Computer Aided Decision Systems Industrial Practices using Big Analytics

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Lecture 53

Summarizing the Course

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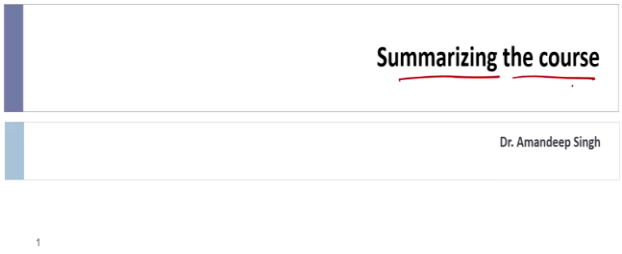

Welcome to the last lecture of the course. I want to try to summarize what we discussed in the 12 weeks in this course.

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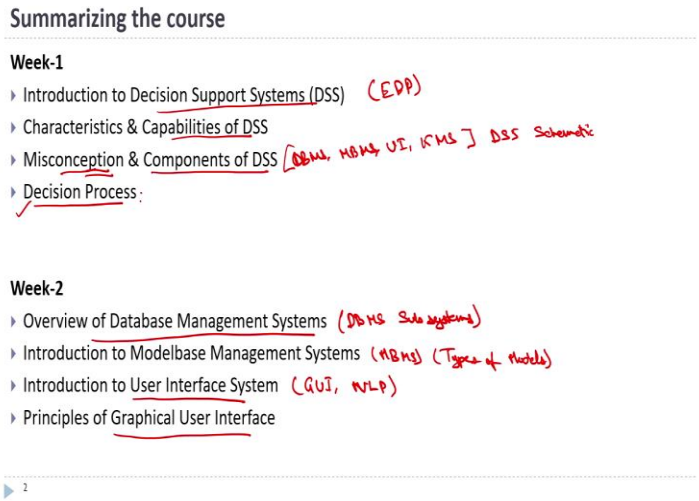

Week 1 had a first lecture where,

- We introduced the Decision Support systems, how the Computer Aided Decision Support systems required or related to the present world scenario, the concepts of the Decision Support systems , some history about it, that is the time historic progression was discussed. Then, acceptance of DSS both in industry and academia. Then, users of Decision Support systems and the components of DSS were discussed in the first lecture itself, where we also gave introduction to the term EDP (Electronic Data Processing) that is when we have an initial form, then, what are the main characteristics of this form.
- Then, the lecture 2 was about the characteristics and capabilities of the Decision Support systems were different characteristics such as the DSS access data, variety of sources. Then, less well-structured data and development and evaluation of a model at a given time for the given process. Certain characteristics like the overview of the capabilities of the DSS were also discussed.
- Lecture 3 in the week one shed a light on the misconception and some components of DSS. The misconceptions of DSS is sometimes thought as the DSS only required at the top levels or DSS is completely independent or DSS is the only thing that is to be managed by the top tier people or only the IT people only. No, for the Decision Support systems. The whole organization has to participate, the people have to understand what data they are recording, where that we used. What are the future implications or uses of this data? So, that was

discussed here in lecture 3. And, components of DSS such as the Database Management System, Model-based Management Systems. DBMS then, MBMS then, User Interface and Knowledge Management Systems. These were introduced in lecture 3 and a DSS schematic was also given in which, the Internal Data Storage is the internal or external data that is there. How does it communicate with the data management?

- And finally, what is the Decision Support systems schematic, what is a decision process and various steps in it, these were discussed in the lecture 4 of week 1. In which the kinds of the decisions such as independent decisions, Sequential Interdependent decisions or Pooled independent decisions, those were introduced. Then, major phases of this are the Intelligence Phase, Design Phase and Choice Phase, those were given. For decision making from the management viewpoint and the resources which are required, then, measuring the success, how to develop a model decision making process for the structured and unstructured problem. All were discussed in lecture 4, which concluded week 1.

