

CS275 – Intro to Databases

What is a DBMS? - *Chap. 1*

Course Outline

- **Overview of Database Systems**
- **Relational Databases & Database Design**
- **Relational Algebra**
- **SQL**
- **Normalization**
- **Database Application Development**
- **Internet Applications**

What is a database?

- Collection of **related** data
- Describes activity between ≥ 1 organizations
 - Entities
 - Relationships

Where Do We See Databases?

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 ☐ Status
 ☐ Avail
 ☒ Section Title
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Term	CRN	Sec	Credits	P/N	Instructor	Day/Time/Date	Location	Curr	Section Title
Sp05	35890	001	4		Staff	TBA	TBA	0	ST/CONS PROC, OPTMZ, REASONING
Sp05	37777	003	4		Zhang, E.	MWF 1000-1050 3/28/05-6/3/05	GBAD 101	16	ST/GEOM PROC FOR CMPTR GRAPH
Sp05	37868	004	4		Bailey, M.	MWF 1300-1350 3/28/05-6/3/05	OWEN 101	33	T/SCIENTIFIC VISUALIZATION
Sp05	38121	005	3		Dietterich, T.	TR 1030-1150 3/28/05-6/3/05	WLKN 203	11	T/CASE STUDIES IN ECOSY INFOR
F05	17615	001	4		Staff	TR 1000-1120 9/26/05-12/2/05	OWEN 103	0	ST/SCIENTIFIC VISUALIZATION
W06	27296	001	4		Herlocker, J.	MWF 1600-1650 1/9/06-3/17/06	MLM 206	0	ST/INTR TO GEOMETRIC MODELING
W06	27583	002	3		Dietterich, T.	TR 1100-1220 1/9/06-3/17/06	WLKN 203	0	T/CASE STUDIES IN ECOSYS INFOR
Sp06	35263	001	1-5		Staff	MWF 1400-1450 4/3/06-6/9/06	EDUC 201	0	

Where Do We See Databases?

Bank Client — Transaction Matrix

BRANCH AND ATM TRANSACTION MATRIX

Where customers bank versus where transactions are performed


Zip Code	Lifestyle Description	% ^[1]	Avg	A	B	C	D	E	F	G	H	I	J	K
99999-1234	Upwardly Mobile	5.3%	373	433	301	407	401	331	267	301	211	400	366	525
99999-1200	Sleepy Suburbs	4.7%	44	38	66	80	7	27	39	123	26	47	67	230
99999-1111	Sleepy Suburbs	4.2%	194	149	332	221	168	153	145	99	163	175	175	260
99999-3432	Upwardly Mobile	3.5%	298	259	428	357	23	217	n/a	32	42	376	153	423
99998-1000	Young Movers	3.2%	280	337	43	284	13	n/a	219	12	12	43	32	12
99998-1111	Young Movers	3.0%	127	23	101	184	43	146	79	115	21	32	179	85
99998-4321	Sleepy Suburbs	2.7%	267	192	205	215	356	245	144	383	443	285	193	277
99998-1234	Gentrified City Limits	2.4%	149	93	91	164	179	169	79	102	179	248	214	125
99998-2000	Gentrified City Limits	2.2%	77	66	63	242	5	26	76	23	32	75	65	43
99998-3000	Urban Dwellers	1.1%	52	41	44	72	68	48	54	50	51	52	67	26

Where Do We See Databases?

2004-05 NBA STANDINGS									
Eastern Conference									
Atlantic	W	L	GB	Pct	Home	Road	Conf	Div	Streak
<u>Celtics</u>	38	32	--	.543	25-11	13-21	23-18	6-5	Lost 3
<u>76ers</u>	35	34	2.5	.507	20-14	15-20	25-17	7-6	Won 3
<u>Nets</u>	32	38	6.0	.457	19-16	13-22	22-19	5-5	Lost 2
<u>Knicks</u>	29	39	8.0	.426	21-14	8-25	17-23	6-7	Lost 2
<u>Raptors</u>	29	40	8.5	.420	21-13	8-27	16-24	6-7	Won 1
Central	W	L	GB	Pct	Home	Road	Conf	Div	Streak
<u>Pistons</u>	43	26	--	.623	26-8	17-18	26-16	5-8	Won 1
<u>Bulls</u>	37	31	5.5	.544	21-13	16-18	23-16	7-6	Won 5
<u>Cavaliers</u>	35	32	7.0	.522	25-9	10-23	22-19	6-6	Lost 2
<u>Pacers</u>	35	34	8.0	.507	20-14	15-20	20-19	6-7	Lost 1
<u>Bucks</u>	27	42	16.0	.391	20-13	7-29	21-20	8-5	Lost 5
Southeast	W	L	GB	Pct	Home	Road	Conf	Div	Streak
<u>Heat</u>	53	18	--	.746	31-5	22-13	36-7	13-1	Lost 1
<u>Wizards</u>	38	30	13.5	.559	24-9	14-21	22-17	7-6	Won 1
<u>Magic</u>	32	37	20.0	.464	21-12	11-25	17-23	5-8	Lost 3
<u>Bobcats</u>	15	53	36.5	.221	12-22	3-31	8-32	5-7	Won 2
<u>Hawks</u>	11	58	41.0	.159	8-26	3-32	7-35	2-10	Lost 8

Where Do We See Databases?

record in parentheses, total points and previous ranking.

