

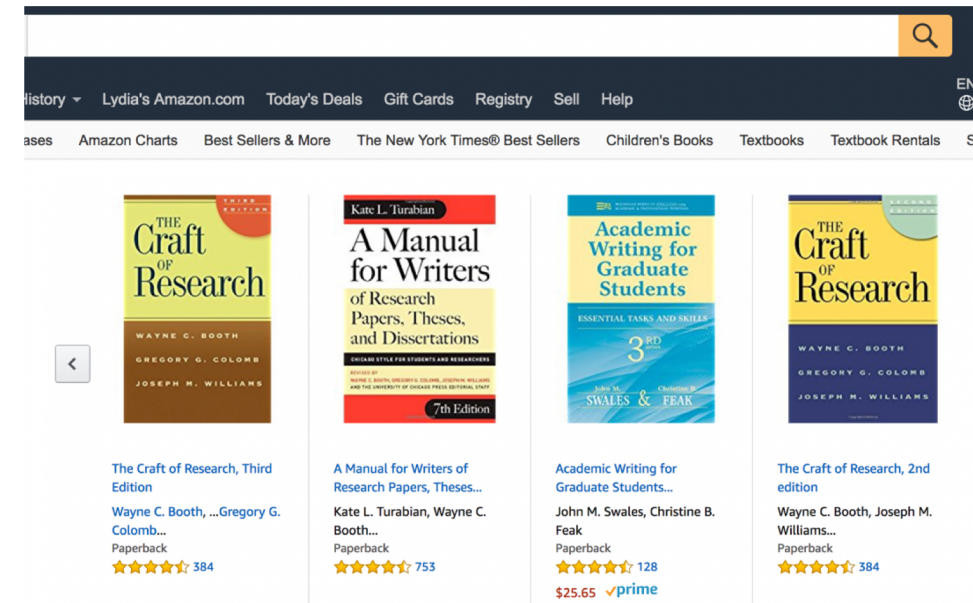
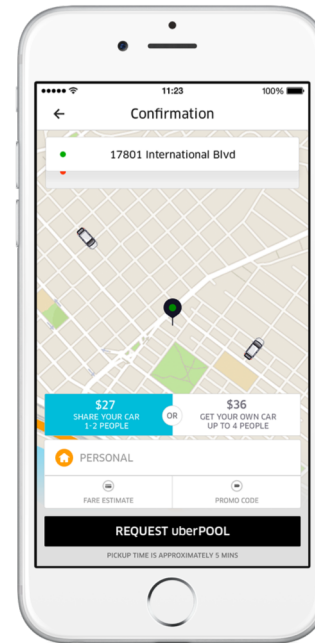
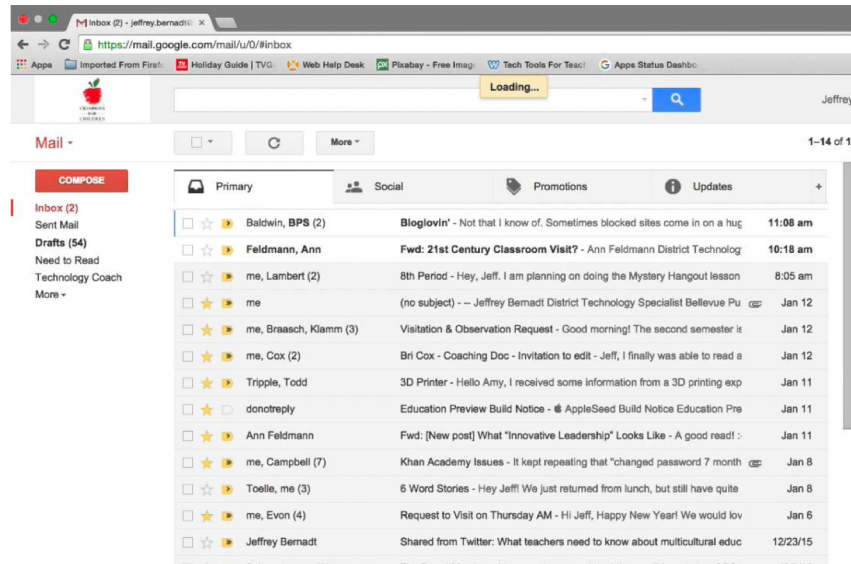
# Database-Backed Websites

Prof. Lydia Chilton  
COMS 4170  
23 February 2022

Raise your hand or chat in zoom



# The main goal of many websites is to interact with data.



We need servers to store the data.  
Clients request data from servers (and display it)

```
people — Python · Python server.py — 80x24
Last login: Sun Feb 16 09:18:51 on ttys001
Lydias-MacBook-Pro:people lydiachilton$ python server.py
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
* Restarting with stat
* Debugger is active!
* Debugger PIN: 723-907-492
127.0.0.1 - - [19/Feb/2020 07:07:16] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:07:17] "GET /favicon.ico HTTP/1.1" 404 -
127.0.0.1 - - [19/Feb/2020 07:07:46] "GET /people HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:07:46] "GET /static/people.js HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:07:56] "POST /add_name HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:08:01] "GET /people HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:09:25] "POST /add_name HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:09:28] "GET /people HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:26:36] "GET /people HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:26:38] "GET /people HTTP/1.1" 200 -
^CLydias-MacBook-Pro:people lydiachilton$ python server.py
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
* Restarting with stat
* Debugger is active!
* Debugger PIN: 723-907-492
127.0.0.1 - - [19/Feb/2020 07:26:46] "GET /people HTTP/1.1" 200 -
█
```

```
server.py
1 from flask
2 from flask
3 from flask
4 app = Flask
5
6
7 current_id
8 data = [
9     {
10      "id": 1,
11      "name": "michael scott"
12     },
13     {
14      "id": 2,
15      "name": "jim halpert"
16     },
17 ]
```

**Server:  
store the data**

127.0.0.1:5000/people

Reload this page

**Hello people:**

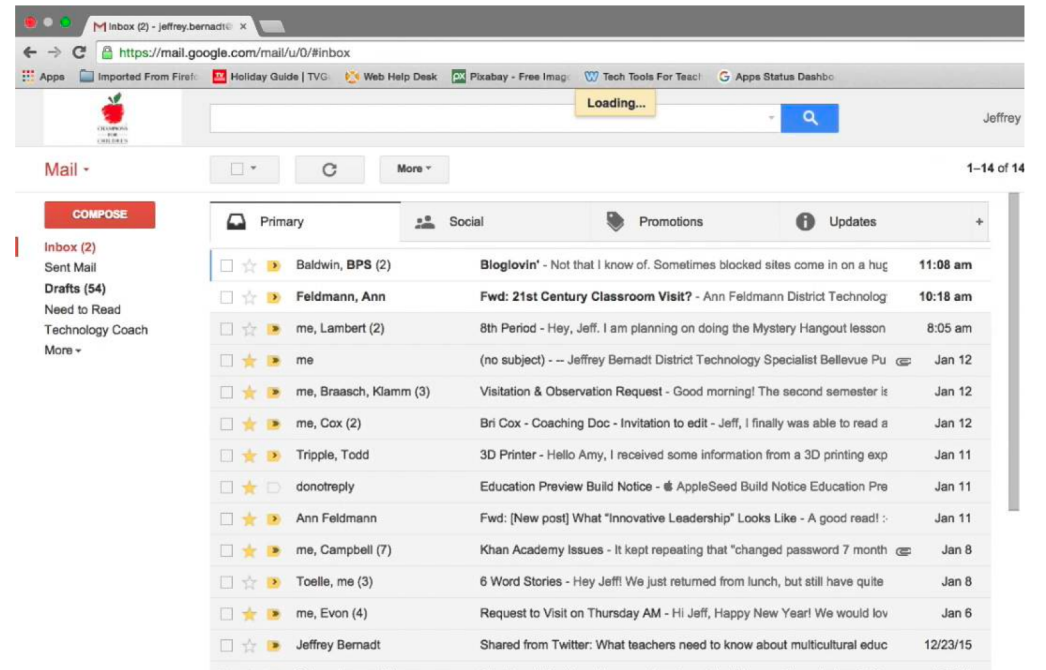
name:  Submit

michael scott  
jim halpert

**Client:  
requests data from server**

# Gmail is a database of emails

```
emails = [  
  {  
    "from": "bollinger",  
    "to": "chilton",  
    "subject": "4170 is awesome!"  
  },  
  {  
    "from": "obama",  
    "to": "chilton",  
    "subject": "belated medal of freedom"  
  },  
]
```



