

Syllabus of "Big Data Systems" Master

1- Data Warehousing

Outline Syllabus

1. Introduction to data warehouse
2. Data warehouse architecture.
3. Multidimensional model.
4. Data warehouse Optimization.
5. OLAP operations.
6. Building data warehouse.
7. Real-Time data warehouse.

2- Statistics and Data Analysis

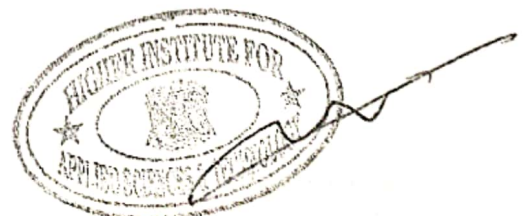

Outline Syllabus

1. About descriptive analysis
2. Some known models
3. Parameter estimation and confidence intervals
4. Model validation
5. Practical work

3- Machine learning

Outline Syllabus

1. Introduction
2. Learning to classify
3. Learning to predict numeric values
4. Evaluating learning procedures
5. Over fitting and the 'bias-variance trade-off'
6. Applications of machine learning
7. Clustering
8. Association rules mining
9. Reinforcement learning: Q learning



10. Multiple learners: Bagging, boosting, forests and stacking

4- Cloud Technologies

Outline Syllabus

1. Introduction to cloud computing paradigm
2. Cloud computing fundamentals
3. Cloud architecture design
4. Cloud applications and cloud programming
5. Advanced cloud computing

5- Big Data Basics

Outline Syllabus

1. Introduction to Big Data
2. Storing Big Data
3. Processing Big Data
4. Tools and Techniques to Analyze Big Data
5. Developing a Big Data Strategy
6. Implementing a Big Data Solution

6- Security and Privacy in Big Data Systems

Outline Syllabus

1. Review:
2. Secure pairing (preserving anonymity of aggregated data).
3. Privacy protection and personal data access protection.
4. Effects of big data characteristics (Variety – Volume – Velocity – Veracity – Volatility) on security and privacy.
5. Cloud security.
6. Example use cases for security and privacy.
7. Taxonomy of security and privacy topics.



7- Mining in massive data set

Outline Syllabus

1. Data mining introduction.
2. Map reduce and the new software stack.
3. Classification and regression.
4. Finding similar items.
5. Mining data streams.
6. Links analysis.
7. Frequent itemsets.
8. Clustering.
9. Dimensionality Reduction.

8- Text Analytics

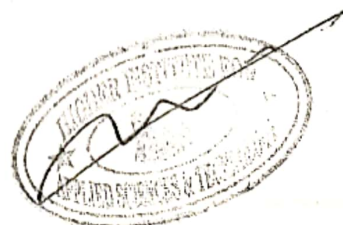
Outline Syllabus

1. Introduction to text mining,
2. Text representation and turning into features
3. exploratory analysis:
4. Develop prototypes for identifying the entities mentioned in text, the relations between them, and the opinions expressed about these entities.

9- Forecasting and time series

Outline Syllabus

1. What Is Forecasting
2. Forecasting Time Horizons
3. The Strategic Importance of Forecasting
4. Forecasting Approaches
5. Time-Series Forecasting
6. Associative Forecasting Methods: Regression and Correlation Analysis
7. Monitoring and Controlling Forecasts



8. Adaptive Smoothing
9. Focus Forecasting
10. Forecasting in the Service Sector

10- Non-Relational Models

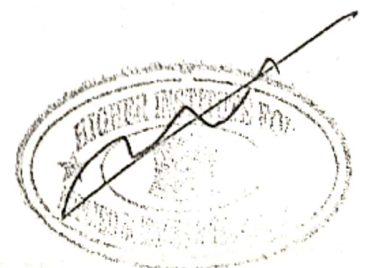
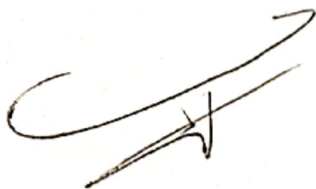
Outline Syllabus

1. Object based models
2. Object oriented model
3. Object relational model
4. Persistent object oriented programming language
5. Semi structured models
6. XML
7. JSON
8. Unstructured models
9. Information retrieval
10. Text mining
11. CAP theorem
12. Use cases
13. Limitations
14. New SQL
15. Polyglot persistence

11- Data Visualization

Outline Syllabus

1. Introduction (definition and uses)
2. Elements of Visualization Techniques
3. Classification of Visualization Techniques
4. Techniques for Point Data
5. Techniques for Scalar Entities
6. Techniques for Vector Entities
7. Other Visualization Techniques (Image Processing, Animation)
8. Interaction Techniques



9. Perception of 3D
10. Future Trends

12- Advanced Web Technologies

Outline Syllabus

1. Introduction to Java web technology: servlets
2. Relational databases, DAOs and domain classes
3. JSP and JavaBeans
4. XML and JDOM
5. Web application architectures and server-side frameworks
6. Mappings and bindings
7. Web services
8. JavaScript, AJAX, libraries and client-side frameworks
9. Miscellaneous

13- Social network analysis

Outline Syllabus

1. Hello Android.
2. GUI Building.
3. Graphics.
4. Handling and persisting data
5. Rich applications.
6. Google Play Store.

14- High Performance Computing

Outline Syllabus

1. Parallel computers



2. Modern processor architecture
3. Basics of parallelization
4. Shared-memory parallel programming with OpenMP
5. Distributed-memory parallel programming with MPI
6. Hybrid parallelization with MPI and OpenMP
7. Topology and affinity in multicore environments
8. Parallelization techniques
9. Numerical applications
10. Practical Work

15- Methodologies of Scientific Research Outline Syllabus

1. Nature of Science and Characteristics of Scientific Knowledge
2. Classification of Sciences
3. Role of Logics and Mathematics in Science
4. Structure and Process of Scientific Research
 - a. Key Concepts and General Approaches
 - b. Typology of Scientific Research
 - c. Methodological Considerations
5. Scientific Progress and Epistemology of Science

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