데이터베이스 개론

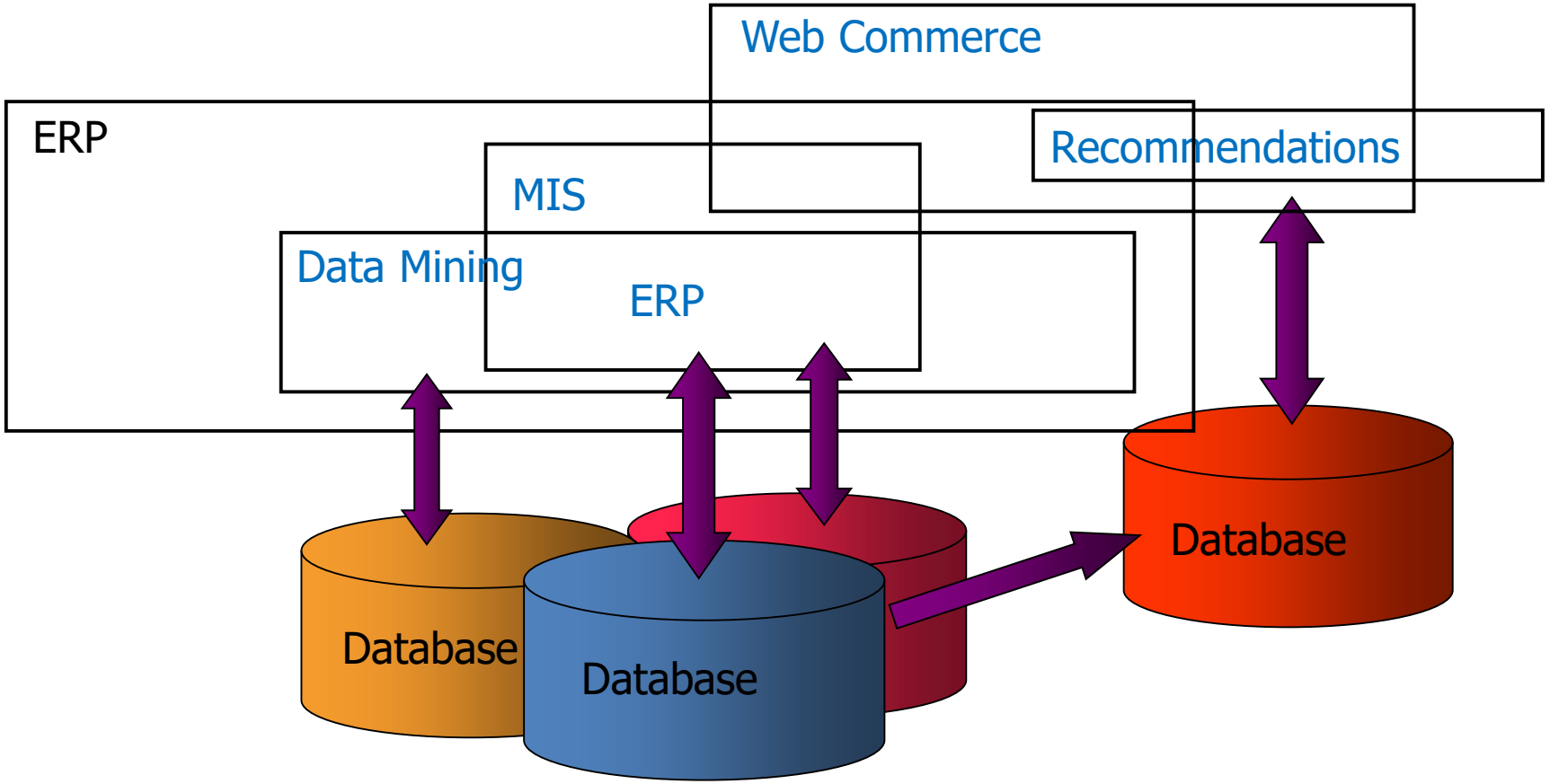
Chap. 00

이상구 교수

Intelligent Data Systems Laboratory

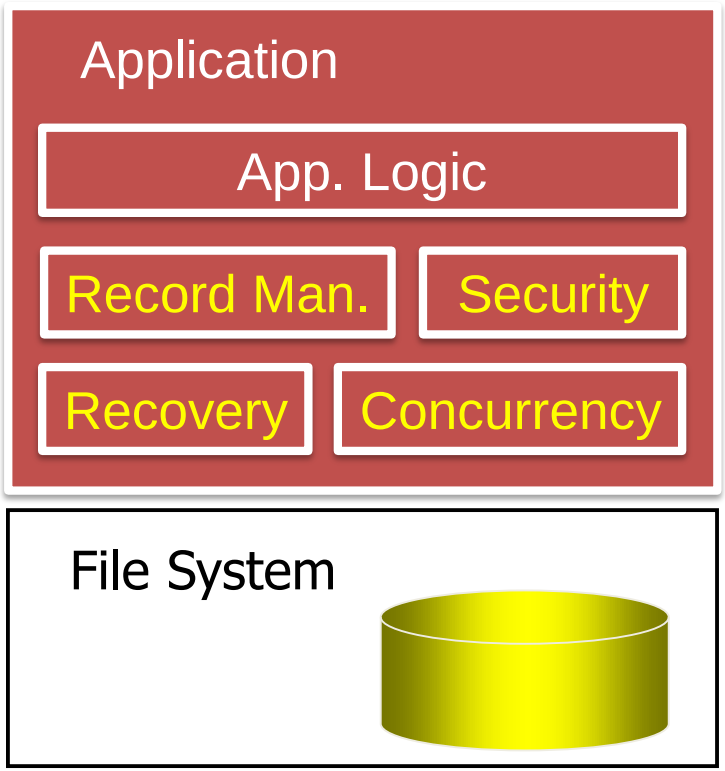
Computing = Data Processing

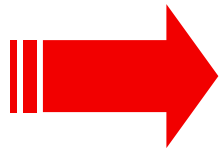
- Most (all?) computing applications use some type of a database