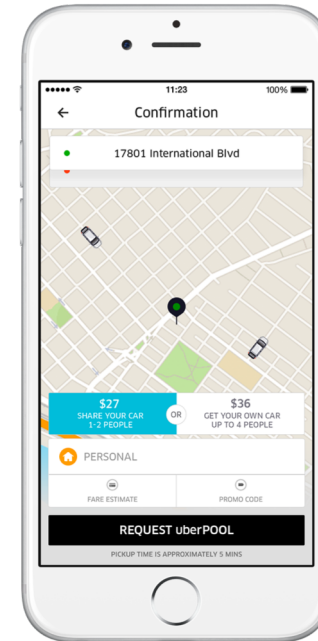
# Amazon is a database of books

```
products = [  
  {  
    "title": "Ivy League Web Design",  
    "author": "chilton",  
    "stars": "5"  
  },  
  {  
    "title": "JavaScript and You",  
    "author": "chilton",  
    "stars": "6"  
  },  
]
```

The screenshot shows the Amazon Books interface. At the top, there is a search bar with 'Books' entered and a magnifying glass icon. Below the search bar, there are navigation links for 'Departments', 'Browsing History', 'Lydia's Amazon.com', 'Today's Deals', 'Gift Cards', 'Registry', 'Sell', and 'Help'. A secondary navigation bar includes 'Books', 'Advanced Search', 'New Releases', 'Amazon Charts', 'Best Sellers & More', 'The New York Times® Best Sellers', 'Children's Books', 'Textbooks', and 'Textbook Rentals'. The main content area features a 'Popular in Books' section with a list of categories: Award Winners, Bargain Books, Best Books of the Month, Best Books of 2017, Books in Spanish, Children's Books, Deals in Books, and Top 20 Lists in Books. Below this is a 'More in Books' section with links to '100 Books to Read in a Lifetime', 'Amazon Book Review Blog', 'Amazon Books on Facebook', 'Amazon Books on Twitter', and 'Amazon First Reads'. The right side of the page displays four book covers in a carousel. The first book is 'The Craft of Research, Third Edition' by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, with a 5-star rating and 384 reviews. The second is 'A Manual for Writers of Research Papers, Theses, and Dissertations, 7th Edition' by Kate L. Turabian and Wayne C. Booth, with a 5-star rating and 753 reviews. The third is 'Academic Writing for Graduate Students, 3rd Edition' by John M. Swales and Christine B. Feak, with a 5-star rating and 128 reviews, and a price of \$25.65 with Prime. The fourth is 'The Craft of Research, 2nd edition' by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, with a 5-star rating and 384 reviews.

# Uber is a database of drivers.

```
cars = [  
  {  
    "location": "116 and broadway",  
    "driver": "kenny",  
    "car type": "uber XL"  
  },  
  {  
    "location": "times square",  
    "driver": "jen",  
    "car type": "normal"  
  },  
]
```



# Tinder is a database of profiles

```
profiles = [  
  {  
    "name": "maddy",  
    "image": "./maddy.png",  
    "likes": "1000",  
    "dislikes": 0,  
  },  
  {  
    "name": "julia",  
    "image": "./julia.png",  
    "likes": "1000",  
    "dislikes": 0,  
  },  
]
```



# YouTube: Database of videos



Windows 95 Video Guide with Matthew Perry & Jennifer Aniston

216,782 views

2K 48 SHARE



Favorite Videos  
Published on Dec 12, 2016

SUBSCRIBE 201K

Watch all about the show Friends in a single playlist - <https://www.youtube.com/playlist?list...>  
Subscribe and watch scenes from all seasons of Friends on my channel - <https://www.youtube.com/channel/UCA8V...>

SHOW MORE

Up next

AUTOPLAY



Friends - The One that Goes Behind the Scenes  
Favorite Videos  
1.8M views



Would I Lie to You? - S11 E08 (NEW WILTY 19th January)  
David Mitchell  
Recommended for you  
New



Actor Replacements That Totally Ruined The Show  
Looper  
3M views



Inside Matthew Perry's Tragic Real Life Story  
Nicki Swift  
952K views



Friends - ET On VH1: Behind The Friends Finale  
Favorite Videos  
1M views



REACT S7 · E19  
TEENS REACT TO WINDOWS 95  
FBE  
12M views



Friends - Ross and Monica's Cousin  
Favorite Videos  
3.6M views



# Facebook: Database of posts

facebook



**PictureCorrect Photography Tips**

What is your Photography-Related New Year's Resolution??

15 minutes ago · Like · Comment

Adel Gomaa and Richard Schneider like this.



**Sadi Molloy** get my business looking more professional: car signed: tick, making up portrait folders: tick, stickers & cd covers: still to do... its getting there though.

11 minutes ago · Flag



**PictureCorrect Photography Tips** My resolution for 2011 is to capture more landscape photos outside the U.S. and add more countries to my portfolio! What is yours?

-Richard

11 minutes ago · Flag



**James Donnelly** Larger concerts to cover and improve my portrait editing style/skill

10 minutes ago · Flag



**Jose Antonio Rubido** To push my photpography foward full throttle

9 minutes ago · Flag



**Deacon Jonathan Jerome Johnson** To learn more and enhance the quality of my shots!

5 minutes ago · Flag



**Latu Peti Vimahi Manulua-hafoka** learn learn learn!!!

4 minutes ago · Flag



**Tina Taylor Hammer** Get my new business moving and have it pay for that lens and other equipment that I want (and a little for me too).

