

# Computer Science 126, Database Systems (3 units)



**Class Instructor:**

**Class Hours:**

**Office:**

**Email:**

David Ruby

MWF 10:00-10:50

Science II – 273

[druby@csufresno.edu](mailto:druby@csufresno.edu)

# Focus: Data

- What is it?
- How should we organize it?
- What kinds of problems might we encounter?

# Data w/ Relational Database

- Good Window on Data.
- A lot of data currently in RDMS.
- Also look at semi-structured data w/ XML & JSON.

# A FIRST COURSE IN DATABASE SYSTEMS

THIRD EDITION

Jeffrey D. Ullman  
Jennifer Widom

## Textbooks and Materials

*A First Course in Database Systems (3<sup>rd</sup>)*  
by Jeffrey D. Ullman & Jennifer Widom




# SQL Mini-Course

## Stanford Online: [lagunita.stanford.edu](https://lagunita.stanford.edu)

Help

Learn from **Stanford Online**  
*for anyone, anywhere, anytime*

**HUMAN TRAFFICKING**




**AHEAD**

HumanitiesSciences  
HumTrfkAwrn


Human Trafficking  
Awareness for the  
General Public

Starts: Jan 20, 2017


**NEXT EXIT**



**GAS**



**FOOD**



**SLAVERY**


HumanitiesSciences  
HumTrfkHsptlty

Human Trafficking  
Awareness for the  
Hospitality Industry

Starts: Jan 20, 2017

**HEAVY HUMAN  
TRAFFICKING  
ZONE**

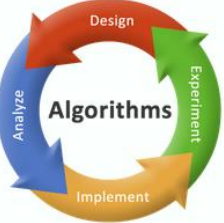
**NEXT 6 MILES**



HumanitiesSciences  
HumTrfkRstrnt

Human Trafficking  
Awareness for the  
Restaurant Industry

Starts: Jan 20, 2017



Engineering  
Algorithms1

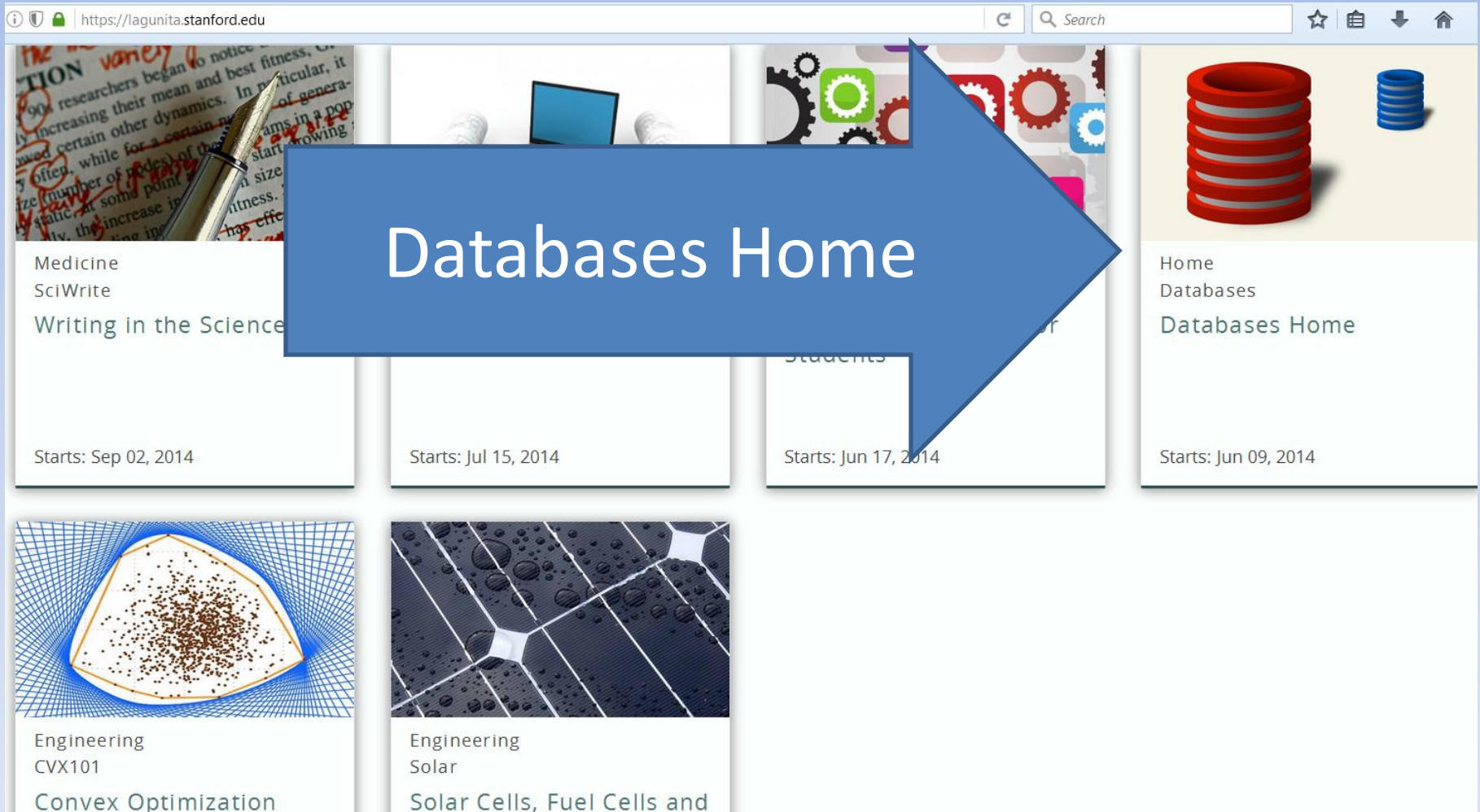
Algorithms: Design and  
Analysis

Starts: Dec 08, 2016



# SQL Mini-Course

## Stanford Online: [lagunita.stanford.edu](https://lagunita.stanford.edu)



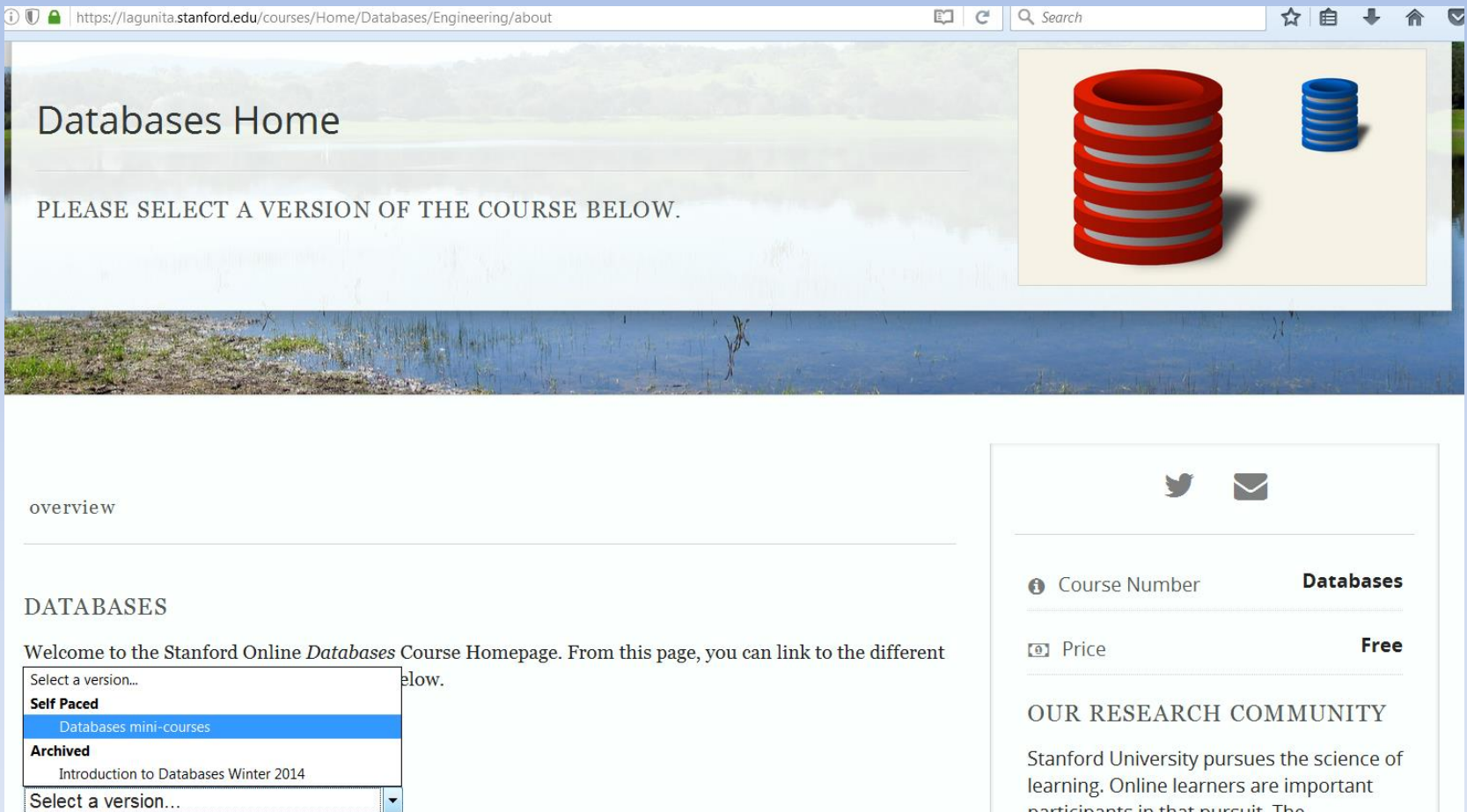
The screenshot shows the Stanford Online Lagunita website interface. A large blue arrow points to the 'Databases Home' card. The website header includes the URL <https://lagunita.stanford.edu> and a search bar. The main content area displays several course cards:

