

INTRODUCTION TO DATA ANALYTICS

Class #3

Multidimensional Data

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QUOTE OF THE DAY..



Without big data analytics,
companies are blind and deaf,
wandering out onto the Web like
deer on a freeway.

— *Geoffrey Moore* —

TODAY'S DISCUSSION...






- Multidimensional Data Model
- Data Cube
- Data cube aggregation
- Data cube segregation
- Data representation

QUESTIONS FROM MEASUREMENT SCALES






- Your toothpaste brand: Colgate, Closeup, Himalaya, Dabur, etc..
- North of Darjeeling, West Midnapore, Southern tip of Tamilnadu, etc..

Rate your experience about using our products

Product packaging

				
Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied

Product design

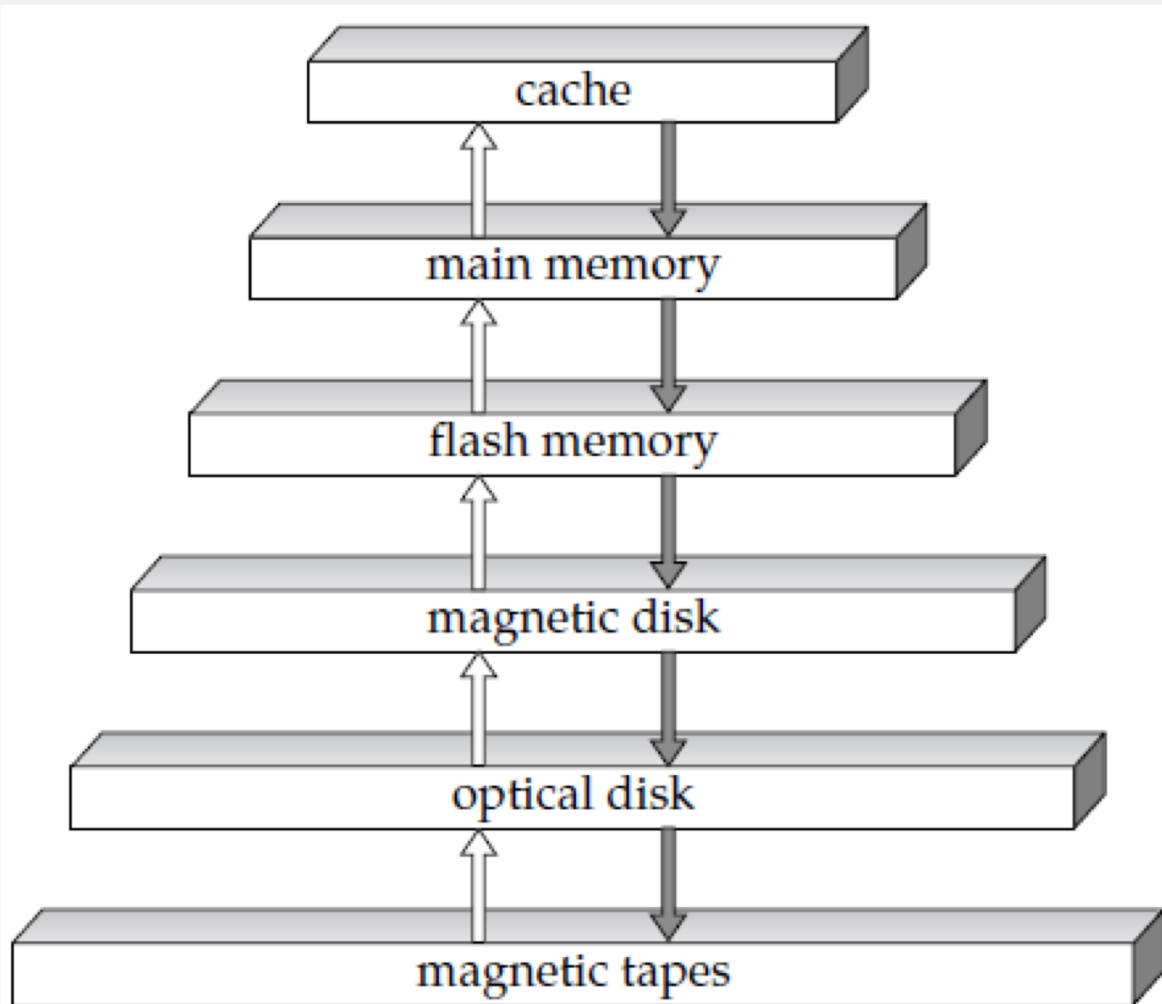
				
Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied

INTERVAL SCALES

- *Discrete variable*: Discrete variable is the quantitative data, but its values cannot be expressed or presented in the form of a decimal; for example, number of males, number of females, number of patients, and family size cannot be expressed in decimal in a meaningful way.
- *Continuous data*: Data are measured in values and can be quantified and presented in decimals. Age, height, weight, body mass index, serum creatinine, heart rate, systolic blood pressure, and diastolic blood pressure are some examples.

DATA STORAGE

STORAGE DEVICE HIERARCHY