Week 2 started with the,

- Overview of Database Management Systems. In which the User Interface Database Management System, Knowledge Management Systems and Model-based Management Systems which were introduced in the lecture 3 of week 1, were more detailed and specifically what is DBMS and its subsystems. These were talked about in the lecture 1 of week 2 and collection of the data, what is database, what is data, major functions of the DBMS then, the structure of DBMS, these are all taken in the first lecture.
- The second lecture continued to the MBMS. It is a Model-based Management System, in which the modeling language and model Integration and execution, how does this take place are discussed. The types of the models could be Strategic, Tactical, Operational, Analytical, those are all discussed here. The certain examples were given by Professor Philip like a tactical model could be one that could have a time interval usually less than one year. So, what tactics are to be their strategic model or something for the long run.
- So, week 2, lecture 3 talked about the User Interface System. In the User interface, the GUI (Graphical User Interface) then, Natural Language Processing (NLP) and its capabilities, these were discussed. The UI design the dialect for GUI, these are all taken.

- Lecture 4 talked about the GUI in more detail where the User Interface System for DSS was taken and the user in control the consistency, personalization or customization of information, these were all taken.

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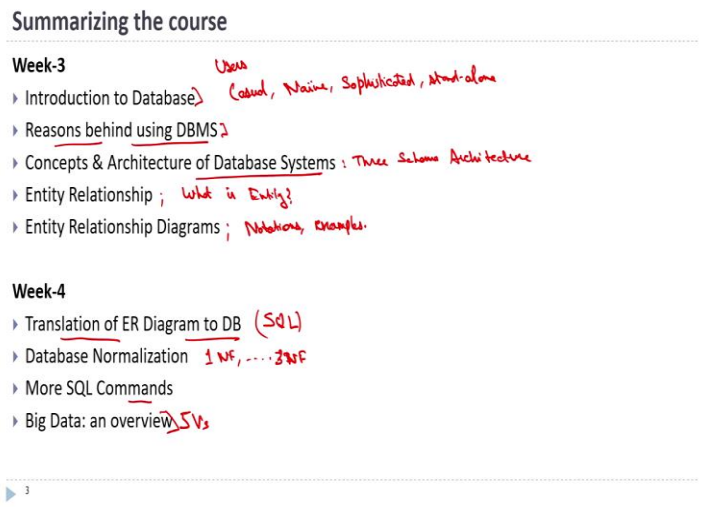

Week 3 started with,

- Introduction to the Database, what database was taken there and database technology history characteristic of database approach and database users, that is the user could be casual, those who are naive then, sophisticated and stand alone. So, what are these kinds of users and what are their behaviors? And accordingly, what we need to design these are all discussed.
- The second lecture in week 3 talks about why we really need the DBMS. That is the reason behind using DBMS. In which the question started from why even not to use DBMS, that is the cost is rising, the number of users are rising, the users need the data which has to be stored. So, it started from here and it discussed the reasons for the Database Management System. Why do we really need it? An example of a company environment was given in this lecture.
- Then, the concepts and architecture of Database Systems was given in the third lecture of week 3 where Data Models and the Schema instances for these were given. The difference

in schemas like diagrammatical display, the component or an object within a schema than database instances; these were all given the 3-Schema architecture was also given here.

- One of the most important points that started in week 3 was Entity Relationships. The ER relationship via the Database Application, the ER model, ER diagram, then, data requirements for it, these are all discussed starting from what is Entity. Then, what are Null Values and Key Attributes of the ER Models, these were discussed.
- The last lecture of week 3 talked more about Entity Relationship in which ER diagrams were given in various notations of ER diagrams were given notations and examples were given.

Then, for the computer decision service system because the ER diagram was very important. How to relate ER diagrams with our Database Management Systems, this was taken in week 4.

- Translation of ER to the database was taken as a topic of discussion in which the major definitions of the SQL (that is the Structured Query Language) they started here and Relational Database, the Cells, Rows, Tables. So, in SQL what are the different components those were taking.
- Lecture 2 started with Data Normalization. Data Normalization is very important because when we talk about the aggregation of the data, the first normal form, the second normal form, all these things were given, I would say that is first to third normal form. And, other normal forms were also discussed.
- Then, More SQL Commands were given in this week itself. Because SQL queries, such as updating something, deleting something or logging out, these are all taken in week 4.
- And, a brief introduction or overview to Big Data was given in week 4 by Professor Deepu Philip where the Vs are 5 Vs that is, Volume, Velocity, Variety Veracity and Volatility were discussed.