- Medicine**  
SciWrite  
Writing in the Science  
Starts: Sep 02, 2014
- Students**  
Starts: Jul 15, 2014
- Databases Home**  
Home  
Databases  
Databases Home  
Starts: Jun 09, 2014
- Engineering**  
CVX101  
Convex Optimization
- Engineering**  
Solar  
Solar Cells, Fuel Cells and

# SQL Mini-Course

## Stanford Online

<https://lagunita.stanford.edu/courses/Home/Databases/Engineering/about>



The screenshot shows the Stanford Online Databases Course Homepage. The browser address bar displays the URL: <https://lagunita.stanford.edu/courses/Home/Databases/Engineering/about>. The page features a large banner with a lake and trees, titled "Databases Home". Below the banner, it says "PLEASE SELECT A VERSION OF THE COURSE BELOW." To the right of the banner, there are two database cylinder icons, one red and one blue. Below the banner, there is a section titled "overview" and a section titled "DATABASES". The "DATABASES" section contains a welcome message and a dropdown menu for selecting a version of the course. The dropdown menu is open, showing options: "Self Paced", "Databases mini-courses" (highlighted), and "Archived". Below the dropdown, there is a link to "Introduction to Databases Winter 2014". To the right of the "DATABASES" section, there is a sidebar with social media icons (Twitter and Email), a table with course information, and a section titled "OUR RESEARCH COMMUNITY".

overview

**DATABASES**

Welcome to the Stanford Online *Databases* Course Homepage. From this page, you can link to the different below.

Select a version...

**Self Paced**

Databases mini-courses

**Archived**

Introduction to Databases Winter 2014

Select a version...

Twitter Email

Course Number	Databases
Price	Free

**OUR RESEARCH COMMUNITY**

Stanford University pursues the science of learning. Online learners are important participants in that pursuit. The

# SQL Mini-Course

## Stanford Online

<https://lagunita.stanford.edu/courses/DB/2014/SelfPaced/about>

### MINI-COURSES

Select a mini-course... ▼

Select a mini-course...

- Data Models**
  - Introduction and Relational Databases
  - XML Data
  - JSON Data
- Querying Relational Databases**
  - Relational Algebra
  - SQL**
- Querying XML Databases**
  - XPath and XQuery
  - XSLT
- Database Design**
  - Relational Design Theory
  - Unified Modeling Language
- SQL Advanced Features**
  - Indexes and Transactions
  - Constraints and Triggers
  - Views and Authorization
  - On-Line Analytical Processing
  - Recursion in SQL

inaugural massive open online courses in the fall of 2011; it  
3 and 2014. The course is now being offered as a set of  
can be assembled in a variety of ways to learn about different  
es are based around video lectures and/or video demos. Many  
understanding, in-depth standalone quizzes, and/or a variety  
amming exercises. Each mini-course also includes a  
and resources. Individual mini-courses can be accessed by  
above. The mini-courses are described briefly below, along  
aught by Professor Jennifer Widom, the overall curriculum  
course.

ES

Databases are incredibly prevalent -- they underlie technology used by most people every day if not



# Excellent Exercises



You've started a new movie-rating website, and you've been collecting data on review movies. There's not much data yet, but you can still try out some interesting queries

Movie ( *mID*, title, year, director )

English: There is a movie with ID number *mID*, a *title*, a release *year*, and a *director*.

Reviewer ( *rID*, name )

English: The reviewer with ID number *rID* has a certain *name*.

# Excellent Exercizes

Q1

Hi (1 point possible)

Find the titles of all movies directed by Steven Spielberg.

**Note:** Your queries are executed using SQLite, so you must conform to the SQL constructs supported by SQLite.

1 Enter your SQL query here

Unanswered

SUBMIT

```
1 select * from movie;
```

Incorrect

**Incorrect**

Your Query Result:

101	Gone with the Wind	1939	Victor Fleming
102	Star Wars	1977	George Lucas
103	The Sound of Music	1965	Robert Wise
104	E.T.	1982	Steven Spielberg
105	Titanic	1997	James Cameron
106	Snow White	1937	<NULL>

SUBMIT

**Incorrect**

Your Query Result:

101	Gone with the Wind	1939	Victor Fleming
102	Star Wars	1977	George Lucas
103	The Sound of Music	1965	Robert Wise
104	E.T.	1982	Steven Spielberg
105	Titanic	1997	James Cameron
106	Snow White	1937	<NULL>
107	Avatar	2009	James Cameron
108	Raiders of the Lost Ark	1981	Steven Spielberg

Expected Query Result:

E.T.
Raiders of the Lost Ark

SUBMIT

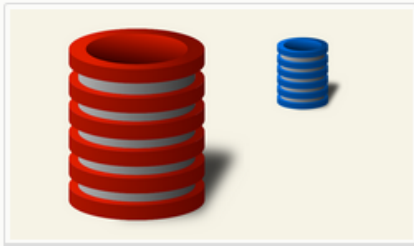
RESET

# SQL Mini-Course

## Stanford Online

### CURRENT COURSES

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Databases

*Course Started - Jun 09, 2014 at 15:00 UTC*

## DB5 SQL

Your final grade: **92%.**

[Download Your Statement \(PDF\)](#)

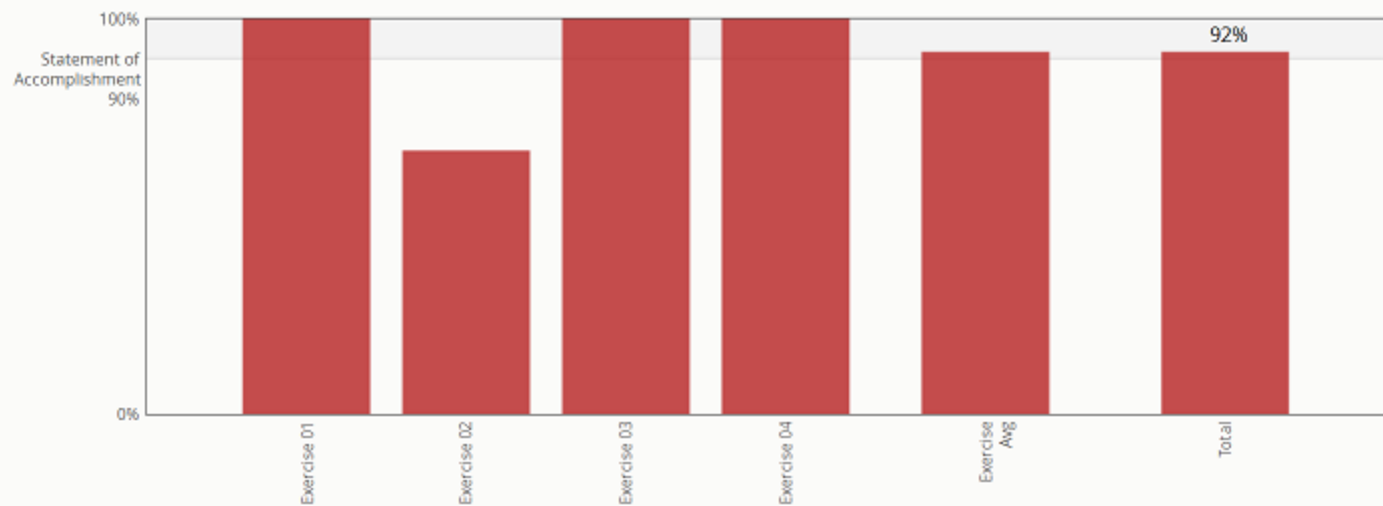
[View Course](#)