DATA CUBE

Multidimensional Data Modeling

CONCEPT OF DATA CUBE

- A multidimensional data model views data in the form of a cube.
- A data cube is characterized with two things
 - **Dimension:** the perspective or entities with respect to which an organization wants to keep record.
 - **Fact:** The actual values in the record

Example.

- Rainfall data of Metrological Department
 - Time (Year, Season, Month, Week, Day, etc.)
 - Location (Country, Region, State, etc.)

2-D VIEW OF RAINFALL DATA

Region: North-East

	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year	2005											
	2006											
	2007											
	2008											
	2009											
	2010											

- In this 2-D representation, the rainfall for “North-East” region are shown with respect to different months for a period of years

3-D VIEW OF RAINFALL DATA

- Suppose, we want to represent data according to times (Year, Month) as well as regions of a country say East, West, North, North-East, etc.

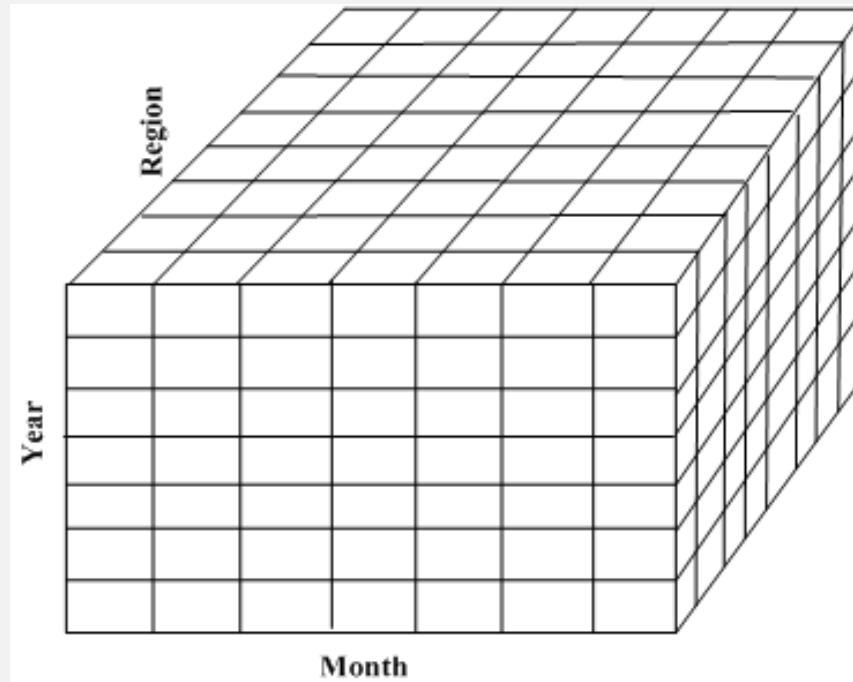
East		Month											
Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	2005												
	2006												
	2007												
	2008												
	2009												
	2010												

West		Month											
Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	2005												
	2006												
	2007												
	2008												
	2009												
	2010												