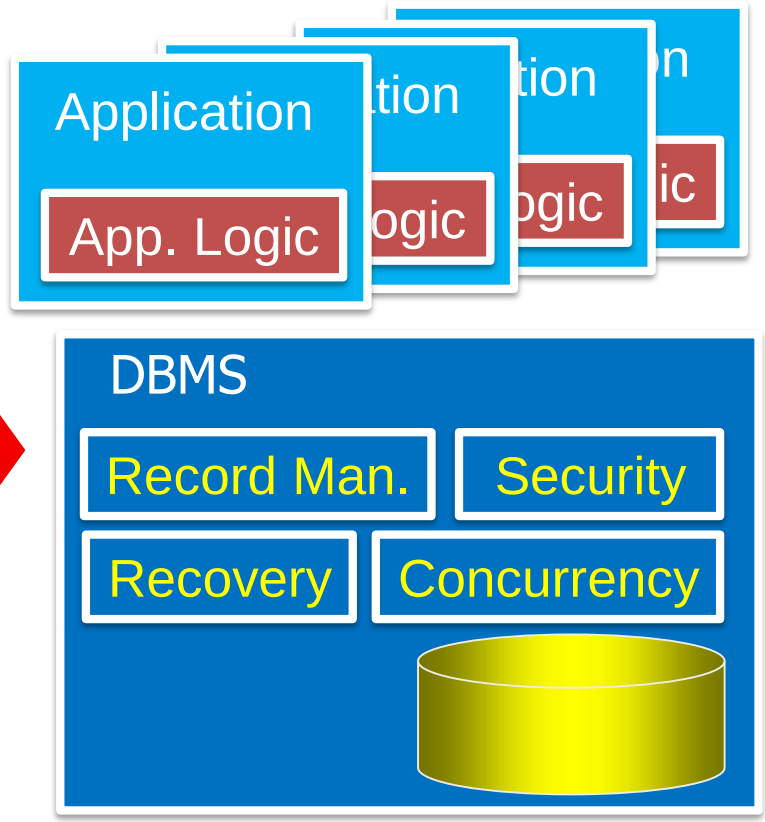


Ground 0: File System

- File System
  - Core part of OS
  - Stores programs, data, documents, or anything
  - (in disk)







Evidence Based Decision Making

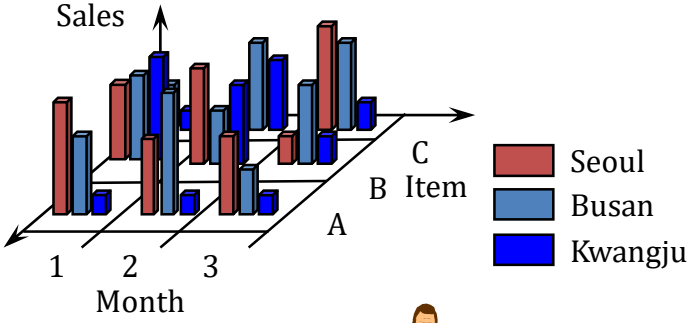
- Insights(통찰력) & foresights(예지력) through data

"It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts."

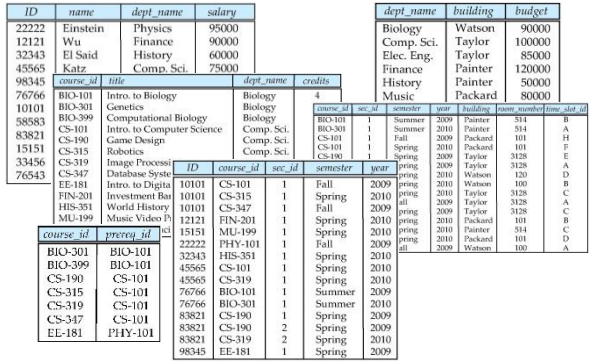
- *The Adventures of Sherlock Holmes*, A. Conan Doyle