[Email Settings](#) [Unenroll](#)

# SQL Mini-Course

## Stanford Online

Course Progress for Student 'everestso' (everestso@aol.com)





# Grading

Date	Assignment/Examination/Presentation	Points
	In-Class Participation	100
	DB2, 3: XML/JSON	50
	DB4: Relational Algebra	50
	DB5: SQL	50
	DB6: Xpath/Xquery	50
	DB8: Design Theory	50
	DB9: UML	50
	DB10: Indexes and Transactions	50
	DB11: Constraints and Triggers	50
	Midterm	200
	Final	300

# In-Class Participation

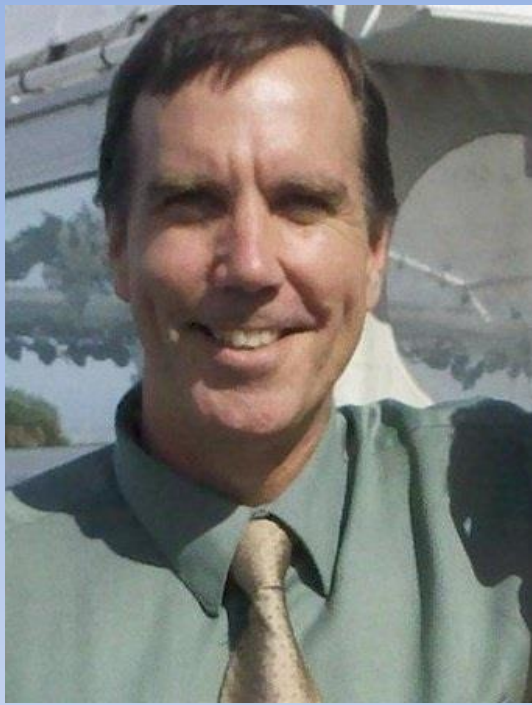
- Attendance
- Presentations

# Tests

- Midterm
- Final

# Laptops

- Tests will use laptops w/ blackboard.



David Ruby

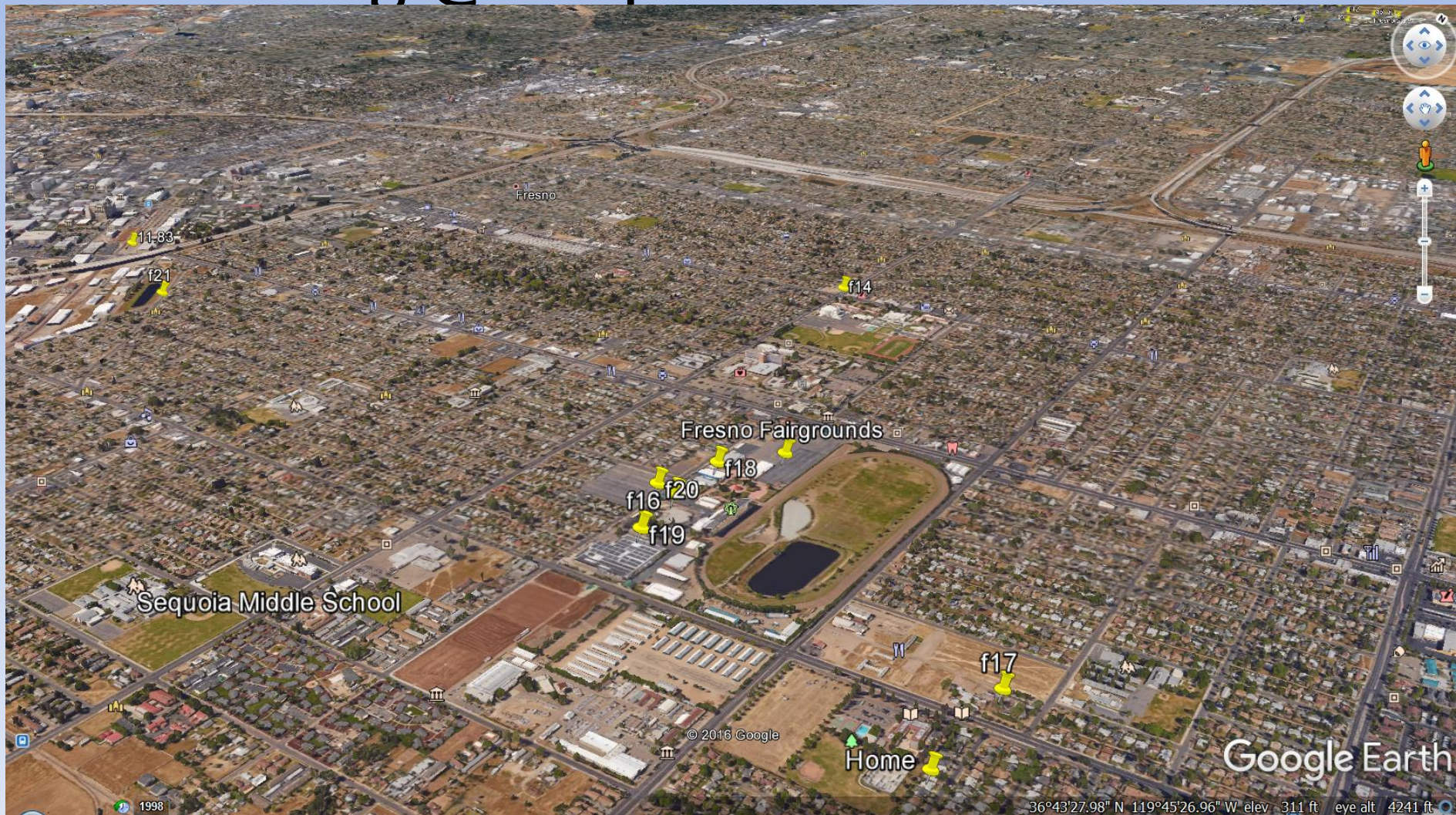
# Class Instructor

- Office
  - Science II – 273
- Email:
  - [druby@csufresno.edu](mailto:druby@csufresno.edu)

- First-Generation College Student
- How PhD?



# Father Floyd Fresno Career Custodian Ending @ Sequoia Middle School







# Compute Science Focus: Jobs/Degrees

- Students want...
  - Jobs!
  - Advanced Degrees!!

• HOW???