2 minutes ago · Flag



**Stefanie Bakewell** get a website up so that i can get clients full steam ahead

about a minute ago · Flag

# GCalendar: Database of events

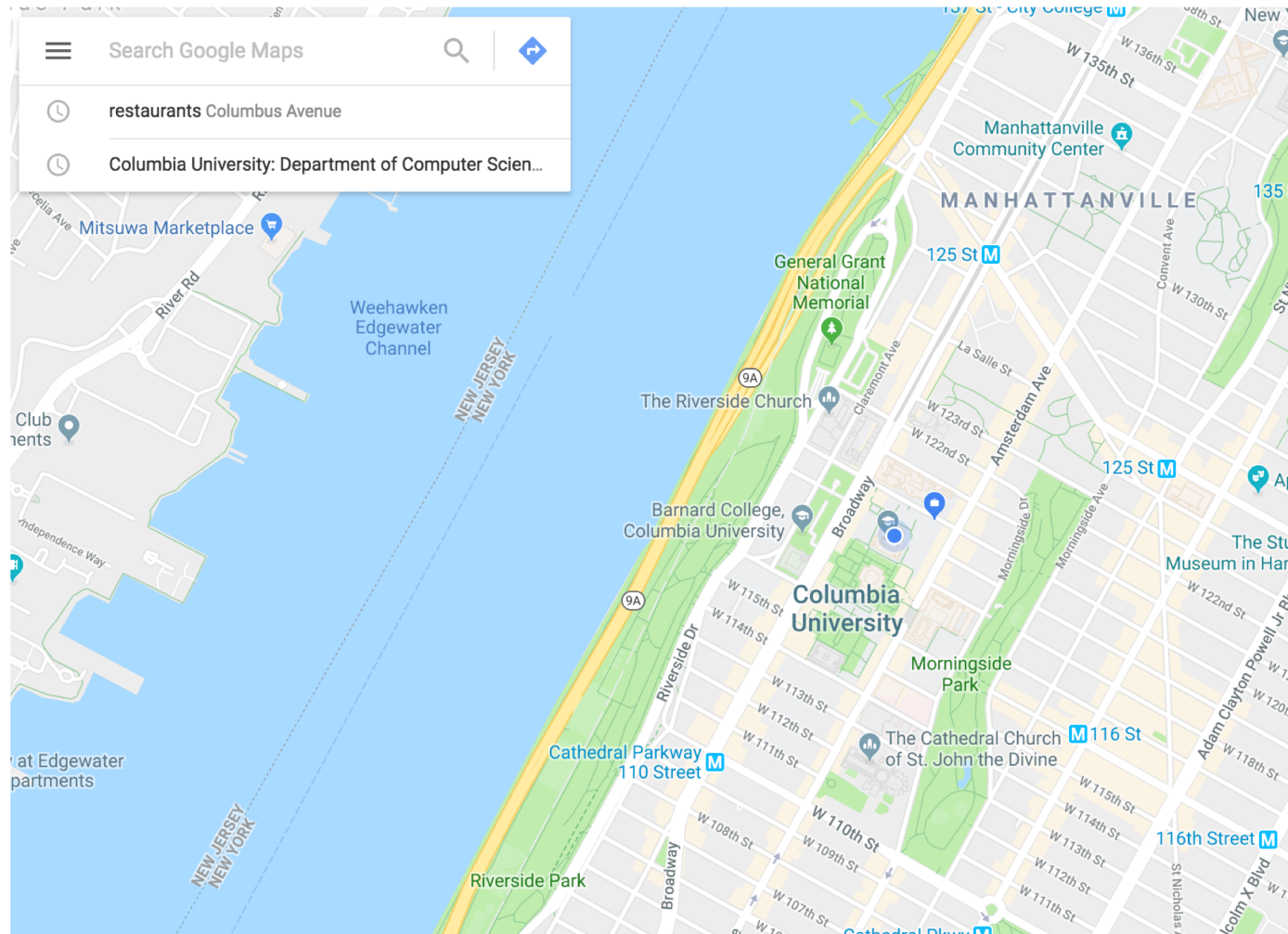
The screenshot displays the Google Calendar web interface. At the top, the browser address bar shows <http://www.google.com/calendar/render>. The page header includes navigation links for Gmail, Calendar, Documents, Photos, Reader, Web, and more, along with the user's email address `einz.einz@gmail.com` and links for Offline, Settings, Help, and Sign out.

The main content area shows a weekly calendar view for May 2009, starting on Monday, May 11th. The calendar is organized into columns for each day of the week. The left sidebar contains a monthly calendar grid for May 2009, with the 16th and 17th highlighted. Below the grid are sections for 'My calendars' (Personal, Guilt-Free Play, Misc Work, Quality Work) and 'Other calendars' (Austrian Holidays, Phases of the Moon, US Holidays).

The main calendar grid shows a dense schedule of events. Each event is represented by a colored bar with a time slot and a title. For example, on Monday, May 11th, there is a pink event from 06:00 to 07:00. On Tuesday, May 12th, events include 'Workout' at 06:45, 'Shower' at 07:30, 'Shopping' at 08:00, 'Reading' at 08:30, 'Breakfast' at 09:00, 'Play' at 09:30, 'Administrativa' at 10:00, 'Blog' at 10:30, 'Walk' at 11:00, 'Mail' at 11:30, 'Brainst' at 12:00, 'Blog' at 12:30, 'Reading' at 13:15, 'Play' at 13:30, 'Lunch' at 14:15, 'Blog' at 14:45, 'Nonsense' at 15:30, 'Play' at 16:30, 'Misc' at 17:30, and 'Tip' at 18:30. Similar event blocks are visible for Wednesday, Thursday, Friday, and Saturday.

At the bottom of the interface, there is a link to 'Customize your default calendar view. Learn more'.

# Google Maps: A database of locations



# New York Times: Database of news articles

SECTIONS SEARCH

hmslydia

ENGLISH 中文 (CHINESE) ESPAÑOL

## The New York Times

Friday, January 19, 2018 Today's Paper Video 34°F S. & P. 500 +0.19%

World U.S. Politics N.Y. Business Opinion Tech Science Health Sports Arts Style Food Travel Magazine T Magazine Real Estate ALL

### Trump in Shutdown Talks With Schumer

#### White House Invites Democratic Leader to Negotiate a Deal

By THE NEW YORK TIMES  
49 minutes ago

- The government will shut down at 12:01 a.m. Saturday if lawmakers fail to get an agreement on some kind of spending bill.
- With Democrats balking, President Trump canceled plans to travel to his Florida resort and contacted Senator Chuck Schumer, the Democratic leader.
- **Timeline: How Congress Got to the Brink of a Shutdown**
- **Right and Left React to Prospect of Shutdown**



“We are not going to desert these young people,” he said, referring to DACA beneficiaries.

Senator Bernie Sanders of Vt.

#### How the Debate in Congress Breaks Down

By ALICIA PARLAPIANO and WILSON ANDREWS  
Lawmakers have until Friday at midnight to pass a short-term spending bill to avoid a government shutdown.

#### Senate to Vote With Shutdown at Stake

By THOMAS KAPLAN and SHERYL GAY STOLBERG 44 minutes ago  
Senate Democrats appear ready to block legislation to keep the government funded past midnight, gambling that Mr. Trump will offer concessions on immigration and other issues.

574 Comments

#### The Chaos President vs. His Iron-Fisted Chief of Staff

By MAGGIE HABERMAN and JULIE

VIDEO INTERVIEW

#### Opinion

EDITORIAL

#### Here's Another Fine Mess They've Gotten Us Into

Once again, Trump and Congress cannot perform a basic task, preventing a government shutdown.



- **Krugman: Doomsday Politics**
- **The Breakdown in Trust That Could Lead to a Shutdown**
- **Brooks: It's Time to Talk About the Power of Touch**
- **Goldberg: Is This the Collusion We Were Waiting For?**
- **Kristof: Swallowed by the Sea**
- **Leonhardt: A Warning for Democrats**
- **Egan: The Mad King**
- **The Shadow Safety Net**

FRANK BRUNI

#### Donald Trump's Radical Honesty

In his own wild way, this president is as truthful and transparent as they come.



#### Clubbable, but in the Worst Way

By MICHAEL GOLDFARB

Donald Trump is a man of his class — the nouveau-riche, country-club class.



- **How the Pro-Life Movement Has Promoted Liberal Values**
- **ICE Detained My Husband for Being an Activist**
- **Follow us on Twitter »**

TIMES INSIDER »

‘I, Figure Skating Reporter’: Full Circle With Tonya Harding

THE CROSSWORD »

Play Today's Puzzle



33m The Justice Department wants to ask if you are a U.S. citizen in the 2020 census. But public distrust of the government could lead Hispanic people to avoid being counted.






5h Can software predict crime? A study suggests that human amateurs are about as accurate as a popular software that many judges use to




# Craigslist: Database of random crap for sale

CL new york > brooklyn > for sale > furniture - by owner

reply   prohibited  Posted 12 days ago [← prev](#) [next →](#)


☆ **Gorgeous new 6ft. tall throne chair - \$1199 (Brooklyn)** 



condition: new

Gorgeous new 6ft. tall throne chair for \$1199obo. I will deliver it to you!