- But …

A *multidimensional/analytic* view

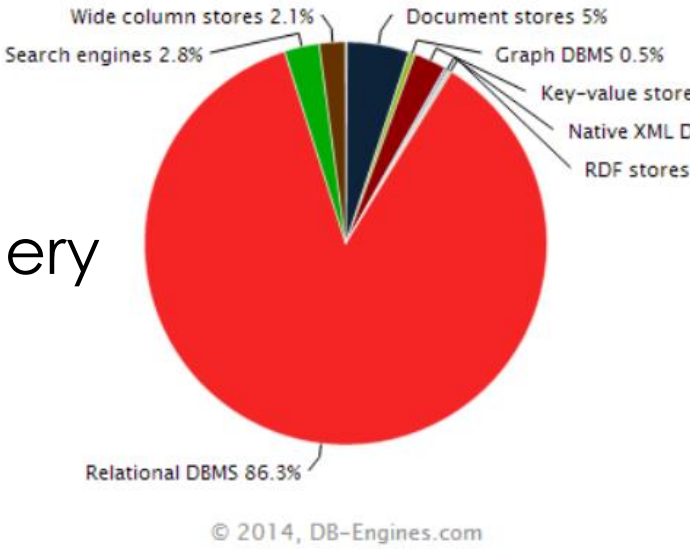


A *tabular/transactional* view



Tipping Point 1: Data Base – Relational

- Simple and intuitive representation
- Powerful language (SQL)
- Performance through automatic query optimization
- Robust transaction support



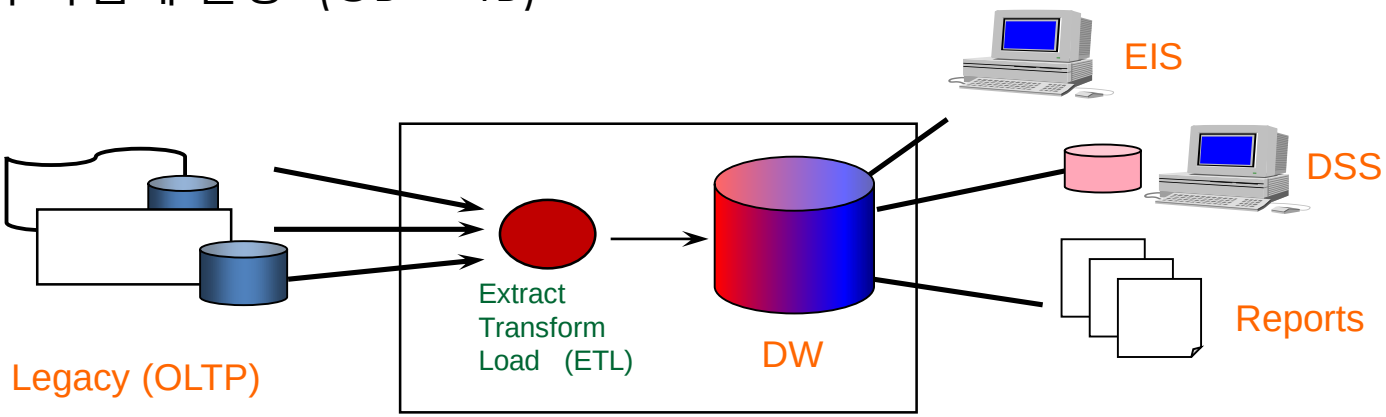
ID	*name*	*dept_name*	*salary*
22222	Einstein	Physics	95000
12121	Wu	Finance	90000
32343	El Said	History	60000
45565	Katz	Comp. Sci.	75000
98345	Kim	Elec. Eng.	80000
76766	Crick	Biology	72000
10101	Srinivasan	Comp. Sci.	65000
58583	Califieri	History	62000
83821	Brandt	Comp. Sci.	92000
15151	Mozart	Music	40000
33456	Gold	Physics	87000
76543	Singh	Finance	80000

dept_name	*building*	*budget*
Biology	Watson	90000
Comp. Sci.	Taylor	100000
Elec. Eng.	Taylor	85000
Finance	Painter	120000
History	Painter	50000
Music	Packard	80000
Physics	Watson	70000

ID	*course_id*	*sec_id*	*semester*	*year*
10101	CS-101	1	Fall	2009
10101	CS-315	1	Spring	2010
10101	CS-347	1	Fall	2009
12121	FIN-201	1	Spring	2010
15151	MU-199	1	Spring	2010
22222	PHY-101	1	Fall	2009
32343	HIS-351	1	Spring	2010
45565	CS-101	1	Spring	2010
45565	CS-319	1	Spring	2010
76766	BIO-101	1	Summer	2009
76766	BIO-301	1	Summer	2010
83821	CS-190	1	Spring	2009
83821	CS-190	2	Spring	2009
83821	CS-319	2	Spring	2010
98345	EE-181	1	Spring	2009

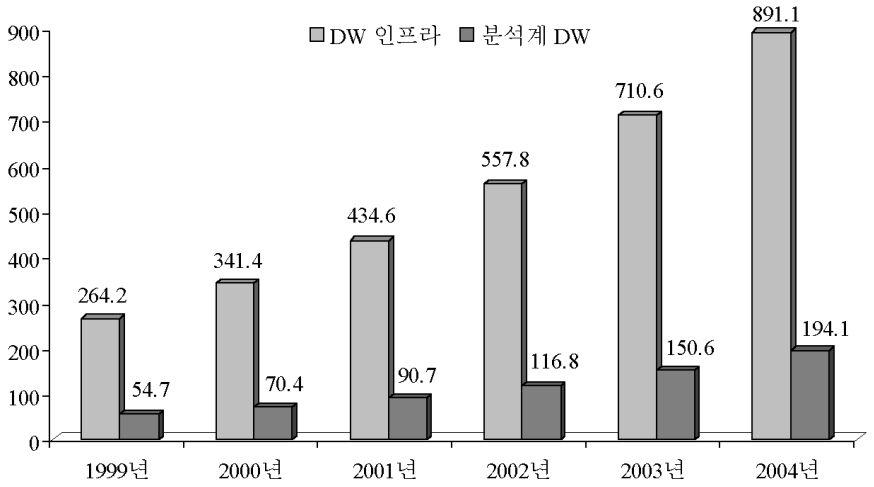
Tipping Point 2: Data Warehouse

- 업무시스템(transaction system)으로부터 쌓이는 데이터를 한 곳에 모아
- 분석적 작업에 활용 (GB -> TB)