# Dr. Joy Goto, Professor Biochemistry, Fresno State

- <https://youtu.be/FXUiEPrK II>



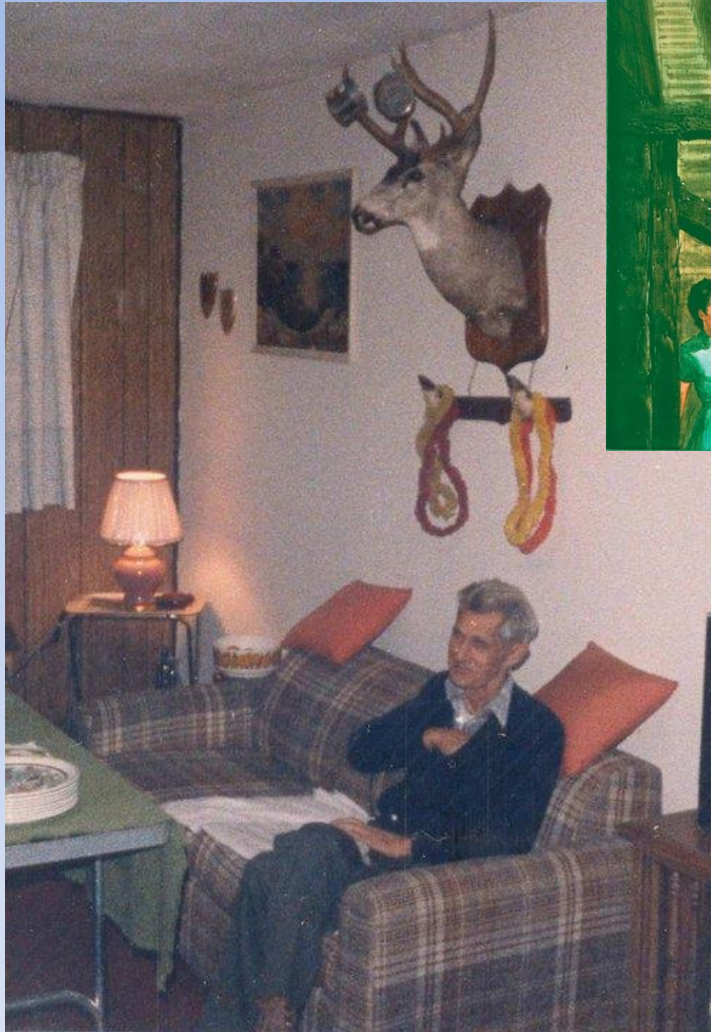
# Dr. Joy Goto, Professor Biochemistry, Fresno State



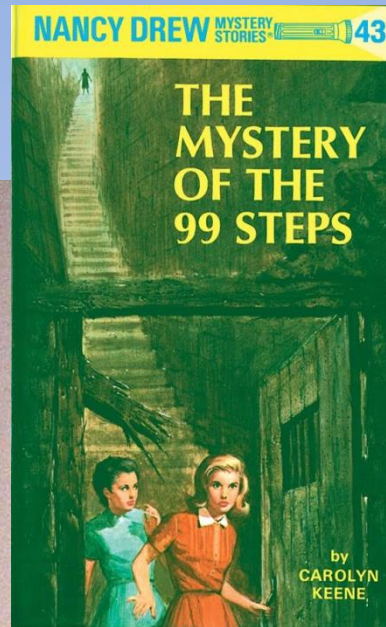
- [https://youtu.be/FXUiEPrK\\_II](https://youtu.be/FXUiEPrK_II)
- Engaging story of discovering joy in science growing up here in the central valley.



# My Story



- Family Memories

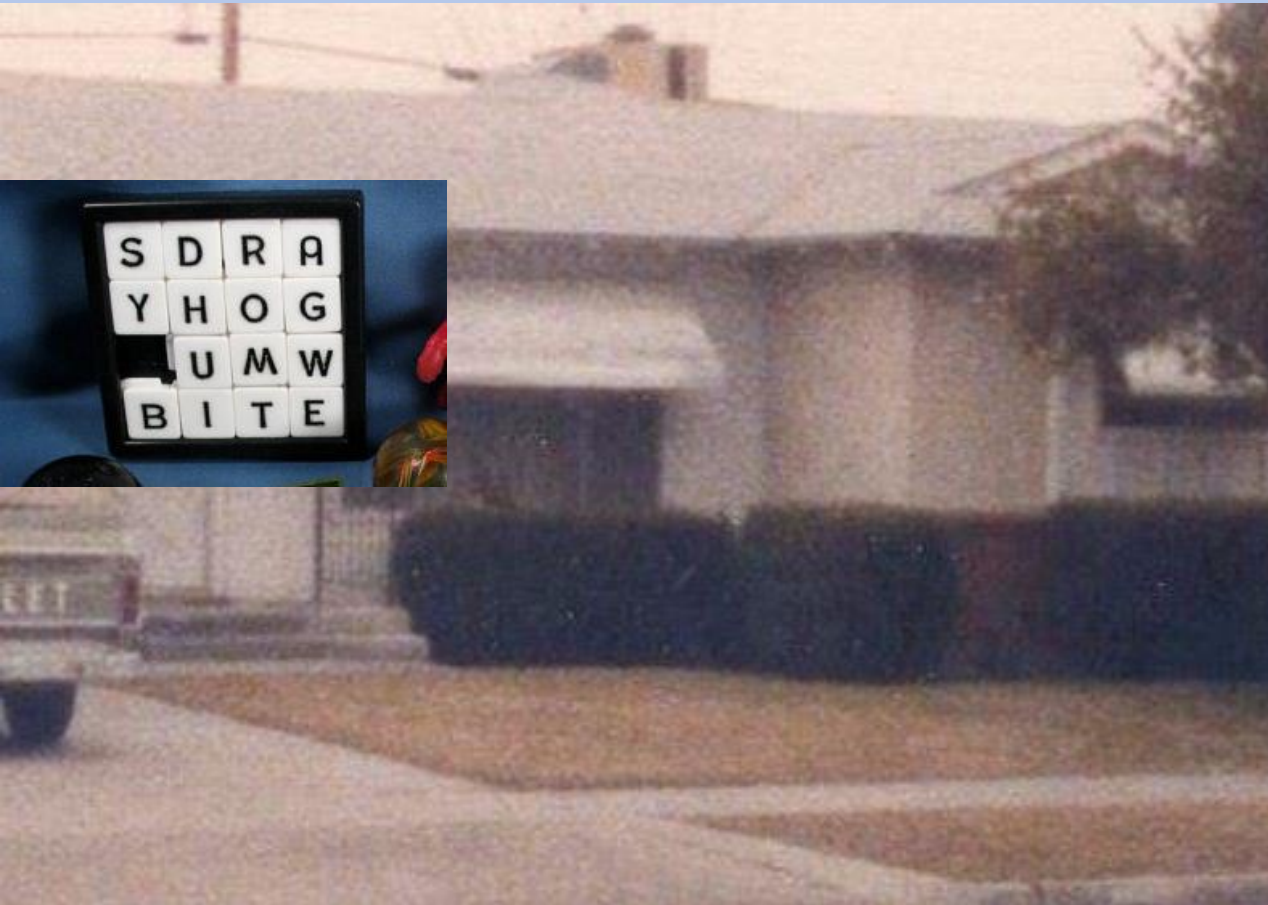


Interest  
In  
Puzzles



# Memories.. eXciting Puzzles !

- Home Hedges Maze Crawwwwwl !
- Also – First time w/ Sliding Tile Puzzle





# Thesis: Tile-Sliding Puzzle

Start State

1	2	3
4		6
7	5	8



1	2	3
4	5	6
7		8




1	2	3
4	5	6
7	8	

Goal State





# Artificial Intelligence

Branch: master ▾ ics1293 / Papers / Ruby.AAAI91-082.pdf Find file Copy path

 everestso paper 017b894 4 days ago

1 contributor

1000 KB Raw History  

From: AAAI-91 Proceedings. Copyright ©1991, AAAI (www.aaai.org). All rights reserved.

## SteppingStone: An Empirical and Analytical Evaluation\*

David Ruby and Dennis Kibler  
Department of Information & Computer Science  
University of California, Irvine  
Irvine, CA 92717 U.S.A.  
druby@ics.uci.edu

### Abstract

Decomposing a difficult problem into simpler subproblems is a classic problem solving technique. Unfortunately, the most difficult subproblems can be as difficult, if not more difficult, than the original problem. This is not an obstacle to problem solving if the difficult subproblems recur in other problems. If the difficult subproblems recur often, then its solution need only be learned once and reused. SteppingStone is a learning problem solver that decomposes a problem into simple and difficult-but-recurring subproblems. It solves the

SteppingStone operates on problems defined with a state space representation consisting of a set of goals, a set of operators, and an initial state. The goal orderer takes as input a set of goals. It orders these goals so that the constrained search method will likely solve them. It does this by ordering them so as to reduce the likelihood of subgoal interactions using a domain independent heuristic we call *openness* [Ruby and Kibler, 1989]. It produces an ordered set of subgoals as output.