North-East		Month											
Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	2005												
	2006												
	2007												
	2008												
	2009												
	2010												

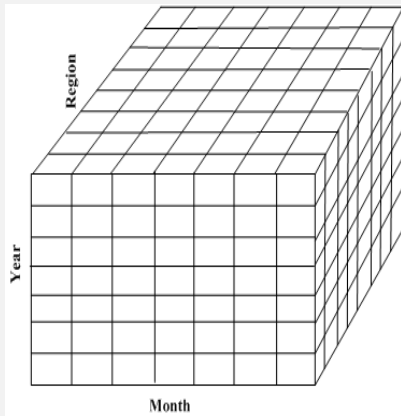
- A 2-D view of 3-D rainfall data

3-D VIEW OF RAINFALL DATA

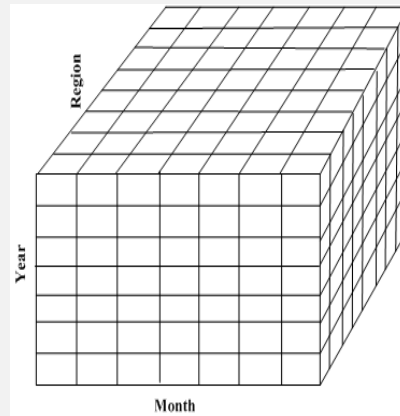