- do NOT contact me with unsolicited services or offers

post id: 6490476659   posted: 12 days ago   updated: 34 minutes ago   [email to friend](#)   [♥ best of](#) 

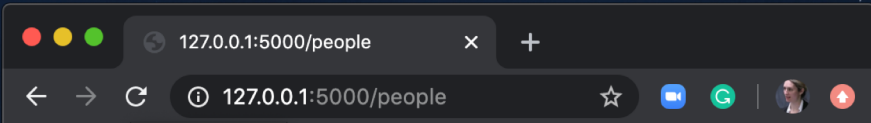
- [safety tips](#)
- [prohibited items](#)
- [product recalls](#)
- [avoiding scams](#)

We need to have another computer store and serve the data.  
That server is running a Python application called Flask.

```
people — Python · Python server.py — 80x24
Last login: Sun Feb 16 09:18:51 on ttys001
Lydias-MacBook-Pro:people lydiachilton$ python server.py
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
* Restarting with stat
* Debugger is active!
* Debugger PIN: 723-907-492
127.0.0.1 - - [19/Feb/2020 07:07:16] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:07:17] "GET /favicon.ico HTTP/1.1" 404 -
127.0.0.1 - - [19/Feb/2020 07:07:46] "GET /people HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:07:46] "GET /static/people.js HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:07:56] "POST /add_name HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:08:01] "GET /people HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:09:25] "POST /add_name HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:09:28] "GET /people HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:26:36] "GET /people HTTP/1.1" 200 -
127.0.0.1 - - [19/Feb/2020 07:26:38] "GET /people HTTP/1.1" 200 -
^CLydias-MacBook-Pro:people lydiachilton$ python server.py
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
* Restarting with stat
* Debugger is active!
* Debugger PIN: 723-907-492
127.0.0.1 - - [19/Feb/2020 07:26:46] "GET /people HTTP/1.1" 200 -
█
```

```
server.py
1 from flask
2 from flask
3 from flask
4 app = Flas
5
6
7 current_id
8 data = [
9     {
10      "id": 1,
11      "name": "michael scott"
12     },
13     {
14      "id": 2,
15      "name": "jim halpert"
16     },
17 ]
```

**Server:  
keeps the data**



127.0.0.1:5000/people

Reload this page

**Hello people:**

name:  Submit

michael scott  
jim halpert

**Client:  
gets data from server  
(and displays it to all users)**

# This website has no database. Why not?

 Columbia University

## User Interface Design

COMS 4170 · Spring 2018

[Home](#) [Syllabus](#) [Assignments](#) ▾

[Piazza](#)

**Part 1** Build websites that suit the needs and abilities of users.

**Part 2** When the needs and abilities of users are uncertain, design systems by learning from iteration and experimentation.

### INSTRUCTOR

[Prof. Lydia Chilton](#)

OH: Tuesday 3-4 pm, CEPSR 612

Please contact staff through Piazza only

### TAS

Tessa Hurr

Eleanor Murguia

Lucille Sui

### WEEKLY SCHEDULE

Lecture

Mon, Wed 4:10–5:25pm, 413 Kent Hall

# But most websites do have databases.

# They allow you to both see and interact with data.

The image is a collage of three web browser screenshots, illustrating data-driven websites. The top-left screenshot shows the Amazon.com homepage with various book categories and a search bar. The top-right screenshot shows a Gmail inbox with a list of emails and a search bar. The bottom screenshot shows a Facebook page for 'PictureCorrect Photography Tips' with a post about a New Year's resolution.

**Amazon.com**

Departments: Books, Advanced Search, New Releases, Amazon Charts, Best Sellers & More, The New York Times® Best Sellers, Children's Books, Textbooks, Textbook Rentals, Sell Us Your Books, Best Books

Popular in Books: Award Winners, Bargain Books, Best Books of the Month, Books in Spanish, Children's Books, Deals in Books, Top 20 Lists in Books

More in Books: 100 Books to Read in a Lifetime, Amazon Book Review Blog, Amazon Books on Facebook, Amazon Books on Twitter, Amazon First Reads

Amazon Kindle: Kindle eBooks, Kindle Deals, Kindle Unlimited, Prime Reading, Spanish Kindle eBooks

Textbooks: Textbooks Store, Textbook Rentals, Sell Us Your Books, Kindle eBooks

**Facebook**

PictureCorrect Photography Tips

What is your Photography-Related New Year's Resolution??

15 minutes ago · Like · Comment

Adel Gomaa and Richard Schneider like this.

Sadi Molloy get my business looking more professional: car signed: tick, making up portrait folders: tick, stickers & cd covers: still to do... its getting there though. 11 minutes ago · Flag

PictureCorrect Photography Tips My resolution for 2011 is to capture more landscape photos outside the U.S. and add more countries to my portfolio! What is yours? 11 minutes ago · Flag

Richard 11 minutes ago · Flag

James Donnelly Larger concerts to cover and improve my portrait editing style/skill 10 minutes ago · Flag

Jose Antonio Rubido To push my photography forward full throttle 9 minutes ago · Flag

Deacon Jonathan Jerome Johnson To learn more and enhance the quality of my shots! 5 minutes ago · Flag

Latu Peti Vimahi Manulua-hafoka learn learn learn!!! 4 minutes ago · Flag

Tina Taylor Hammer Get my new business moving and have it pay for that lens and other equipment that I want (and a little for me, too). 2 minutes ago · Flag

Stefanie Bakewell get a website up so that i can get clients full steam ahead about a minute ago · Flag

**Gmail**

Mail - 1-14 of 14

COMPOSE

Inbox (2)

Sent Mail

Drafts (54)

Need to Read

Technology Coach

More -

Primary Social Promotions Updates

Baldwin, BPS (2) Bloglovin' - Not that I know of. Sometimes blocked sites come in on a hug 11:08 am

Feldmann, Ann Fwd: 21

me, Lambert (2) 8th Peri

me (no subj)

me, Braasch, Klamm (3) Visitation

me, Cox (2) Bri Cox

Tripple, Todd 3D Print

donotreply Educati

Ann Feldmann Fwd: [Ni

me, Campbell (7) Khan Ac

Toelle, me (3) 6 Word

me, Evon (4) Request

Jeffrey Bernadt Shared

**craigslist**

post to classifieds

my account

search craigslist

event calendar

M	T	W	T	F	S	S
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

help, faq, abuse, legal

avoid scams & fraud

personal safety tips

terms of use

privacy policy

system status

about craigslist

craigslist is hiring in sf

craigslist open source

craigslist blog

best-of-craigslist

craigslist TV

"craigslist joe"

craig connects

progressive directory

weather quake tide

**SF bay area**

community

local news

lost+found

musicians

politics

rideshare

volunteers

personals

strictly platonic

women seek women

weekend reading

men seeking women

men seeking men

misc romance

casual encounters

missed connections

rants and raves

discussion forums

apple

arts

atheist

autos

beauty

bikes

celebs

comp

crafts

diet

divorce

dying

eco

educ

feedback

film

fitness

food

frugal

help

history

housing

jobs

jokes

kink

legal

linux

m4m

manners

marriage

media

money

motocv

music

nonprofit

open

outdoor

over 50

parent

photo

p.o.c.