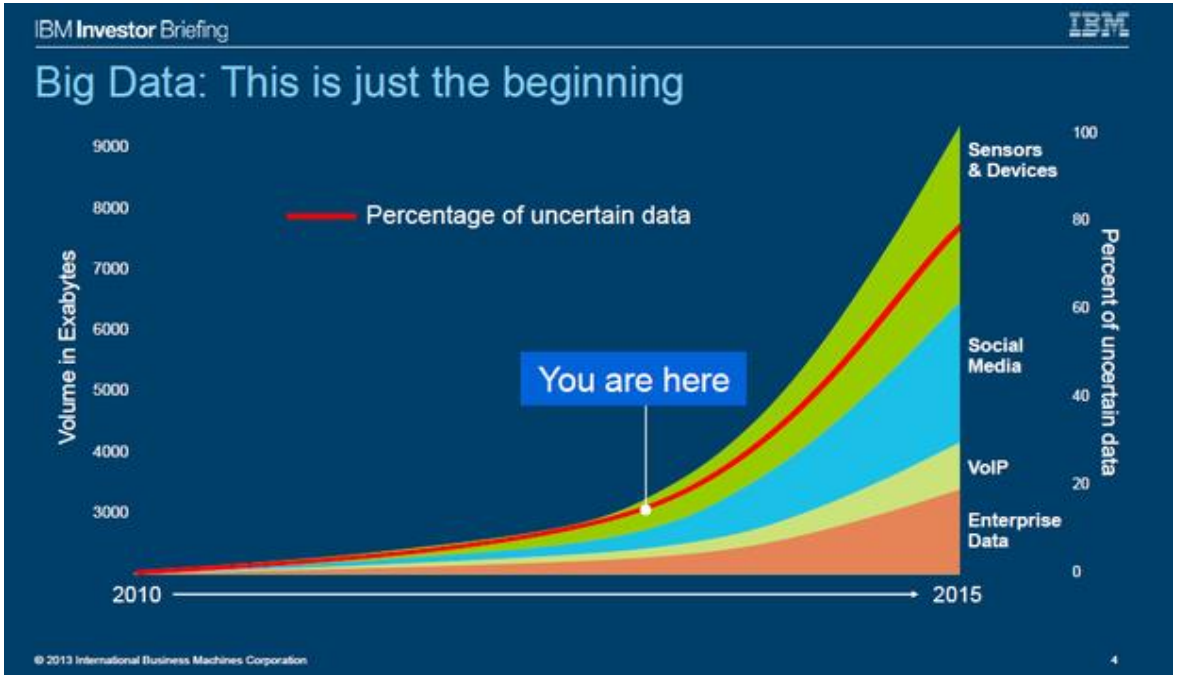
Data Processing (Transaction) ⇔ **Information Processing (Analytics)**