The constrained search component takes as input an

# My Idea...

## Memories are constructed.. Not stored complete!

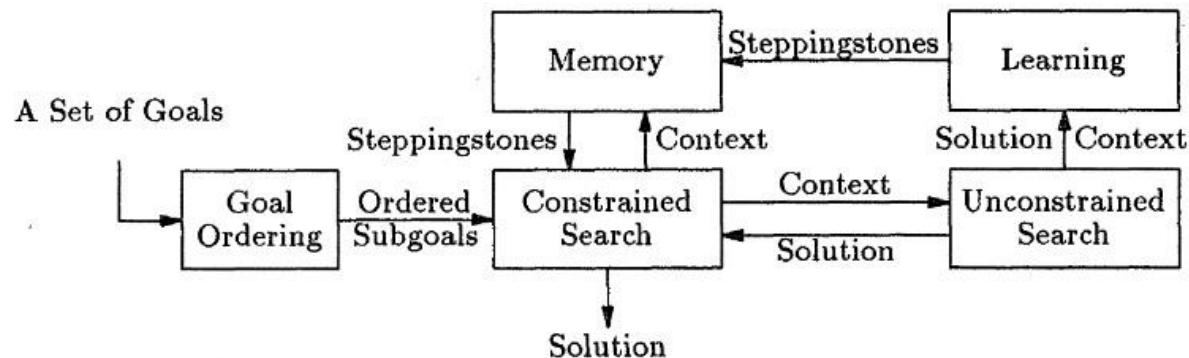


Figure 1: Overview of SteppingStone

the original impasse state.

When memory fails to return any useful steppingstones the constrained search component calls the unconstrained search component. The unconstrained search component takes as input a context, just as the memory component did. Unconstrained search relaxes the protection on the solved subgoals in its search for a solution. If it resolves the impasse, it returns the sequence of moves found to the constrained search component. The unconstrained search component also sends its impasse solution, along with the context, to the learner.

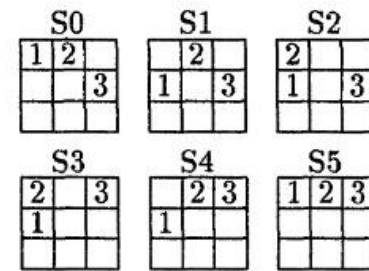
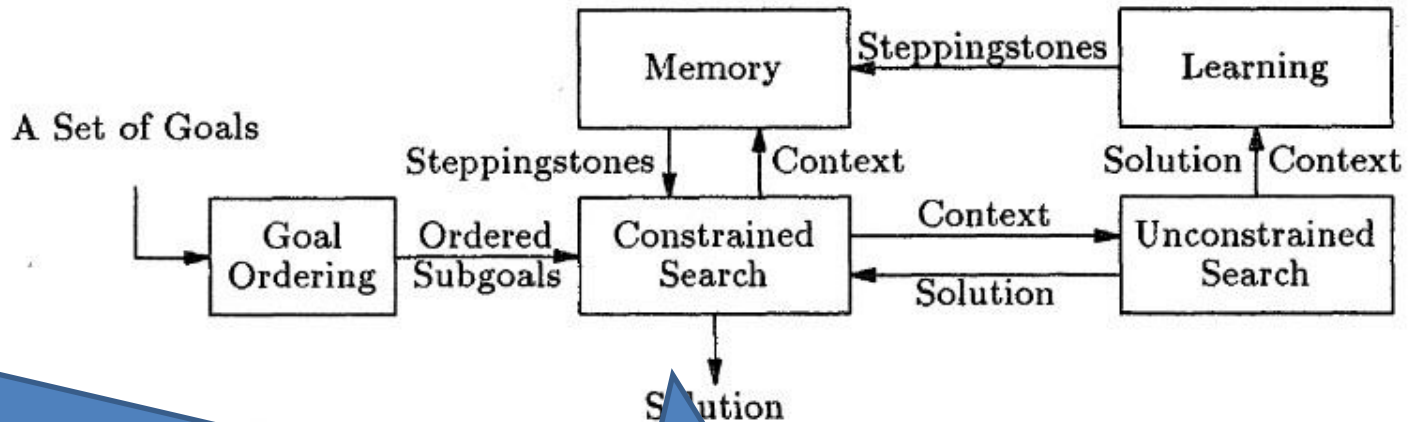


Figure 2: Steppingstones from Memory



# Thesis: Tile Sliding Domain



**Memories have gaps!!!**

When the constrained search component takes as input a context from the memory component did. Unconstrained search is the protection on the solved subgoals in its search for a solution. If it resolves the impasse, it returns the sequence of moves found to the constrained search component. The unconstrained search component also sends its impasse solution, along with the context, to the learner.

Figure 1: Overview of SteppingStone

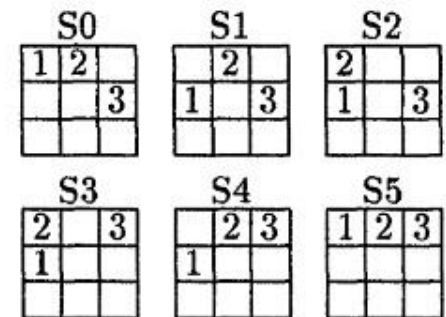
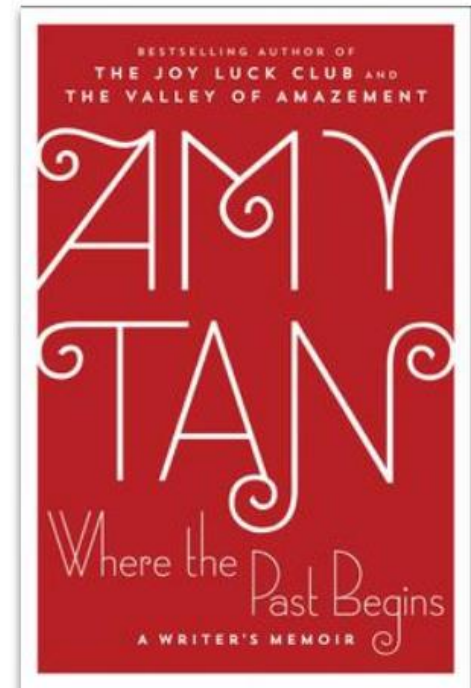
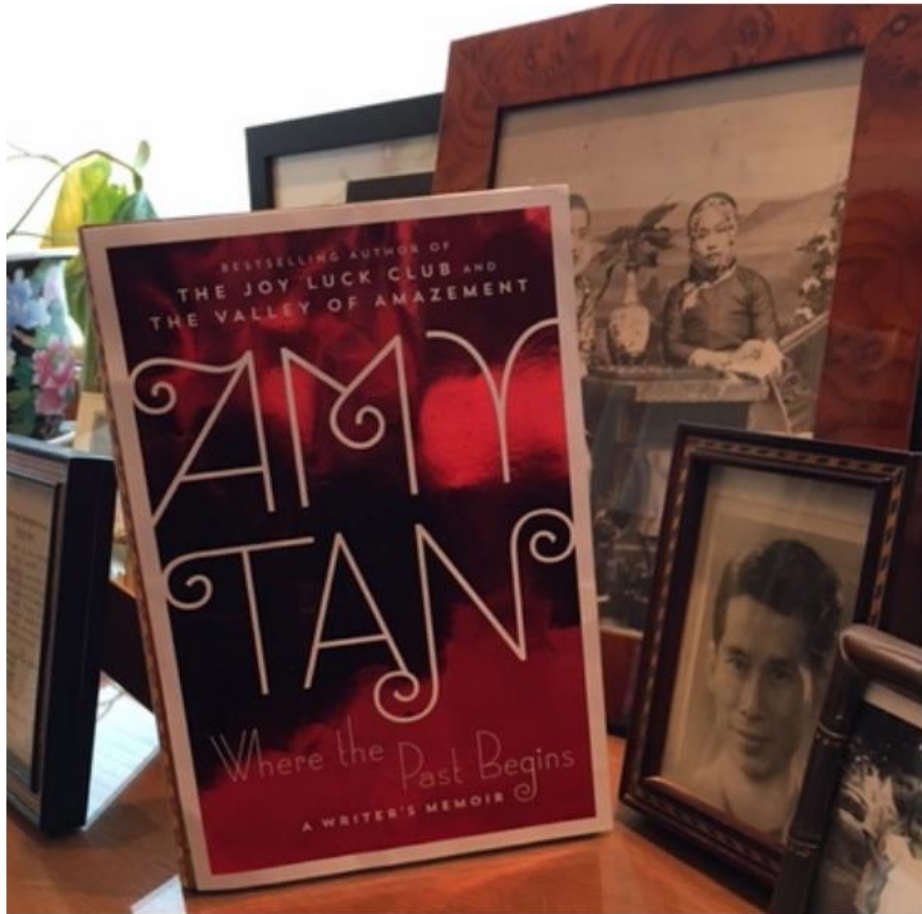