politics

psych

queer

recovery

religion

romance

science

spirit

sports

tax

travel

tv

vegan

w4w

wed

wine

women

words

apts / housing

housing swap

housing wanted

office / commercial

parking / storage

real estate for sale

rooms / shared

rooms wanted

sublets / temporary

vacation rentals

for sale

antiques

appliances

arts+crafts

atv/utv/sno

auto parts

baby+kid

barter

beauty+hilth

bikes

boats

books

business

cars+trucks

cds/dvd/vhs

cell phones

clothes+acc

collectibles

computers

electronics

farm+garden

free

furniture

garage sale

general

heavy equip

household

jewelry

materials

motorcycles

music instr

photo+video

rsv+camp

sporting

tickets

tools

toys+games

trailers

video gaming

wanted

services

automotive

beauty

cell/mobile

computer

creative

legal

lessons

marine

pet

real estate

accounting+finance

admin / office

arch / engineering

art / media / design

biotech / science

business / mgmt

customer service

education

food / bev / hosp

general labor

government

human resources

internet engineers

legal / paralegal

manufacturing

marketing / pr / ad

medical / health

nonprofit sector

real estate

retail / wholesale

sales / biz dev

salon / spa / fitness

security

skilled trade / craft

software / qa / dba

systems / network

technical support

transport

tv / film / video

web / info design

writing / editing

[ETC]

[part-time]

gigs

computer

creative

crew

domestic

event

labor

talent

writing

nearby city

bakersfield

chico

fresno

gold country

hanford

humboldt

inland empire

kiamath falls

las vegas

los angeles

medford

merced

modesto

monterey

orange co

palm springs

redding

reno

roseburg

sacramento

san luis obispo

santa barbara

siskiyou co

stockton

susanville

ventura

visalia-tulare

yuba-sutter

us states

canada

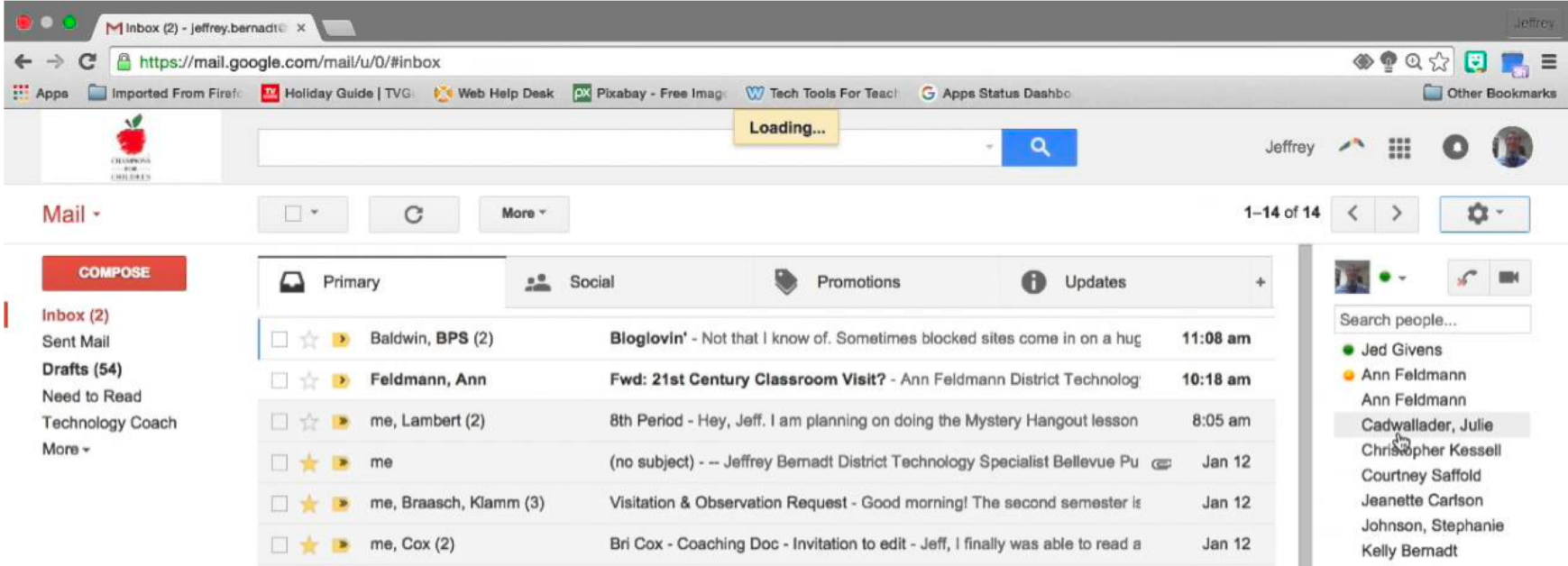
ci worldwide



# Interacting with Data

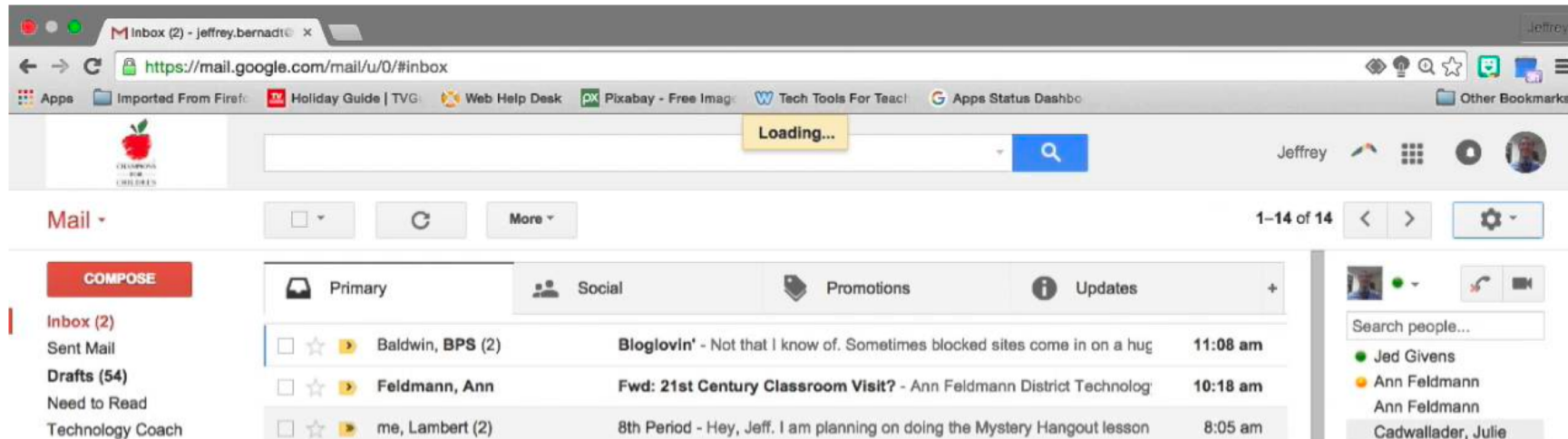
CRUD: Create, Read, Update, and Delete data