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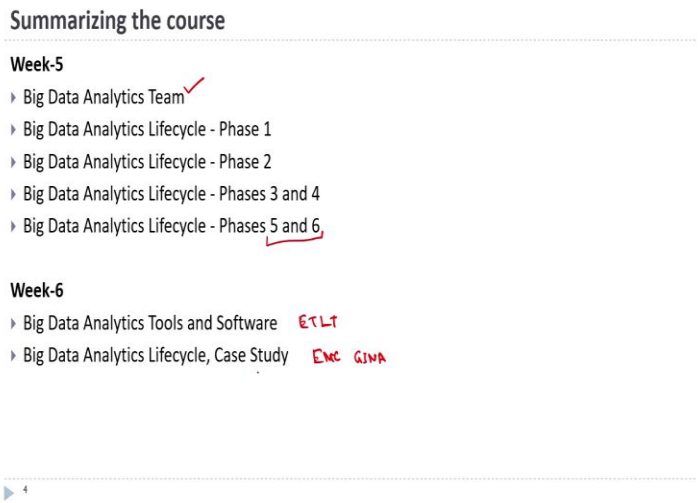

And, this was taken further in the next week,

- The Big Data Analytics team, what are the requirements for them? And, why do we really need a team? Because IT professional data scientists only generally understand coding. The data administrator mostly understands the overall targets. The investor or the funding agency, the one who has to fund, should also understand why the person is spending what is the final market value that will go into that. So that is why the team is required.
- So then, the lifecycle of the Data Analytics was discussed in this whole week, in which different phases were there. Starting from phase 1 to phase 5. Phase 1 was Discovery, phase 2 was the Data Preparation. Phase 3 was the Model Planning and phase 4 came as Model Building. And, Phase 5 and 6 were the Communicating the Results and Operationalizing. These were taken in the discussion in week 5.

Week 6, further discussed about the,

- Big Data Analytics Tools and Software's because nowadays multiple tools are available, we are ETLT, which is a combination of ETL and ELT that is Extract Transfer Load plus Extract Load Transfer that led to the Extract Transfer Load Transfer. This was discussed in week 6 and, taking examples of certain Big Data platforms such as Apache Hadoop, Apache Spark, then, Rstudio, Teradata, Microsoft, HDInsight, Microsoft Azure, these are

all taken by all the major players in Big Data which are there. These are all discussed in week 6 itself.

- And, a case study was taken in week 6, which discussed the AMCS, Global Innovation Network Analysis, EMC. GINA study on the influence of attending the different conferences, international conferences on the intelligence enhancement of the people or of the organization, this study was taken in week 6.

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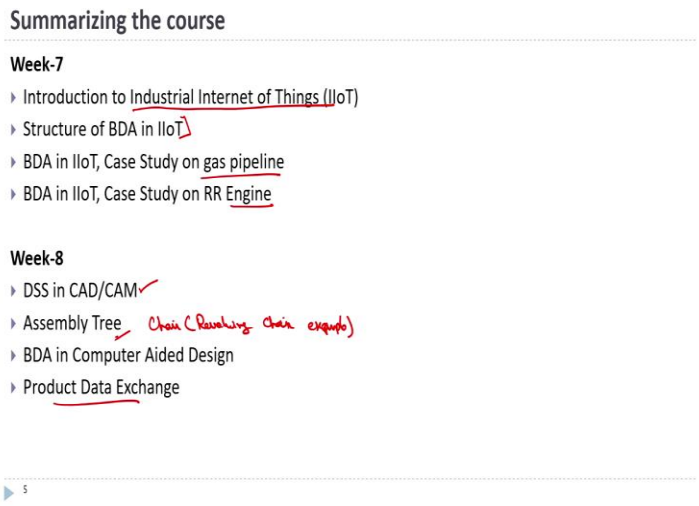

Week 7 started with,

- Introduction to IIoT, when we talked about the 4.0 industry. The Internet of Things and Industrial Internet of Things were very important to be discussed upon, which were taken in week 7, where the Introduction to IIoT was given and how Big Data Analytics is related to the IIoT. Starting from the Internet of Things only, how do the different layers or different phases of the structure of the IIoT these were taken. Starting from the very central computing to the layer where perception is taken, then, network, then, processing and finally application where smart manufacturing, smart homes, smart city, those things are all taken. These were discussed in the first lecture of week 7.
- Then, Big Data Analytics in the Industrial Internet of Things. This was discussed in the second lecture week 7 where Big Data takes the relations of it to different parts of the IIoT. That is the source of data sensors from where it should come. Then, analytics tools,

analytics methods, the needs of the types of analytics, these were taken in week 7, where the whole structure of Big Data Analytics while using in the IIoT environment were discussed.