=> 데이터 분석의 전성기



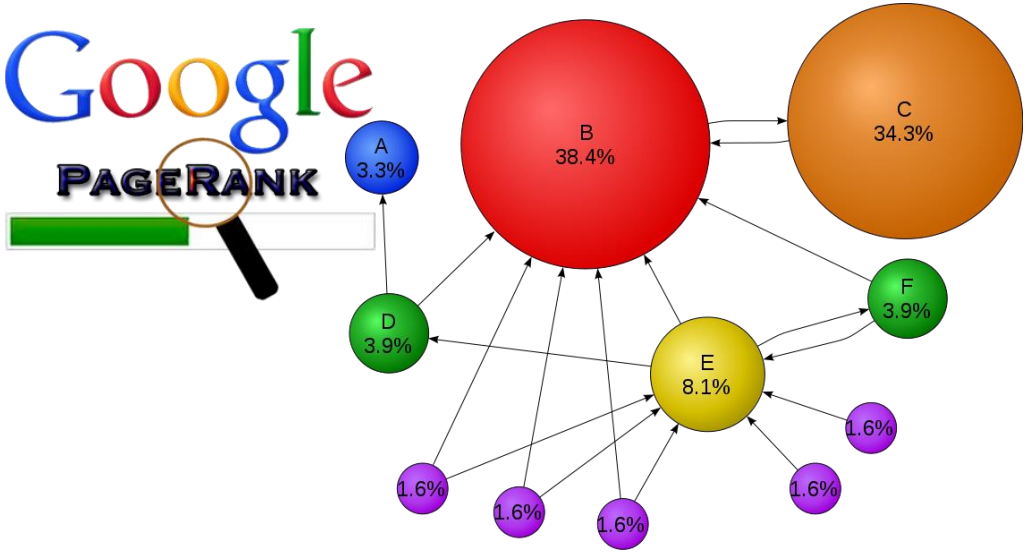
Data Explosion

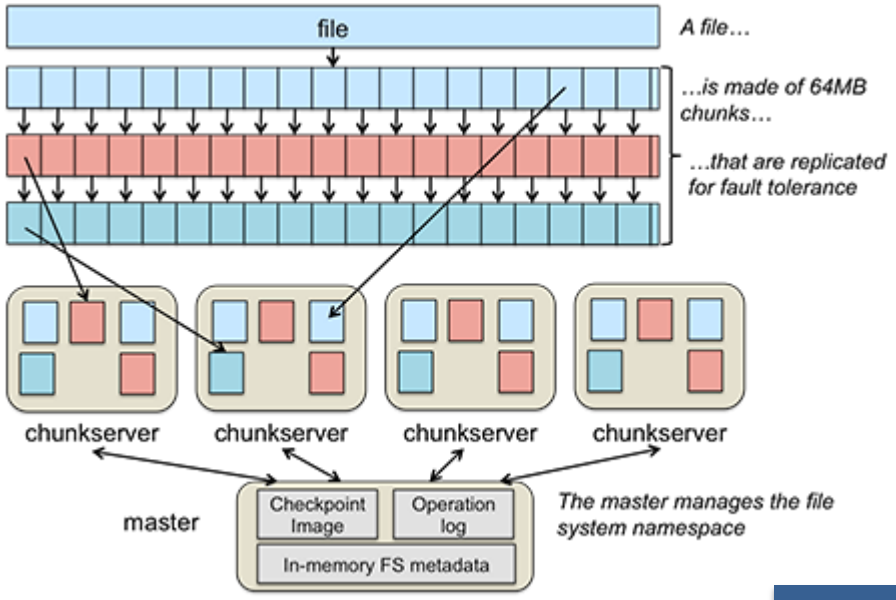
- DW 는 빙산의 일각 - Enterprise data growth 도 따라가지 못함
- 1.5년마다 2배로 증가!
- Data growth 요인
  - "SW is eating the world" – 모든 곳의 전산화/정보화
  - Mobile & social networks
  - Sensors & smart devices



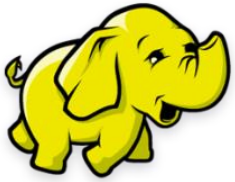
Web Scale Computing

- Different data,
- Different operations,
- Different scale!





Big Data Systems

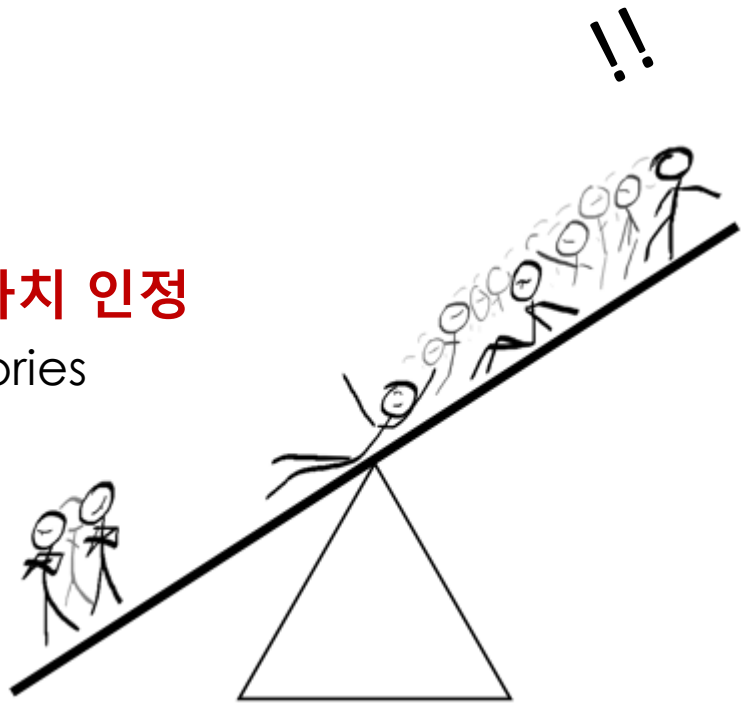


- Hadoop
  - Apache Open Source SW
  - MapReduce 기반의 대량 데이터 분산처리 framework
  - Yahoo!에서 시작/지원 (2006)

- NoSQL
  - Not Only (?) SQL
  - 단순한 데이터 모델: Key-Value store
  - 단순한 질의: get(), put()
  - 단순한 트랜잭션 모델: BASE – Basically Available, Soft state, Eventual consistency

Tipping Point 3: Big Data

- ***Ubiquitous* – 모든 분야에 일어나고 있는 현상**
  - 생산, 유통, 의료, 공공, 문화, 언론, 역사, …
  - 정보화/자동화, 모바일, 소셜, 센서!!
  - Impact 있는 사례
- ***Feasible* – 효과적으로 대응할 수 있는 환경**
  - 풍부한 데이터
  - 강력한 컴퓨팅 자원
  - 효과적인 분석 기술
- ***Virtuous Cycle* – 데이터 기반 해결책의 가치 인정**
  - 분위기 전환 – more and more success stories
  - Data가 핵심 자산이라는 인식 확산
  - 연계/통합/융합으로 새로운 기회 발굴