# Gmail is a database of emails



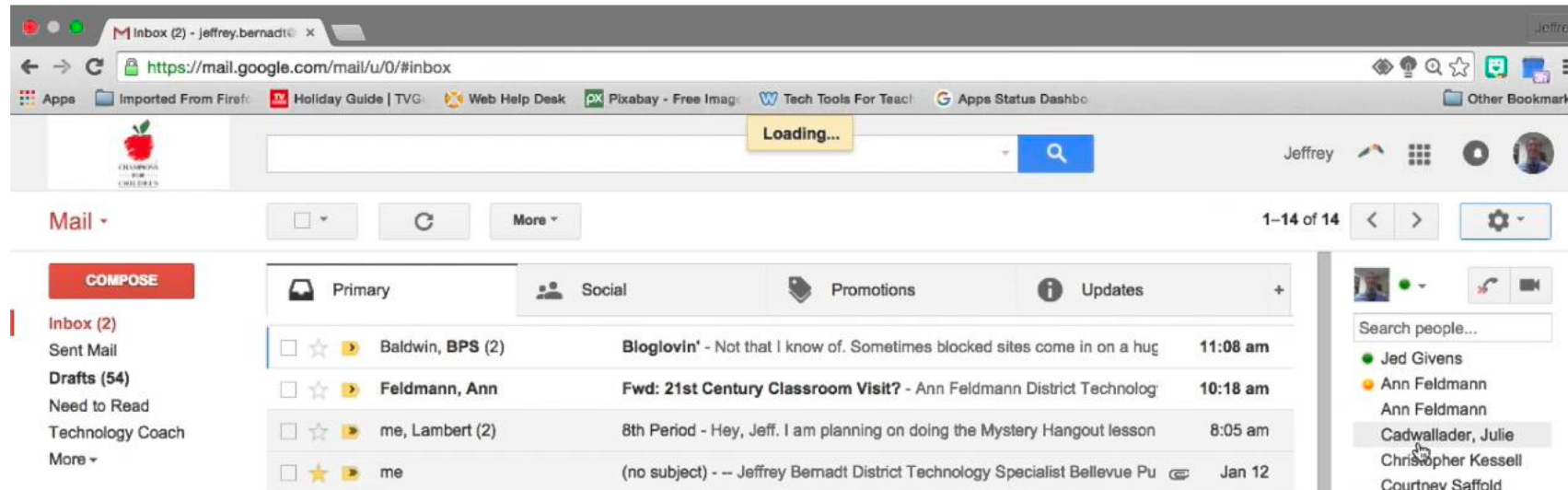
ID	From	To	Subject	Body	Time
1	Baldwin	Jeffrey	Bloglovin'	Not that I know of...	158904993585835
2	Ann Feldman	Jeffrey	Fwd: Classroom visit?	Ann Feldman District Technology	158904993585923
...					

# All emails are stored in one big database. How do we only show Jeff's email to Jeff?



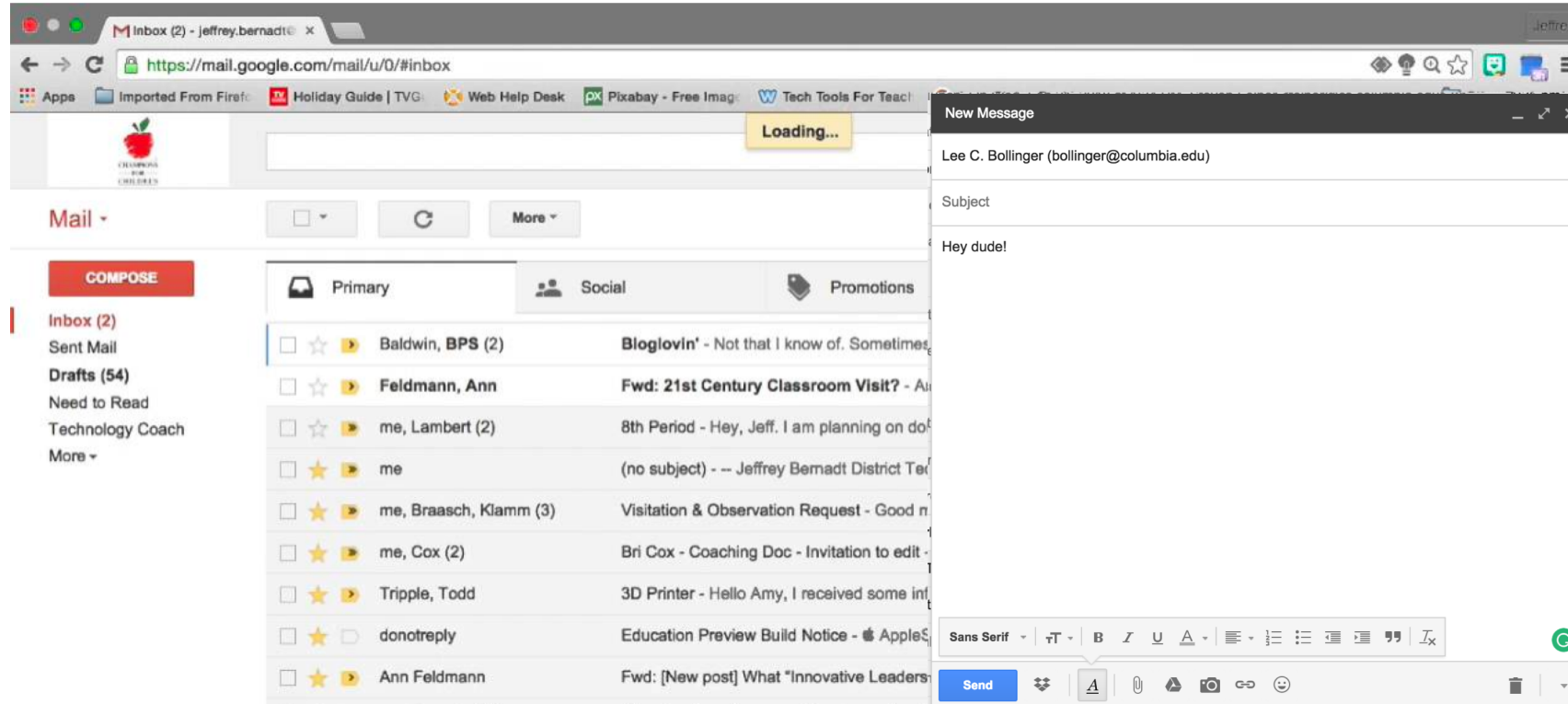
ID	From	To	Subject	Body	Time
1	Baldwin	Jeffrey	Blogloving'	Not that I know of...	158904993585835
2	Ann Feldman	Jeffrey	Fwd: Classroom visit?	Ann Feldman District Technology	158904993585923
3	Lydia Chilton	Lee Bollinger	Bowling tuesday	Hey dude! Donnie and I were thinking of going bowling...	158904993443772
...					

# CRUD operations on data: Create, Read, Update, and Delete Data



ID	From	To	Subject	Body	Time
1	Baldwin	Jeffrey	Blogloving'	Not that I know of...	158904993585835
2	Ann Feldman	Jeffrey	Fwd: Classroom visit?	Ann Feldman District Technology	158904993585923
3	Lydia Chilton	Lee Bollinger	Bowling tuesday	Hey dude! Donnie and I were thinking of going bowling...	158904993443772

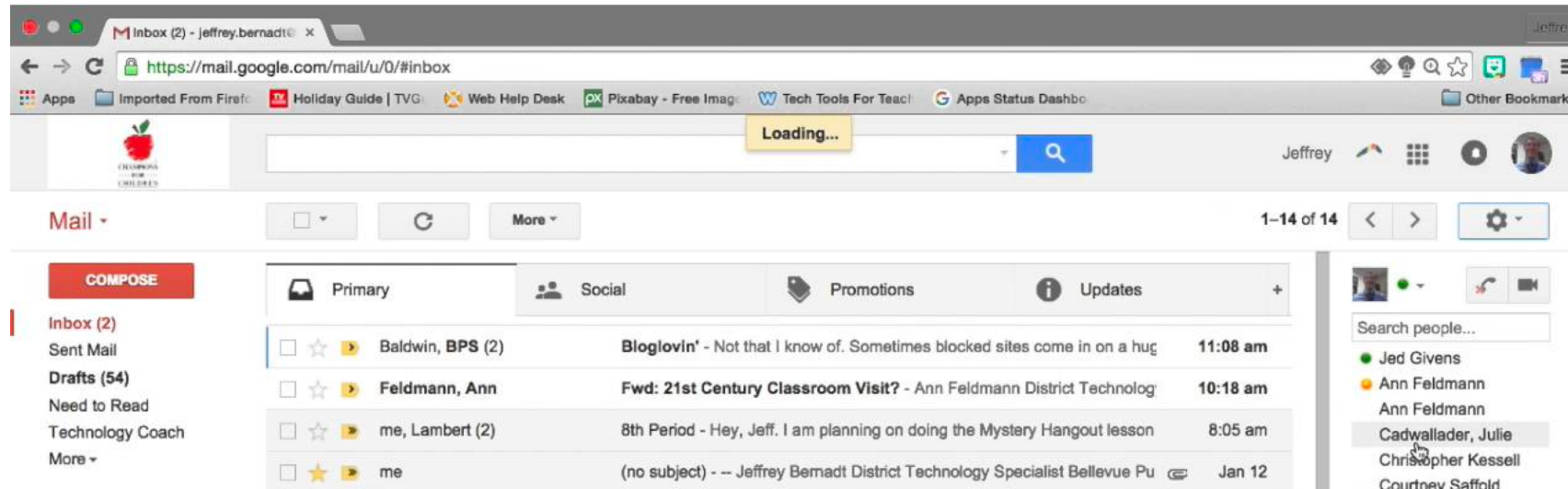
# CREATE: How do users create data in GMail?



