and classification

Maths for Data Science

- Demonstrate understanding of basic mathematical concepts in data science, relating to linear algebra, probability, and calculus
- Employ methods related to these concepts in a variety of data science applications
- Apply logical thinking to problem-solving in context
- Use appropriate technology to aid problem-solving and data analysis
- Demonstrate skills in writing mathematics
- Identify suitable existing methods of analysis, if any, and assess their strengths and weaknesses in the context of the problem being considered

Machine Learning

- Select and apply appropriate artificial intelligence and machine learning techniques and algorithms that meet the needs of a specific operational/business process.
- Design and apply data models that meet the needs of a specific operational/business process.
- Design machine learning and associated algorithms that can address one of the real world problems that they selected for the experiment
- Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issue
- Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies
- Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques

Advanced Analytics

- Construct data models and prototypes needed to gain stakeholder support or achieve business objectives
- Create effective mathematical solutions to analytical problems
- Create effective solutions to computing challenges in analytical projects
- Effectively organize and manage datasets for analytical projects
- Critique the role of information and analytics in supporting business processes and functions

Step Presentation (Step 1)

- Demonstrate the ability to apply the concepts of Python to a live dataset.
- Demonstrate the ability to extract inference and statistical insights from available data.
- Demonstrate the ability to apply the theoretical concepts of Statistics and Mathematics studied in semester 1 to a data science problem
- Demonstrate the ability to convert business problem into statistical problem; and then apply programming, maths, stats to find out a statistical solution; and finally convert the statistical solution

Machine Learning - Part 2

- Identify the characteristics of datasets and compare the trivial data and big data for various applications.
- Understand machine learning techniques and computing environment that are suitable for the applications under consideration
- Design machine learning and associated algorithms that can address one of the real world problems that they selected for the experiment.

- **Understand how to apply a variety of learning algorithms to data**
- **Optimize the main trade-offs such as overfitting, and computational cost vs accuracy**
- **Understand how to perform evaluation of learning algorithms and model selection**

Data Visualization

- **Apply data visualization best practices to their work, including choosing the right chart type for the situation and avoiding visualization techniques that can mislead an audience**
- **Act as a data-driven visual storyteller for optimal presentation of trends, patterns and insights.**
- **Effectively communicate insights about data in various formats, including oral presentations, written reports and interactive visualizations**
- **Prepare professional business reports and make effective client presentations of their work**
- **Create multiple versions of digital visualizations using various software packages**
- **Identify appropriate data visualization techniques given particular requirements imposed by the data.**
- **Detect and understand the stories within datasets and extract insights from that data.**
- **Effectively present data visually to enhance audience comprehension of findings and insights**

Data Storytelling Techniques

- **Make stories that highlight value from data-driven insights**
- **Design intuitive visuals that are easy for the audience to interpret**
- **Present findings through stories**
- **Explain the importance of communication skills and competencies for individuals who serve as data analysts.**
- **Demonstrate the ability to create charts with greater complexity.**
- **Use analogies and examples to support a narrative**

Deep Learning

- **Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains**
- **Implement deep learning algorithms and solve real-world problems**
- **Understand the key fundamentals associated with Deep Learning and Deep Network architectures for Machine Learning.**
- **Understand the evolution of Deep Learning from Artificial Intelligence and Machine Learning.**
- **Explore the meaning, process, and types of neural networks with a comparison to human neurons**
- **Identify the platforms and programming stacks used in Deep Learning**

Data Science Project Management and Requirement Gathering

- **Plan end to end data science projects including activities involved, dependencies, external/internal resource needs and skills requirements**
- **Manage stakeholder expectations on the delivery of data science projects**
- **Manage data science team and ensure alignment to larger project/program objectives**
- **Plan communications on status reporting of data science projects with details of all activities.**
- **The major steps involved in practicing data science, from forming a concrete business or research problem, to collecting and analyzing data, to building a model**

Step Presentation (Step 2)

- **Demonstrate the ability to apply the machine learning algorithms on the cleaned data.**
- **Demonstrate the ability to perform data visualization on the data available**
- **Demonstrate the ability to present insights from modelling to a data science problem**
- **Demonstrate the ability to convert business problem into statistical problem; and then apply programming, maths, stats to find out a statistical solution; and finally convert the statistical solution**

Computer Vision

- **Identify basic concepts, terminology, theories, models and methods in the field of computer vision**
- **Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.**
- **Describe the scope of challenges and applications addressed by computer vision.**
- **Develop and apply computer vision techniques for solving practical problem**
- **Design and develop practical and innovative image processing and computer vision applications or systems**
- **Analyse cognitive tasks including image classification, recognition and detection**

Natural Language Processing

- **Know the structural features of natural language texts and the principles of their computer processing in order to obtain linguistic (morphological, syntactic, semantic) information**
- **Understand the limitations of existing computer models of natural language processing.**
- **Apply the existing NLP systems, determine the advantages and disadvantages of these systems, evaluate and compare the results of their work**
- **Solve specific NLP tasks, which may involve programming in Python, as well as running experiments on textual data.**
- **Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.**

- Understand the complexity of speech and the challenges facing speech engineers.
- Apply these mathematical models and algorithms in applications in software design and implementation for NLP

Programming and Deployment of IoT Devices

- Explain the definition and usage of the term "Internet of Things" in different contexts
- Understand the key components that make up an IoT system
- Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack
- Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis
- Appreciate the role of big data, cloud computing and data analytics in a typical IoT system
- Examine the potential business opportunities that IoT can uncover

Tools for AI

- Understand basic concepts of how a database stores information via tables.
- Understand SQL syntax used with MySQL.
- Learn how to retrieve and manipulate data from one or more tables
- Work with Kubernetes in order to create Pods, deployments as well as services
- Understand the concepts surrounding Docker Volumes as well as Docker networks.
- Work with Data Lake technologies to store and process data

Deployment of AI Solutions

- Implement various test processes for quality improvement
- Apply the software testing techniques in commercial environment.
- Use practical knowledge of a variety of ways to test software and an understanding of some of the tradeoffs between testing techniques.
- Explain DevOps and what its architectures are.
- Explain what a retraining pipeline is and how it can be used.
- Implement some of the best AI Ops best practises
- Deploy of AI products on the Cloud

Industry Internship

- This will be hands on experience with real data from industry and help students to get work on real-world problems and case studies