- Further, a case study was taken for BDA in IIoT on gas pipeline leakage were different hardware, the software, the communication, the cloud, how are these connected and what are the sensors which are used, like 4 sensors, fiber optic sensors, physio electric sensor, those are all taken. Then, outcomes such as condition-based monitoring were possible and it fulfilled the needs of the people. Then, condition made monitoring means the plant which is running for the last 10 years with the old plants could also be refurbished. These were all taken that whole Big Data has helped to identify the point of the leakage that was taken.
- A very prominent case study is on the Rolls Royce engine, where pay per hour or pay for service that was taken in the last lecture of week 7, where a win-win scenario for the engine manufacturers or the engine service taker at the airliners, how are these connected? These were also discussed.

Week 8 started with,

- The role of Digital Support Systems in CAD/CAM that is Computer Aided Design and Computer Aided Manufacturing. So, where the DSS for the CNC programming or the NC programming was introduced, here ideas of design analysis and production are able to develop Geometric Modeling. These were looked upon, then, what is Geometric Modeling? Starting from the very base, what kinds of Geometric Modeling are there.
- Starting from the Wireframe Model, to Surface Model, to Soil Modeling and how an assembly tree is built, which goes against the decision tree for the manufacturing or a physical product. An example of a chair was given in a sample tree chair or revolving chair, this example was given.
- Then, Big Data Analytics in Computer Aided Design certain studies such as the box that triggered object recognition were taken.
- And in other, Product Data Exchange. And, what is Product Data Exchange? What is the need of the Product Data Exchange systems? Is there a direct and indirect relationship between the systems when a neutral file is there? That helps us to exchange the data

between 2 systems. That is, a CNC machine has to make a decision where to machine where the material is, where the negative space is, where the positive space is to be cut. So, all these things help. So, Decision Support Systems, that is the G-code or M-code is developed for Computer Aided Manufacturing. How is this taken from the Geometric Model that Decision Support Systems for a numerical control system or a computer numerical control system that was looked upon in week 8.

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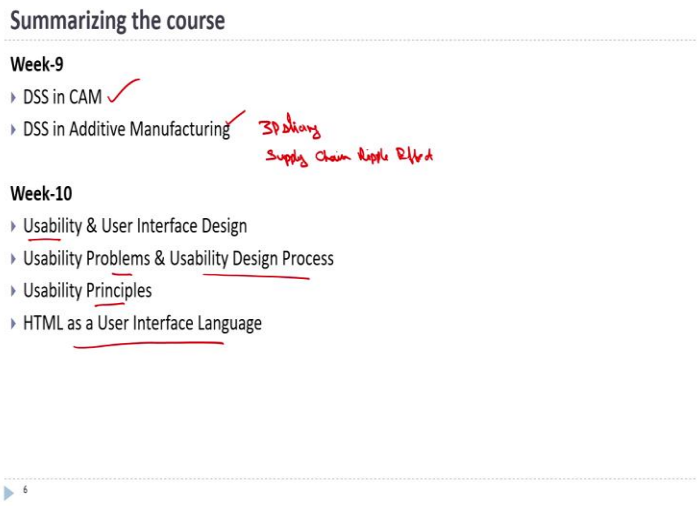

Week 9 further discussed about,

- DSS in CAM in which the GM encoded the Part Programming and Integrating CAD and CAM. The features of part programming tool path, the types of programming the language statements, these are all taken. Certain examples of path programming are absolute and incremental programming different from each other and what are the needs of those for different components this was taken as an example.
- In the second part of week 9 DSS for Additive Manufacturing. Additive Manufacturing where layer by layer the components or the material has to be added starting from the introduction to the different kinds of Additive Manufacturing Processes only. The 3D slicing concept of and what are the various steps you need to convert a requirement or a model to a final product. The algorithm for the 3D slicing choosing G-code was also given in this lecture. Then, Big Data Analytics in Additive Manufacturing, how is it related, how

are BDA and AM related? What are the risk controls? Finally, how does it help us to control the supply chain ripple effect.