1. Compose a new email and send it
2. Reply to an email

# READ: How do users read data in GMail?

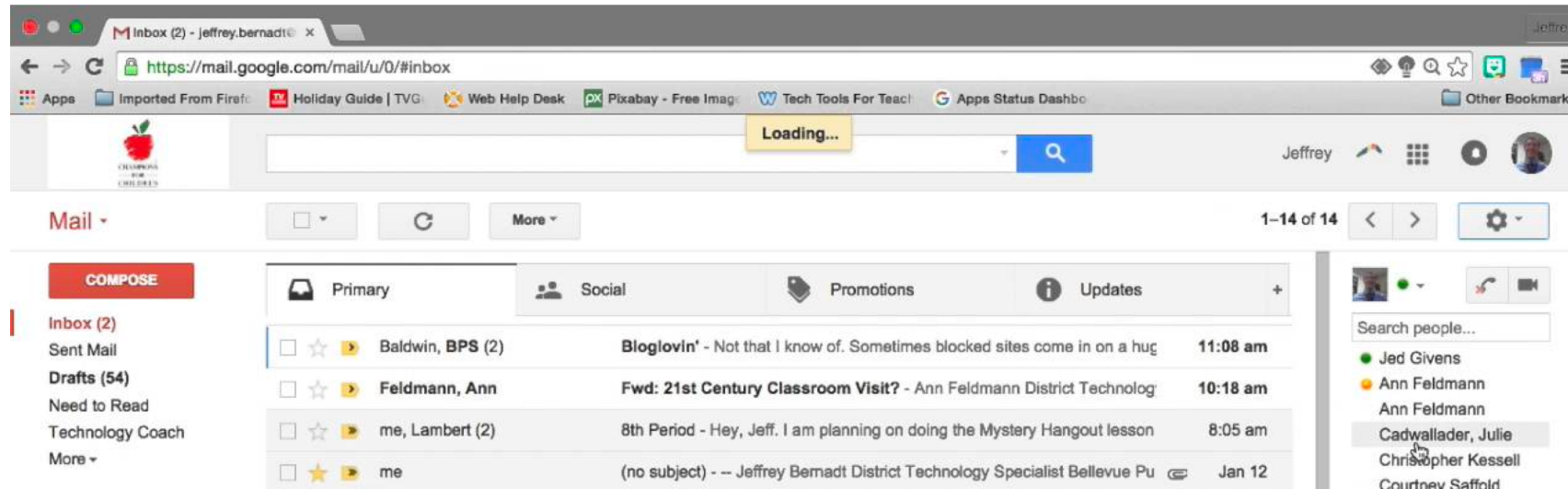
How do they see different portions of the database?



1. Load the page
2. Search inbox

# UPDATE: How do users update data in GMail?

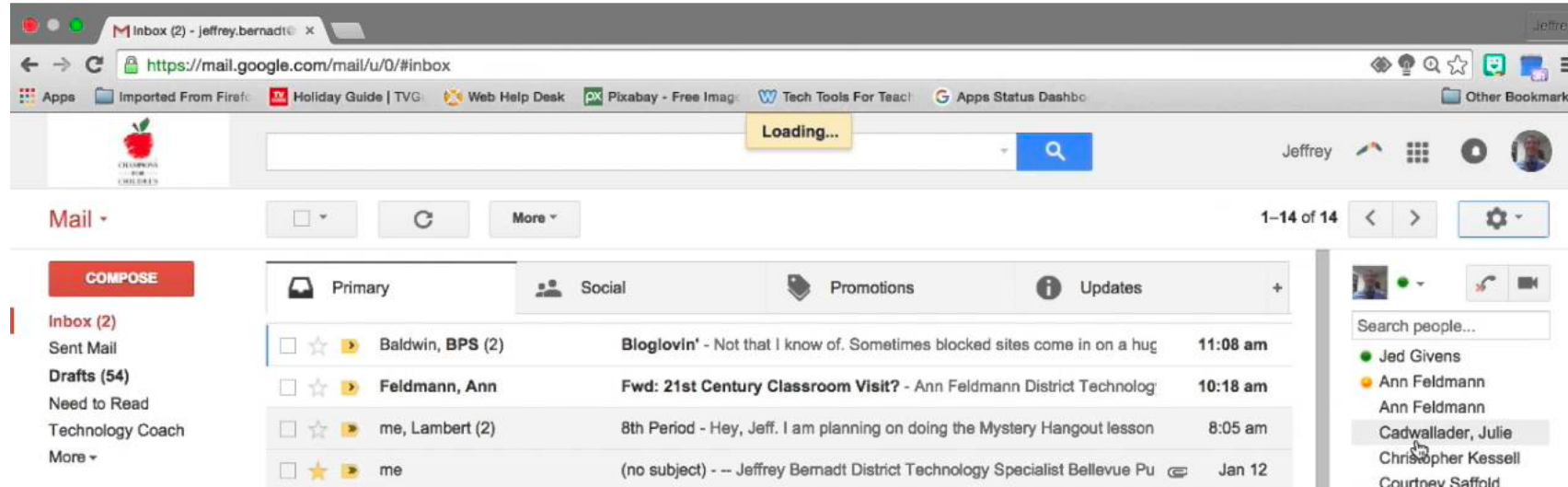
What do they update? And how do they do it in the interface?



1. Read an email (it gets marked as “read”)
2. Star and email
3. Add/remove a label
4. Reply to an email ( the original email gets update to point to the reply)

# DELETE: How do users delete data in GMail?

First, what objects can be deleted in GMail?