The Associated Press Top 25				
Other Polls: <input type="text"/> 				
	Team	Record	Points	Prev
1.	USC (62)	13-0	1,622	1
2.	AUBURN (3)	13-0	1,559	3
3.	OKLAHOMA	12-1	1,454	2
4.	UTAH	12-0	1,438	5
5.	TEXAS	11-1	1,391	6
6.	LOUISVILLE	11-1	1,261	7
7.	GEORGIA	10-2	1,204	8
8.	IOWA	10-2	1,111	11
9.	CALIFORNIA	10-2	1,060	4
10.	VIRGINIA TECH	10-3	996	9
11.	MIAMI FLA	9-3	917	14
12.	BOISE ST	11-1	888	10
13.	TENNESSEE	10-3	868	15
14.	MICHIGAN	9-3	842	13
15.	FLORIDA ST	9-3	754	17
16.	LSU	9-3	711	12
17.	WISCONSIN	9-3	482	16
18.	TEXAS TECH	8-4	476	23
19.	ARIZONA ST	9-3	463	21
20.	OHIO ST	8-4	423	24
21.	BOSTON COLLEGE	9-3	314	25
22.	FRESNO ST	9-3	203	--
23.	VIRGINIA	8-4	157	18
24.	NAVY	10-2	126	--
25.	PITTSBURGH	8-4	99	19

Introduction

- **Database**

- Collection of related data
- Known facts that can be recorded and that have implicit meaning
- Represents some aspect of the real world
 - **Miniworld or universe of discourse (UoD)**
- Logically coherent collection of data with inherent meaning
- Built for a specific purpose

Introduction (cont'd.)

- Example of a large commercial database
 - Amazon.com
- **Database management system (DBMS)**
 - Collection of programs
 - Enables users to create and maintain a database
- Why do we need these?
 - Data is everywhere
 - Simplify tasks for getting info

DBMS

- Define – data type, constraints(metadata).
- Construct
- Manipulate- Query, transaction
- Sharing
- Protection-
 - System protection(HW/SW malfunction)
 - Security protection(unauthorized access)
- Maintain

An Example

- UNIVERSITY database
 - Information concerning students, courses, and grades in a university environment
- **Data records**
 - STUDENT
 - COURSE
 - SECTION
 - GRADE_REPORT
 - PREREQUISITE

STUDENT

Name	Student_number	Class	Major
Smith	17	1	CS
Brown	8	2	CS

COURSE

Course_name	Course_number	Credit_hours	Department
Intro to Computer Science	CS1310	4	CS
Data Structures	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database	CS3380	3	CS

SECTION

Section_identifier	Course_number	Semester	Year	Instructor
85	MATH2410	Fall	07	King
92	CS1310	Fall	07	Anderson
102	CS3320	Spring	08	Knuth
112	MATH2410	Fall	08	Chang
119	CS1310	Fall	08	Anderson
135	CS3380	Fall	08	Stone

GRADE_REPORT

Student_number	Section_identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

PREREQUISITE

Course_number	Prerequisite_number
CS3380	CS3320
CS3380	MATH2410
CS3320	CS1310

Figure 1.2
A database that stores student and course information.

RELATIONS

Relation_name	No_of_columns
STUDENT	4
COURSE	4
SECTION	5
GRADE_REPORT	3
PREREQUISITE	2

Figure 1.3

An example of a database catalog for the database in Figure 1.2.

COLUMNS

Column_name	Data_type	Belongs_to_relation
Name	Character (30)	STUDENT
Student_number	Character (4)	STUDENT
Class	Integer (1)	STUDENT
Major	Major_type	STUDENT
Course_name	Character (10)	COURSE
Course_number	XXXXNNNN	COURSE
....
....
....
Prerequisite_number	XXXXNNNN	PREREQUISITE

Note: Major_type is defined as an enumerated type with all known majors.
XXXXNNNN is used to define a type with four alpha characters followed by four digits.

Databases: A Brief History

- The first general-purpose DBMS:
 - Charles Bachman @ GE, 1960's.
- IBM: Information Management System
 - 1960's.

Databases: A Brief History

- Relational data model
 - Edgar Codd @ IBM San Jose, 1970's.
- SQL language
 - IBM, 1980.
 - Current standard: SQL:2008.

Databases: A Brief History

- Various database management systems:
 - DB2 (IBM).
 - Oracle.
 - UDS (Informix, now part of IBM).
 - Sybase SQL server.
 - Microsoft SQL server.

Database Access

- Visit <https://secure.onid.oregonstate.edu>
- Log in and choose Web Database
- Information is provided for:
 - Database name:
 - User id:
 - Password:
- Read the text
 - Chapter 1 & 2