- Data cube: This enables us a 3-D view of the rainfall data

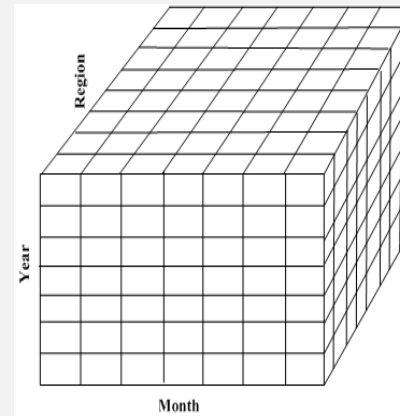
3-D VIEW OF RAINFALL DATA



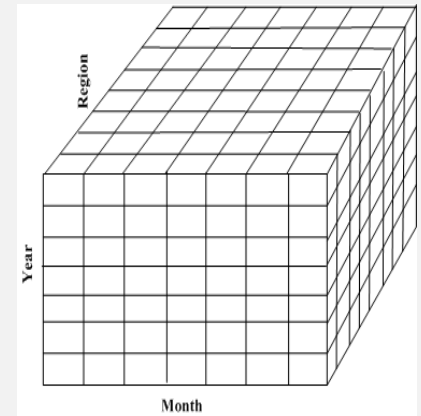
India



China



Russia



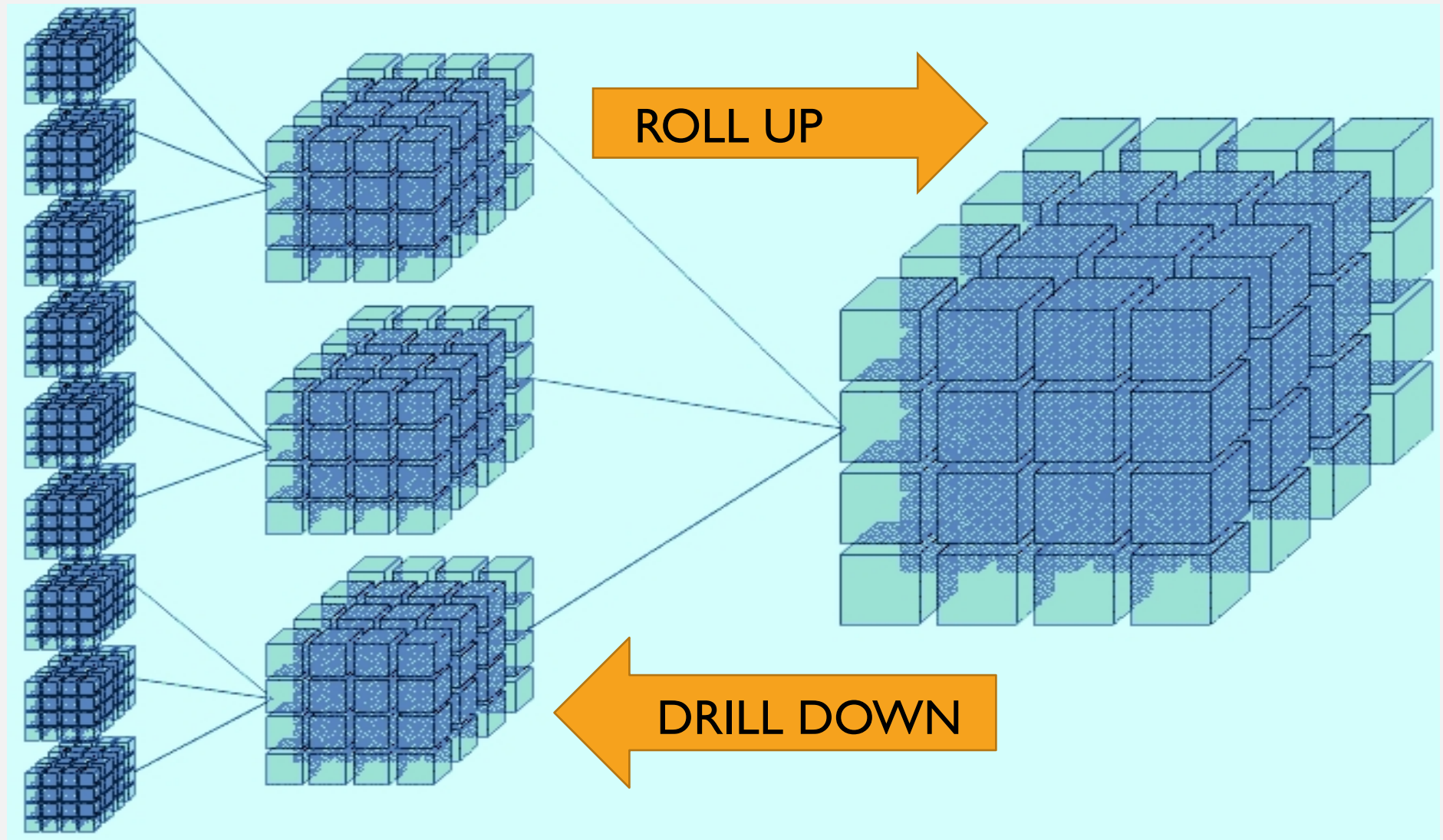
Pakistan

- Data cube: This enables us a 3-D view of the rainfall data for a continent say?