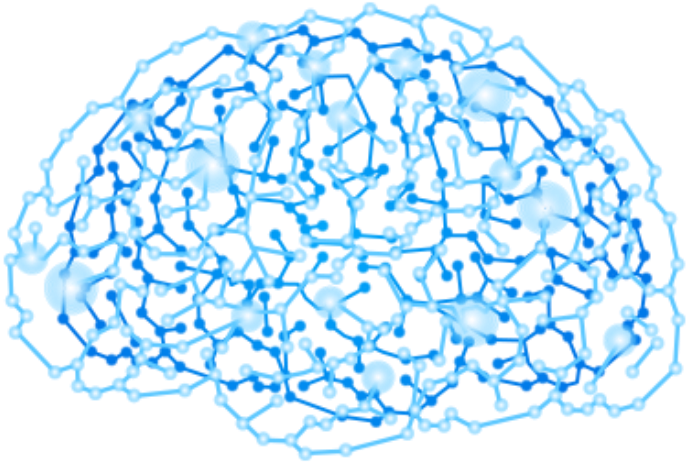


Tipping Point 4: AI – Machine Learning

전통적 인공지능 분야 문제 해결

- Computer Vision
- Natural Language Processing
  - Google Translate, Narrative Science
- Q&A system
  - IBM Watson, Apple Siri
- Autonomous navigation

- 기계학습(machine learning)의 기반



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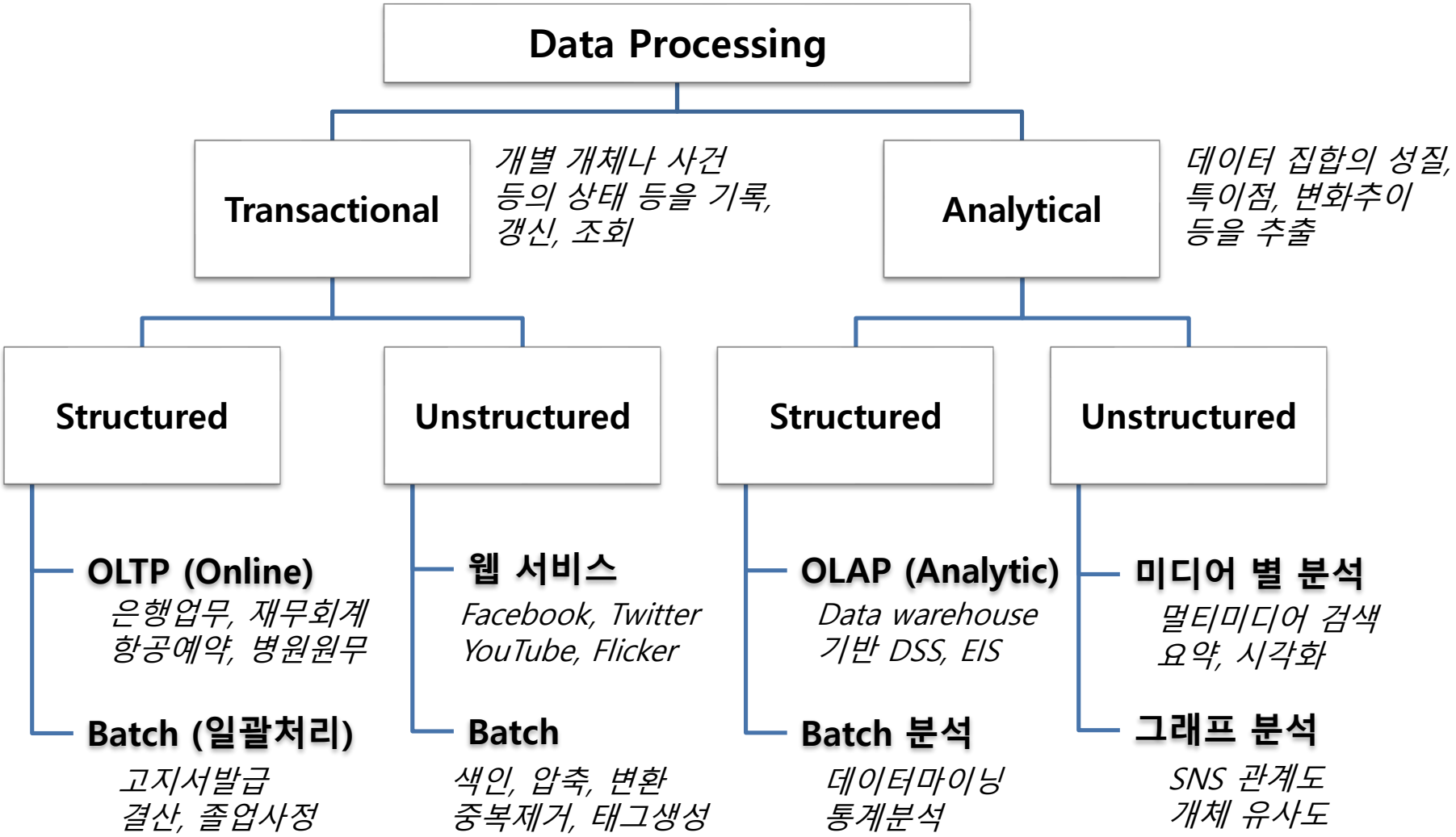
Data Processing Tasks