Figure 2: Steppingstones from Memory

# Emotional Memory



*coming*  
*Oct 17, 2017*  
Pre-order

# Malleable Memory (Gaps)

## Learning & Memory w/ Elizabeth Loftus



### CORRUPTED MEMORY

*Elizabeth Loftus has spent decades exposing flaws in eyewitness testimony. Her ideas are gaining fresh traction in the US legal system.*

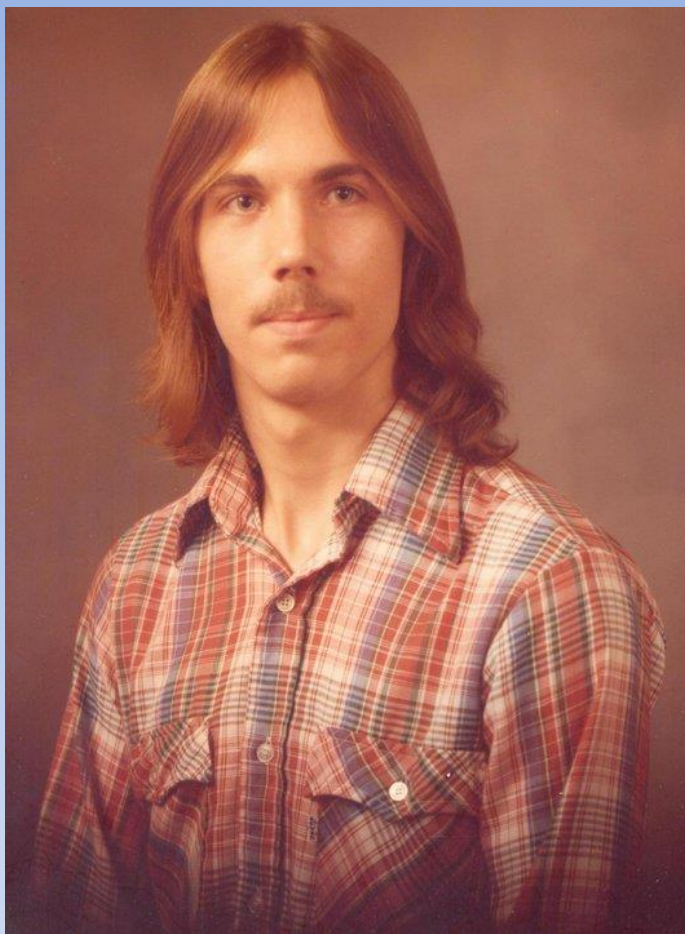
BY MOHEB COSTANDI



Elizabeth Loftus is a cognitive psychologist at the University of California Irvine.



# eXciting Mazes Memories!



- ME:
  - Do you remember the FUN maze?
- NEIGHBOR:
  - Do YOU remember this other HORRIBLE thing??
- ME:
  - Hmmm .. I guess not.
- Language influencing memory ??

# Memories & Learning

JOURNAL OF VERBAL LEARNING AND VERBAL BEHAVIOR 13, 585–589 (1974)

## **Reconstruction of Automobile Destruction: An Example of the Interaction Between Language and Memory'**

ELIZABETH F. LOFTUS AND JOHN C. PALMER

*University of Washington*

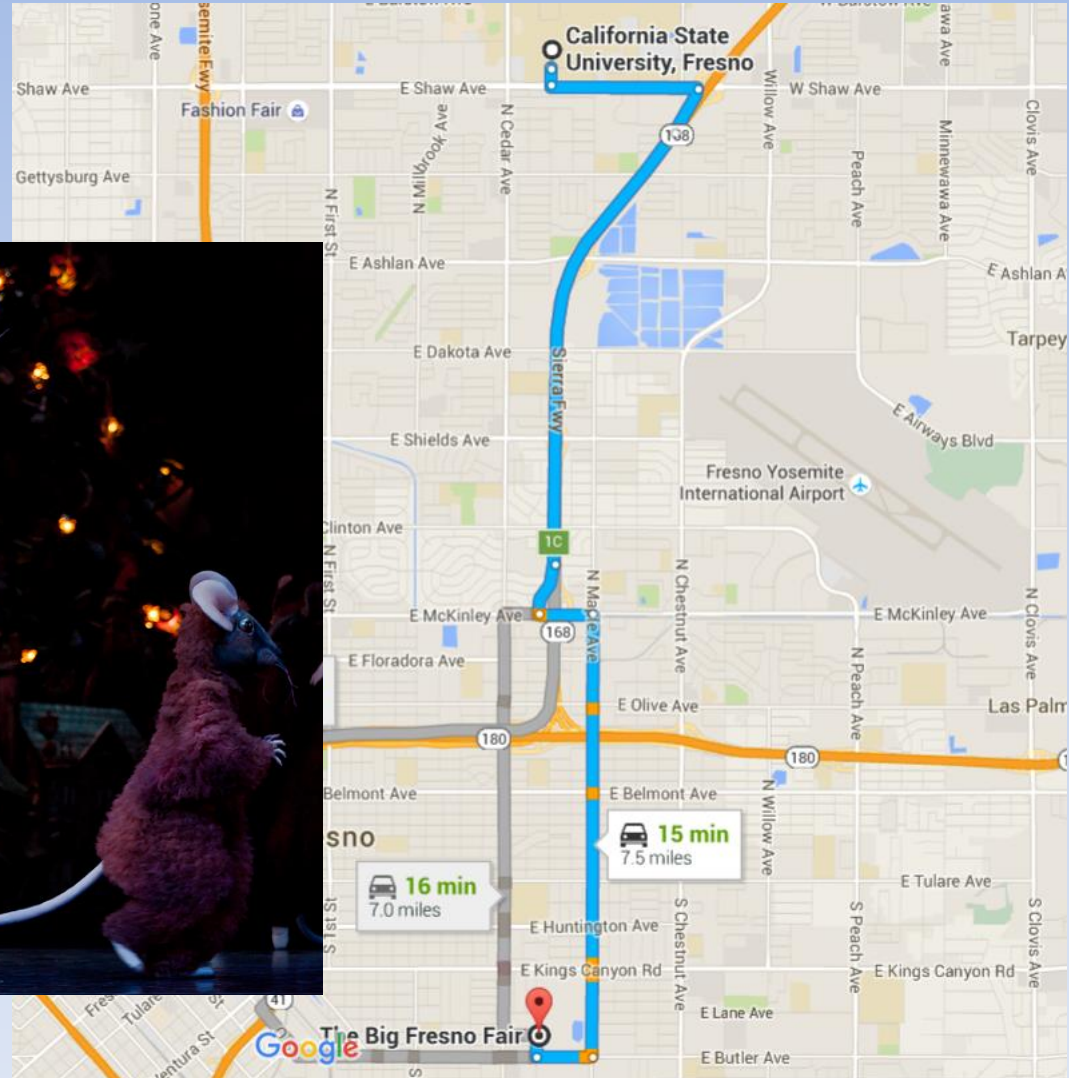
Two experiments are reported in which subjects viewed films of automobile accidents and then answered questions about events occurring in the films. The question, “About how fast were the cars going when they smashed into each other?” elicited higher estimates of speed than questions which used the verbs *collided*, *bumped*, *contacted*, or *hit* in place of *smashed*. On a retest one week later, those subjects who received the verb *smashed* were more likely to say “yes” to the question, “Did you see any broken glass?”, even though broken glass was not present in the film. These results are consistent with the view that the questions asked subsequent to an event can cause a reconstruction in one’s memory of that event.