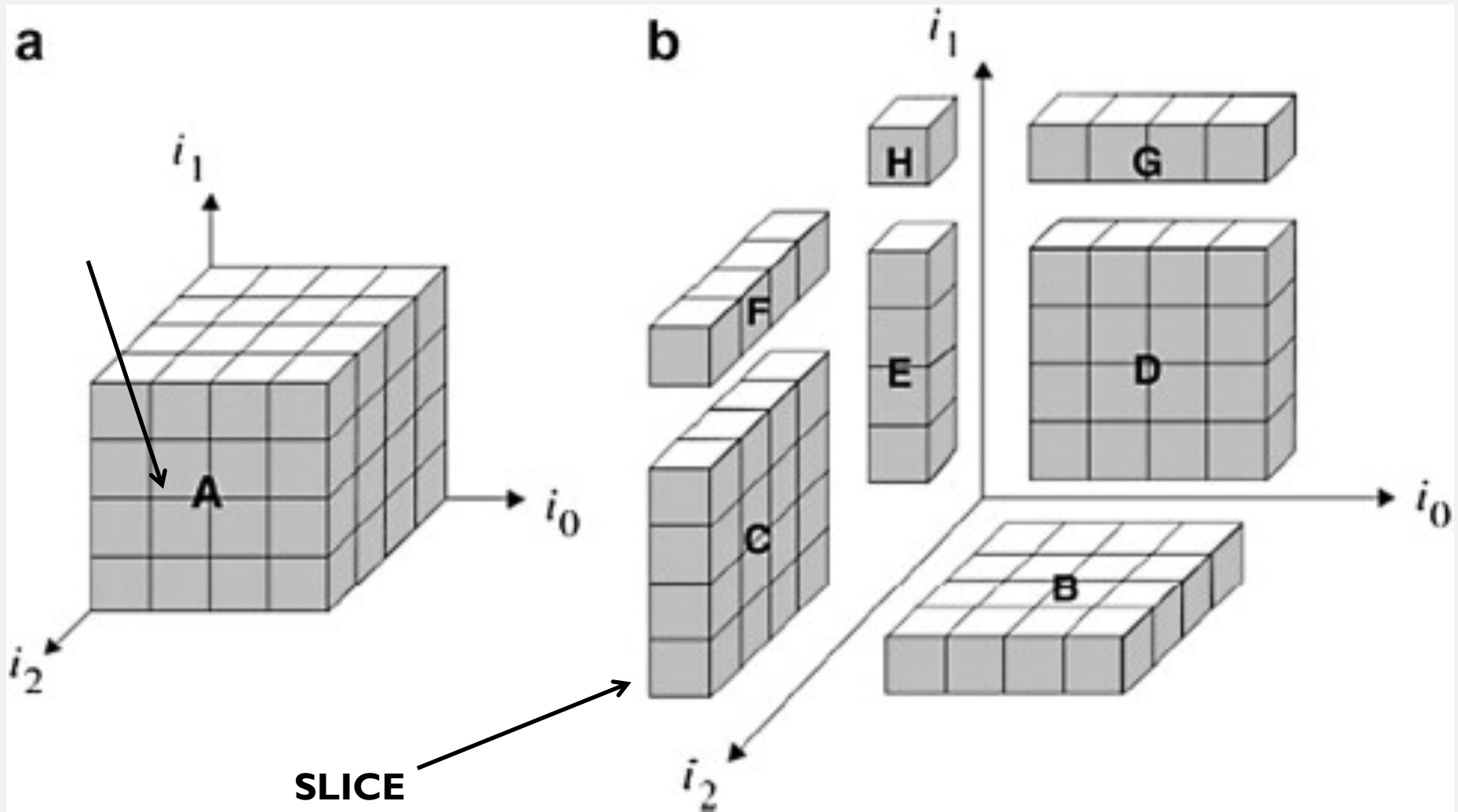
3-D VIEW OF RAINFALL DATA

- What is the data cube representation of rainfall data of the entire world?

DATA CUBE AGGREGATION



DATA CUBE SEGREGATION



DATA REPRESENTATION

- How a document (e.g., text) can be represented?

THE SILVER CHAIR

By C.S. Lewis

**CHAPTER ONE
BEHIND THE GYM**

It was a dull autumn day and Mr Pole was crying behind the gym.

She was crying because they had been bullying her. This is not going to be a school story, so I shall say as little as possible about Mr's school, which is not a pleasant subject. It was "Co-educational," a school for both boys and girls, what used to be called a "mixed" school; some said it was not really so mixed as the motto of the people who ran it. These people had the idea that boys and girls should be allowed to do what they liked. And unfortunately what ten or fifteen of the biggest boys and girls had been bullying the others. All sorts of things, horrid things, went on which at an ordinary school would have been found out and stopped in half a term. But at this school they weren't. Of even if they were, the people who did them went out unpunished or punished. The Head said they were annoying psychological cases and sent for them and talked to them for hours. And if you know the right sort of things to say to the Head the main result was that you became rather a favourite than otherwise.

That was why Mr Pole was crying on that dull autumn day on the damp little path which runs between the back of the gym and the slaughter. And she hadn't nearly finished her cry when a boy came round the corner of the gym whistling, with his hands in his pockets. He nearly ran into her.

"Can't you look where you're going?" said Mr Pole.

"All right," said the boy, "you needn't start," and then he noticed her face. "I say, Pole," he said, "what's up?"