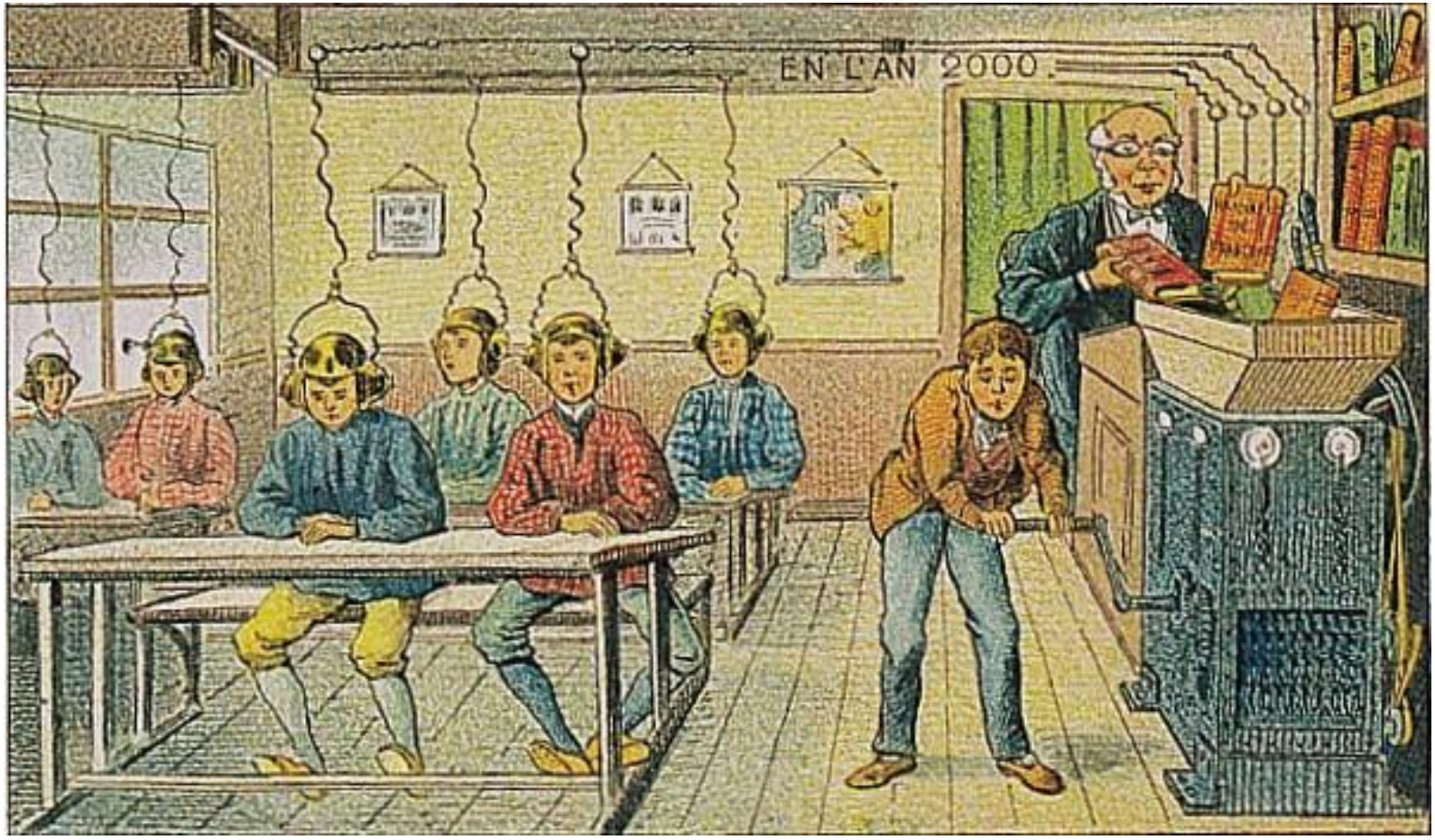
Flipped Classroom

Classroom - 1233

Henry of Germany delivering a lecture to university students in Bologna, Italy, in 1233.
- Artist: Laurentius de Voltolina;

Classroom - 2016

Classroom of the Future?