Week 10 was taken by Professor Deepu Philip where he talked about the,

- Web-based Decision Support Systems, in which again the DBMS, the KBMS, MBS and User Interface were taken in which Ease of Learning, Ease of Use, which were discussed before were taken in the Usability Part. Then, for User Interface Design, Usability Engineering and why is not Usability Engineering being done regularly. The certain reasons were given for the benefits of Usability Engineering given to the user to the company to the designer. And, how do we plan for design? This was introduced in the week 10 lecture first
- And, second and third lectures also talked about the problems and Usability Design Process and Principles. So, majorly this week centered upon the Usability, and HTML as a User Interface Language was only introduced at the end of this week, where HTML as a Hypertext Markup Language where, basic outputs, inputs, formatting forms, links, morally introduced.

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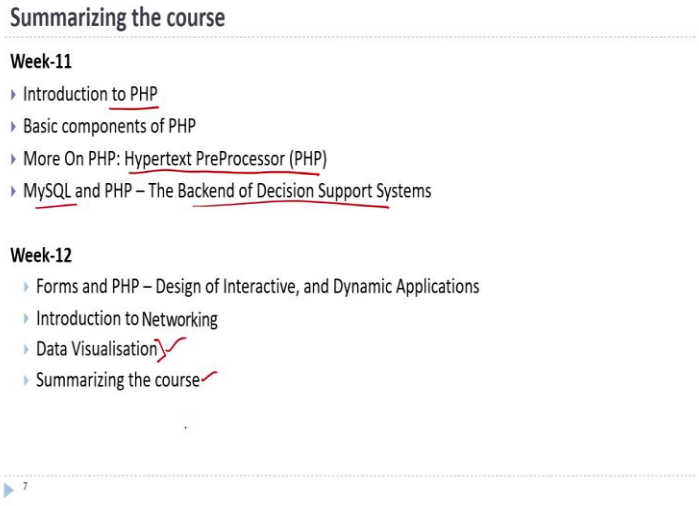

And, these were connected to a PHP program. PHP which is a Hypertext PreProcessor. That is HTML to PHP. How do we connect these HTML tags? What they can do, in week 11.

- Starting from the history from 1994 till date, how has PHP emerged as a long-used language. So, major uses of PHP and web servers support it. Now, the configuration of Apache plus PHP 5, which is now also coming into account, was also discussed. So basic PHP script, in which opening a tag, closing a tag, then, naming a file in HTML or PHP, how do we do, all the small commands were given in this week.
- Then, MySQL and PHP, that is the Backend of the Decision Support systems, was taken in the last lecture of week 11 where MySQL was a very popular language for open-source database systems. How is this important and MySQL certain facts that it can be scaled down to support embedded database applications, these are all taken. Then, connect MySQL with PHP, this was given as an example of a connection, was also given.

In week 12, various forms and PHP were also given, that is the HTML form, which is the data input to PHP, and the PHP processing form.

- These were taken in week 12 and displayed the results, that is HTML to PHP to finally display it these were taken in the second lecture week 12.
- Third and fourth lecture on Data Visualization where the use of data visualization, its framework, the different kinds of the data visualization tools, that is the kinds of the data, the types of data visualization do need to interact, do we need to present do we need to interact while having the feedback itself. Those were also given within examples here in the data visualization lectures.
- Then, this last lecture is where we summarize the course. With this the course on Computer Aided Decision Support Systems where industrial practices using Computer Aided Decision Support Systems is closing.

This will be definitely followed up with a course where the demonstration part will be more focused upon. For instance, if this course was only an introduction to the theoretical part where certain practices were given on HTML, PHP, certain tools were given for the CAM, Additive Manufacturing and Data Visualization was introduced. How to actually make use of them, using different languages, actually typing the PHP code and trying to have a visualization using the PHP further. So, this will be taken in the forthcoming courses.

I hope this course has given you a good introduction to the Decision Support Systems? What are the needs? Why do we need various structures of different concepts? And, why do we need a really planned lifecycle of Big Data Analytics? Any queries which are there you can post in the forum; we would be happy to cater all of them. Thank you.