Mr only made faces, the sort you make when you're trying to say something but find that if you speak you'll start crying again.

"It's Thom, I suppose - as usual," said the boy grimly, digging his hands farther into his pockets.

Mr nodded. There was no need for her to say anything, even if she could have said it. They both knew.

"Now, look here," said the boy, "there's no good in all -"

He meant well, but he did talk rather like someone beginning a lecture. Mr suddenly flew into a temper (which is quite a likely thing to happen if you have been mistreated in a cry).

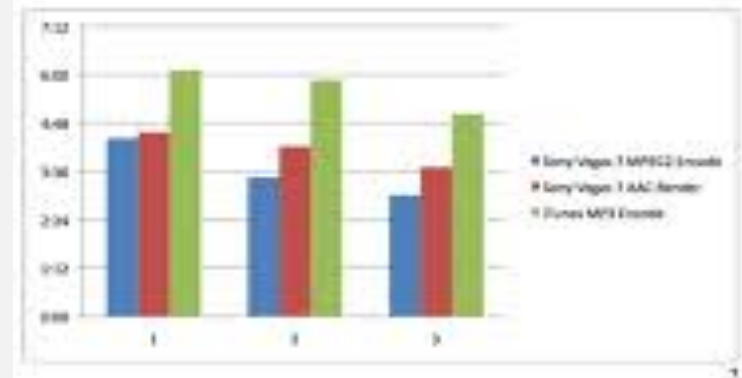
disc rather than reducing the video quality. These discs are more expensive, but aren't your memories worth a couple of bucks?

Note for some paragraphs of filler text. We're almost ready to leave. On the final screen, under "Select total recording time," enter the recording length you calculated in Step 4. Note that the maximum recording time on a standard single-layer disc is 44 minutes at best quality and 133 minutes at Good quality. If you want to record more than 99 minutes of video on a disc, and your DVD burner supports double-layer discs, consider recording on a DL disc rather than reducing the video quality. These discs are more expensive, but aren't your memories worth a couple of bucks?

Step 5: Now open the settings page of iTunes. We're almost ready to leave the iTunes store, under "Select the recording length." enter the recording length you calculated in Step 4, while that the maximum recording time on a standard single-layer disc is 44 minutes at best quality and 133 minutes at Good quality. If you want to record more than 99 minutes of video on a disc, and your DVD burner supports double-layer discs, consider recording on a DL disc rather than reducing the video quality. These discs are more expensive, but aren't your memories worth a couple of bucks?

Step 6: We're almost ready to leave the iTunes store, under "Select the recording length." enter the recording length you calculated in Step 4, while that the maximum recording time on a standard single-layer disc is 44 minutes at best quality and 133 minutes at Good quality. If you want to record more than 99 minutes of video on a disc, and your DVD burner supports double-layer discs, consider recording on a DL disc rather than reducing the video quality. These discs are more expensive, but aren't your memories worth a couple of bucks?

Step 7: We're almost ready to leave the iTunes store, under "Select the recording length." enter the recording length you calculated in Step 4, while that the maximum recording time on a standard single-layer disc is 44 minutes at best quality and 133 minutes at Good quality. If you want to record more than 99 minutes of video on a disc, and your DVD burner supports double-layer discs, consider recording on a DL disc rather than reducing the video quality. These discs are more expensive, but aren't your memories worth a couple of bucks?



DATA REPRESENTATION

- How an image can be represented?



DATA REPRESENTATION

- How a video can be represented?



DATA REPRESENTATION

- How the streaming data from an artificial earth satellite can be represented?



REFERENCE

- The detail material related to this lecture can be found in

Data Mining: Concepts and Techniques (3rd Edn.) by Jiawei Han, Michelline Kamber and Jian Pei, Morgan Kaufmann (2014).

Any question?

QUESTIONS OF THE DAY...

1. Give the concept of data cube to represent hyper-dimensional data? Also, explain with suitable diagrams the following.
 - Roll up
 - Drill down
 - Slice
2. Using the concept of data cube, how YouTube can archive videos of all type?