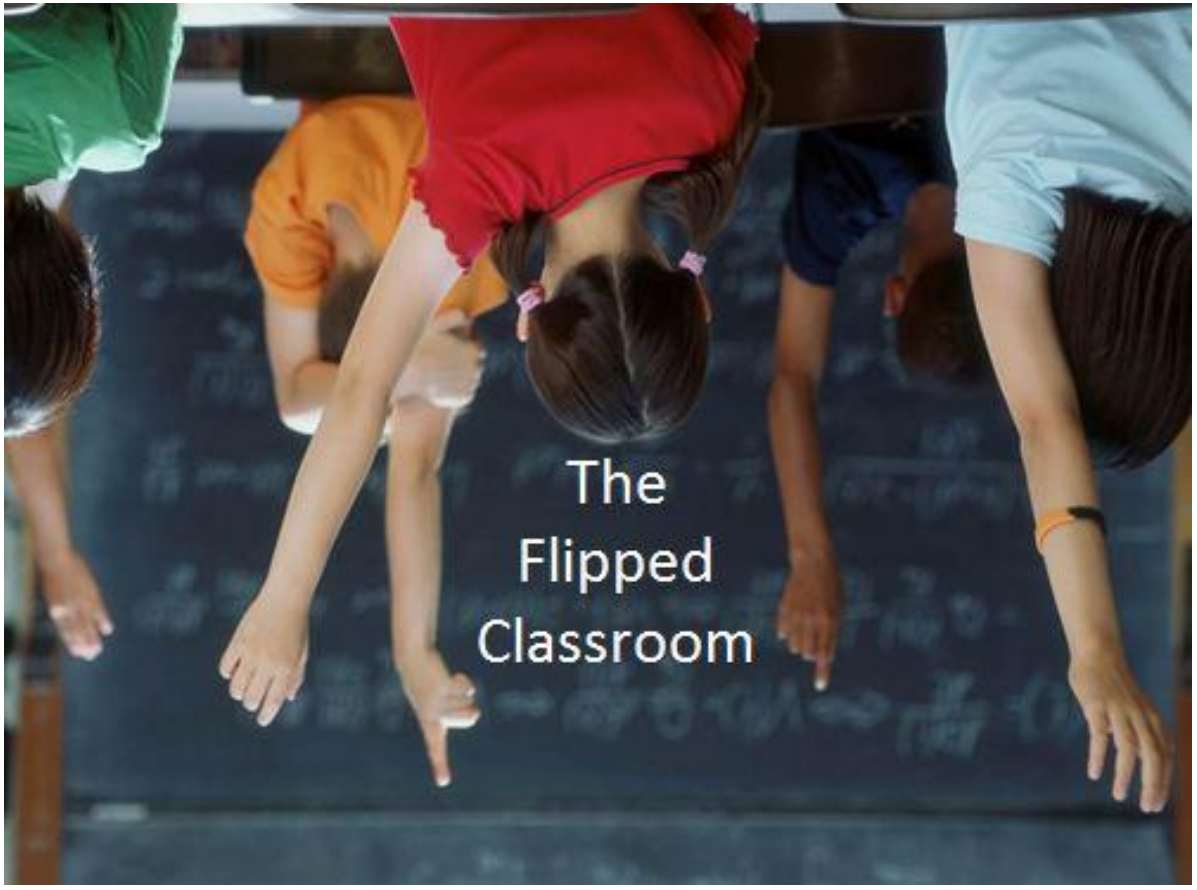
[Villemard, 1910]

MOOC

- Massive Open Online Course

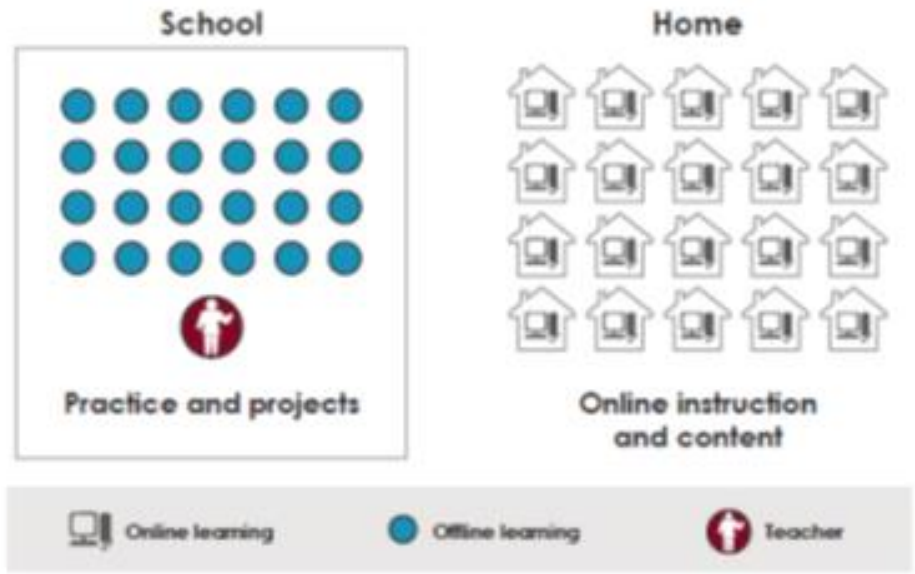
coursera

Flipped Classroom



Flipped Classroom

- **Online learning off-site as homework**
  - primary delivery of content and instruction is online
- **Face-to-face, teacher-guided practice or projects**
  - quizzes, discussions and exercises in class



In This Class

- **Homework & Quizzes (20%)**
  - **Watch lecture video** according to the lecture schedule
  - Verification quizzes will be given at the start of each class
    - 5~10 questions (10~20min)
    - multiple choice clicker (app) problems
  - Discussions and Q&A
- **Exams (50%)**
  - Midterm & final: 25% each
- **Projects (30%)**
  - SQL processor & DB application
- ***F* will be given for**
  - a score of 0 in one of the following
    - any one of the exams, or
    - over 50% of your projects, or
    - over 50% of your assignments/quizzes, or
  - any type of *Plagiarism*!

In This Class

- **Text Book**

  Database System Concepts, 6th Ed., Silberschatz, et al, McGraw Hill, 2010

- **Lecture Notes & Video Links**
  - will be posted a few days before each class at http://ids.snu.ac.kr/site/lectures/
    - ✓Password required
  - Please use only for personal use

- **TA**
  - lecture@europa.snu.ac.kr