# Computer Science / Memories

- Puzzles
- Abstractions
- Memories

# Current Interest: Abstraction

- Hello, World!





# Abstraction:

## Computational Thinking

- Abstraction
- Automation
- Algorithms/Analysis



# A FIRST COURSE IN DATABASE SYSTEMS

THIRD EDITION

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Jennifer Widom

## Textbooks and Materials

*A First Course in Database Systems (3<sup>rd</sup>)*  
by Jeffrey D. Ullman & Jennifer Widom



# Chapter 1

## DATA



- Databases, Big Data, Data Mining, Data Science
- What's all this about DATA???
- Stanford Online (DB 1)

# **Chapter 11:**

## **Semistructured Data**

- XML
  - Well-Formed
  - DTD/XML Schema
- JSON
  - JSON Schema
- Assignment XML/JSON
  - Stanford Online DB2, DB3



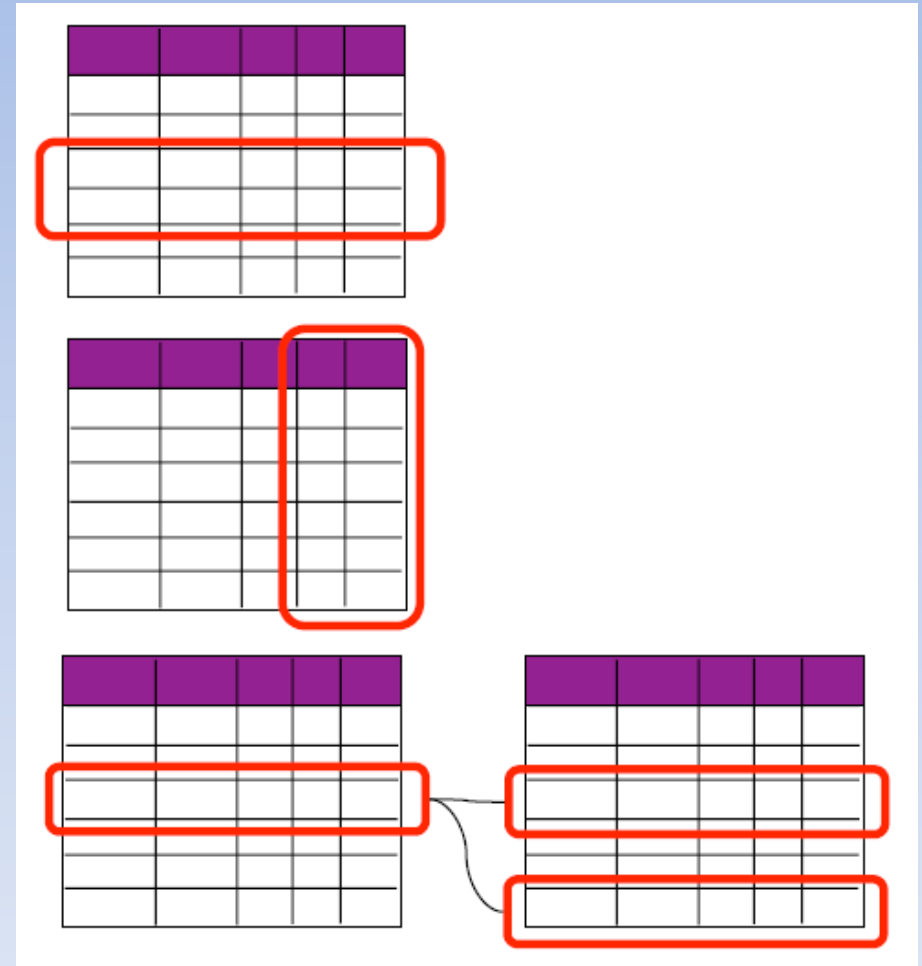
# **Chapter 2:**

# **Relational Data Model**

- Data Models
- Relational Data Model
- Relational Algebra

# Chapter 2: Relational Data Model

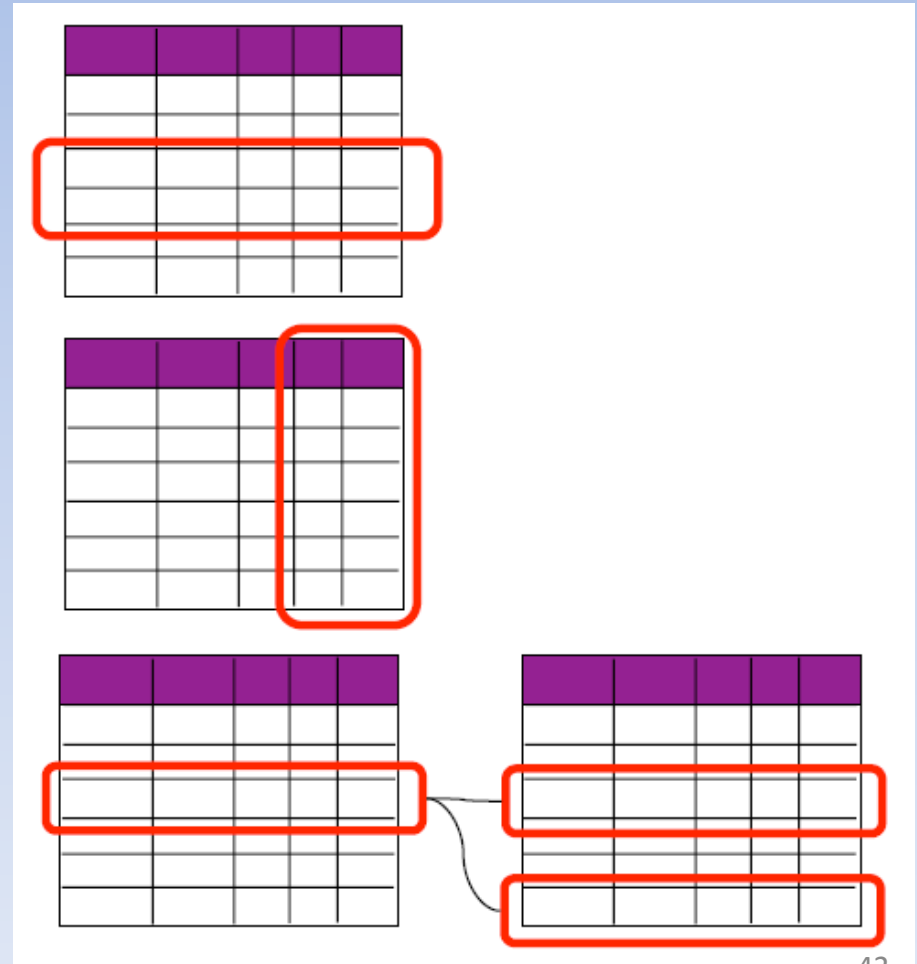
- Language of Relational Algebra
- Assignment Relational Algebra
  - Stanford Online DB4



# Chapter 5, 6:

## SQL & Relational Algebra/Datalog

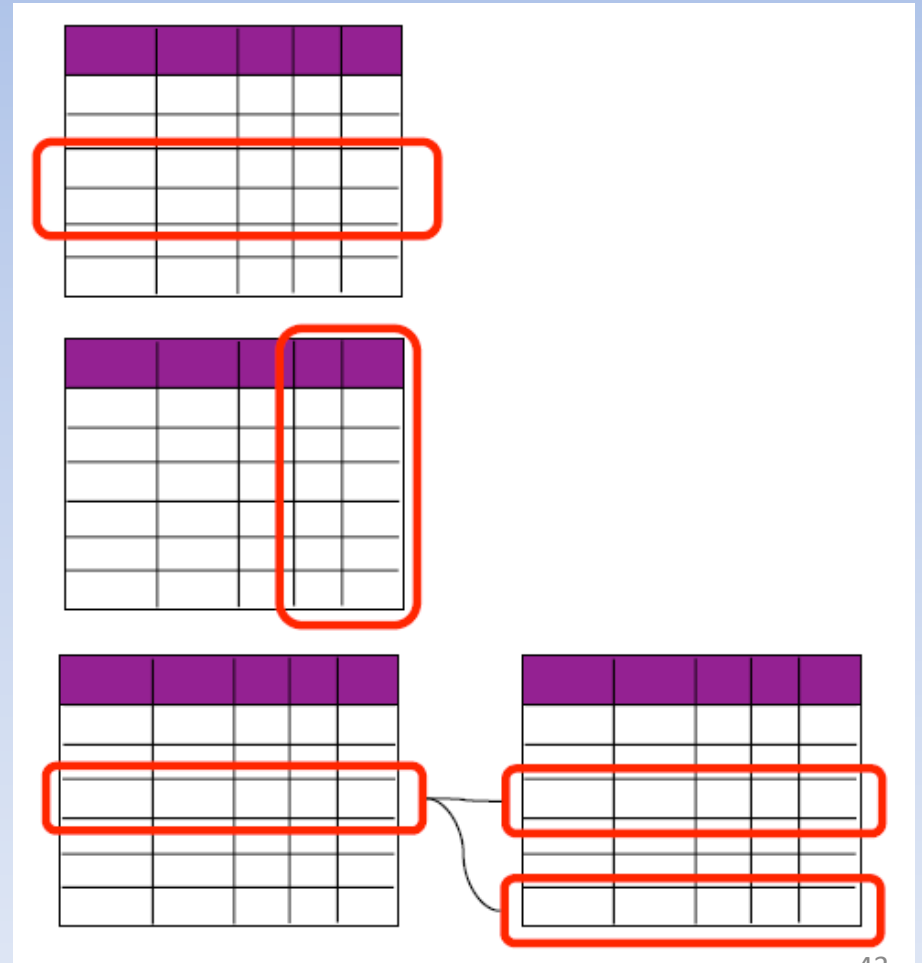
- SELECT \* FROM table
- Data Analysis Examples
- Data Mining Examples



# Chapter 5, 6:

## Assignment

- Assignment : SQL DB5
  - Modifications
  - Queries



# **Chapter 12:**

## **Querying**

### **Semistructured Data**

- Xpath/Xquery
- Assignment DB6



# MIDTERM

- Midterm
  - Chapter 1: Introduction to Databases
  - Chapter 11: Semistructured Data
  - Chapter 2: Relational Data Models
  - Chapter 2, 5: Relational Algebra/Datalog
  - Chapter 6: SQL (not transactions)
  - Chapter 12: Querying Semistructured Data

# **Chapter 3:**

## **Design Theory**

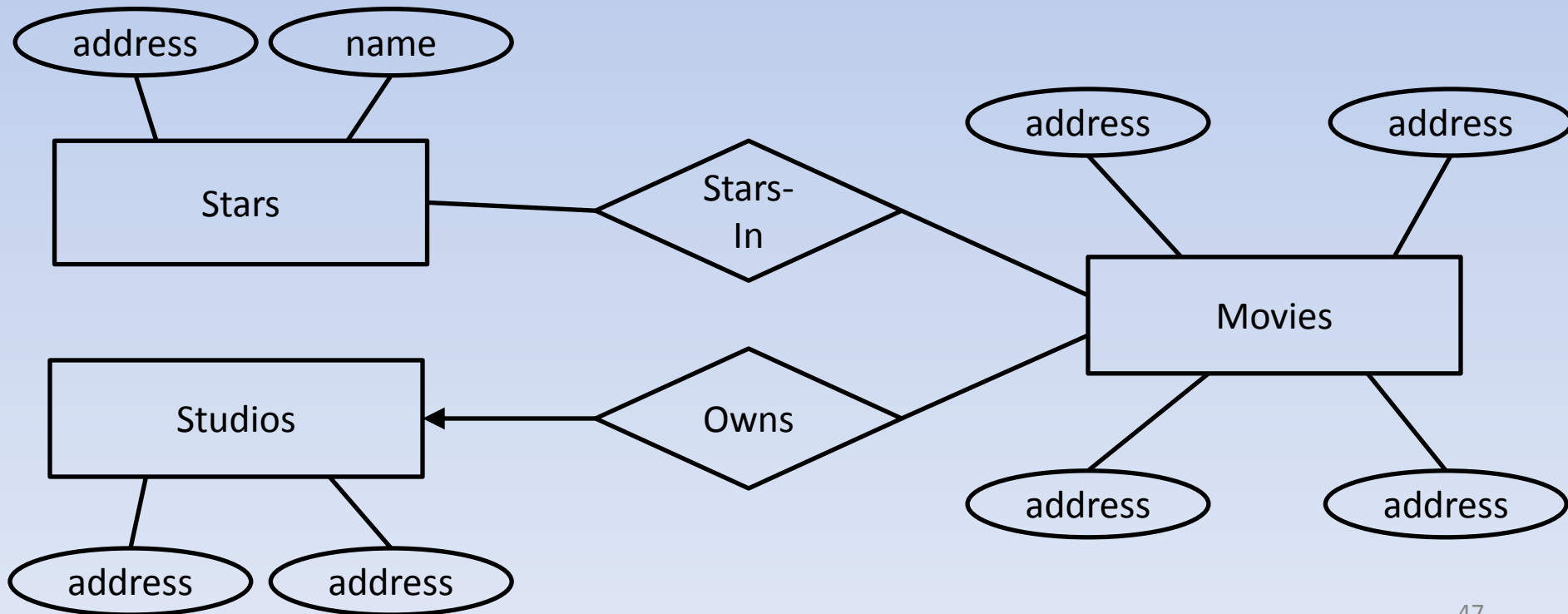
### **for Relation Databases**

- Database Theory
- Assignment DB8

# Chapter 4:

## Database Design w/ E/R & UML Diagrams

•



# **Chapter 6:**

# **Transactions**

- ACID Properties

# **Chapter 7:**

## **Constraints/Triggers**

- Maintaining Consistency



# **Chapter 9:**

# **Stored Procedures**

# **Chapter 8:**

## **Index/Views**

- Indexes for Performance

# **Chapter 10:**

## **Advanced Topics/Authoring**

- Users & Passwords

# Introduction to NoSQL

- Hadoop: Map-Reduce
- MongoDB

# **Machine Learning/ Data Mining**

- Supervised/Unsupervised Learning
- Validating Data Mining Results



# Final

# MySQL

MySQL Workbench

SQL Editor (cs126) x

File Edit View Query Database Plugins Scripting Help

Object Browser

SCHEMAS

Search objects

- ass2
- assgn1
- assignment2
- bank
- computers
- cs126a
- housedb
- iris2d
- movies**
- music
- quizzes
- ratest
- sakila
- ships
- test
- world

SQL File 1 movies x

```
14 • LOAD DATA
15 LOCAL INFILE 'D:/Documents/GitHub/CSci226.Fall13/assignments/movie_ratings/movie_list.1.csv'
16 INTO TABLE movie_list
17 FIELDS TERMINATED BY ',';
18
21 • delete from movie_list;
22 • select * from movie_list limit 100;
23
24 • select * from movie_list where mname like "%Avengers%";
25 • select * from movie_list where mname like "%Batman%";
26 • select * from movie_list where mname like "%Cat%";
27 • select * from movie_list where mname like "%Jungle%";
28
29 • select * from movie_list where mname like "Alice in Wonderland_" or
30 mname like "%Batman%"
31
```

Filter:

mid	myear	mname
29	1995	Batman Forever
231	1992	Batman Returns
254	1997	Batman & Robin
403	1989	Batman
420	1951	Alice in Wonderland
*	NULL	NULL NULL

Information

No object selected

movie\_list 1

Output

Action Output

	Time	Action	Message
✓ 1	15:29:41	use movies	0 row(s) affected
✓ 2	15:29:47	select * from movie_list where mname like "Alice in Wonderland_" or mname like "%Batman..."	5 row(s) returned

# Day 1: Discussion

1. Highlight academic & professional background.
2. Highlight Professional & Research interests.

# Next Time

- <https://lagunita.stanford.edu/>
- Register w/ Stanford Online
- Register for DB1 : Introduction and Relational Databases
- It has no quizzes... Just check out the vids and how everything work.
- The next set is DB2 (XML), DB3 (JSON)