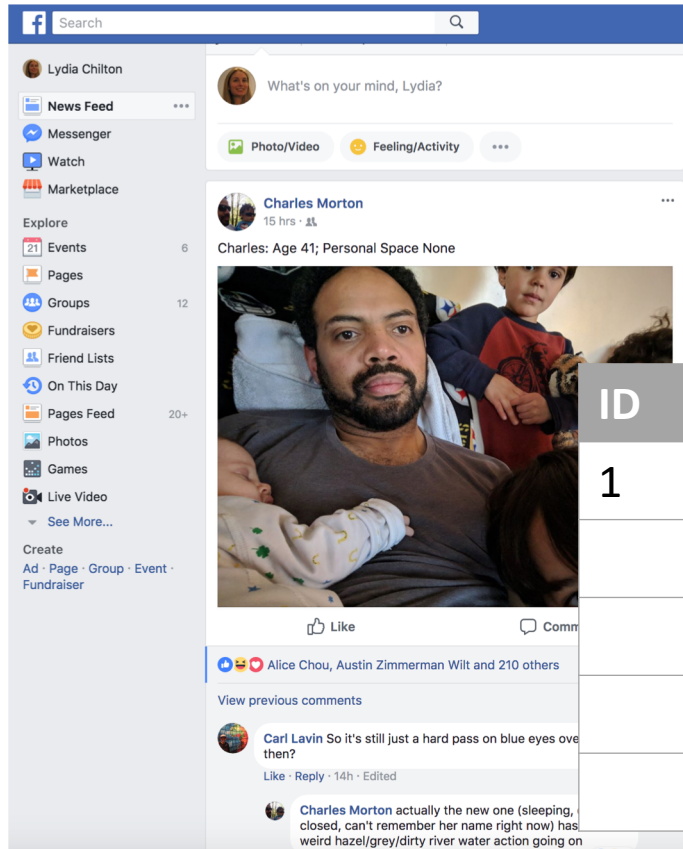
1. Discard a draft

2. Leave spam untouched for 30 days.

Deleting an email doesn't actually delete it – other users may still have it.  
But it does UPDATE the email and mark it as deleted, so it doesn't show up for you.

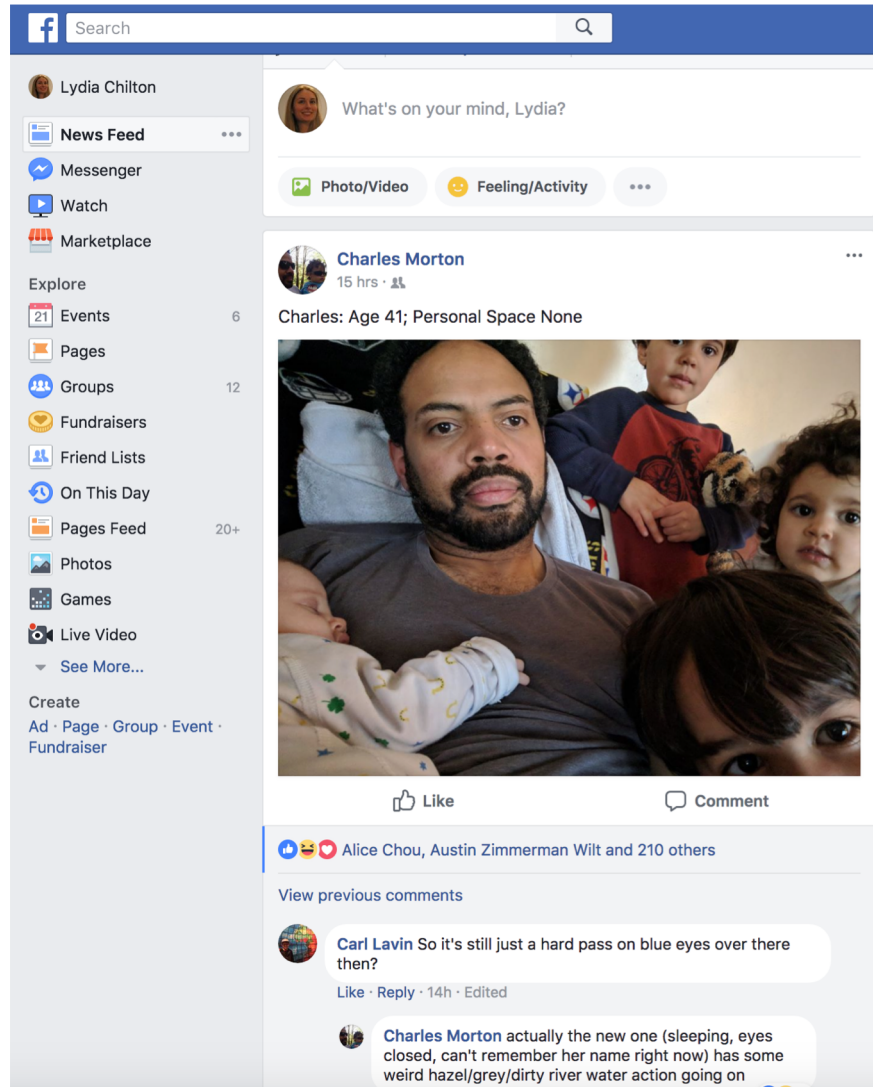


# Facebook is a database of posts.



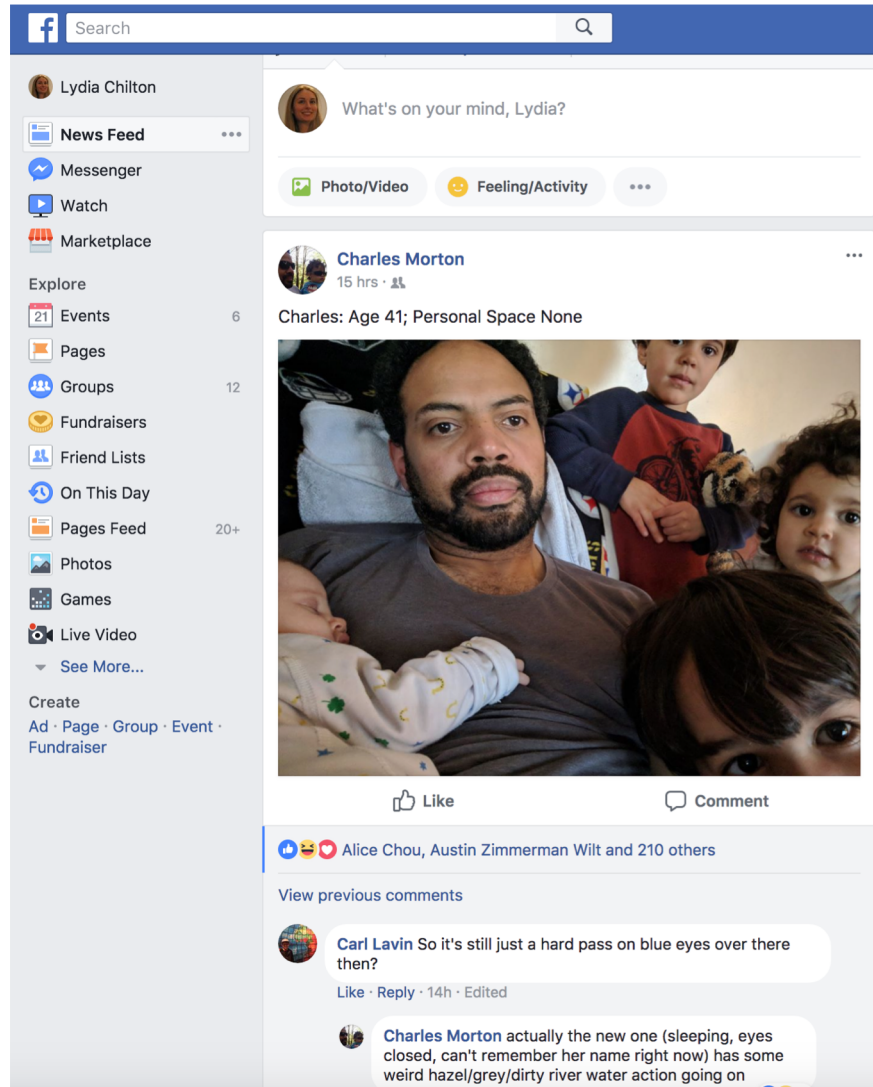
ID	creator	text	Likes	Time
1	Charles Morton	Charles Age 41: Personal..	210	15890499

# CREATE: How do users create data in Facebook?




1. Create Post
2. Create Reply

# READ: How do users read data in Facebook?



1. Load the page
2. Search for posts
3. Scroll –and it will autoloading posts

# UPDATE: How do users update data in Facebook?

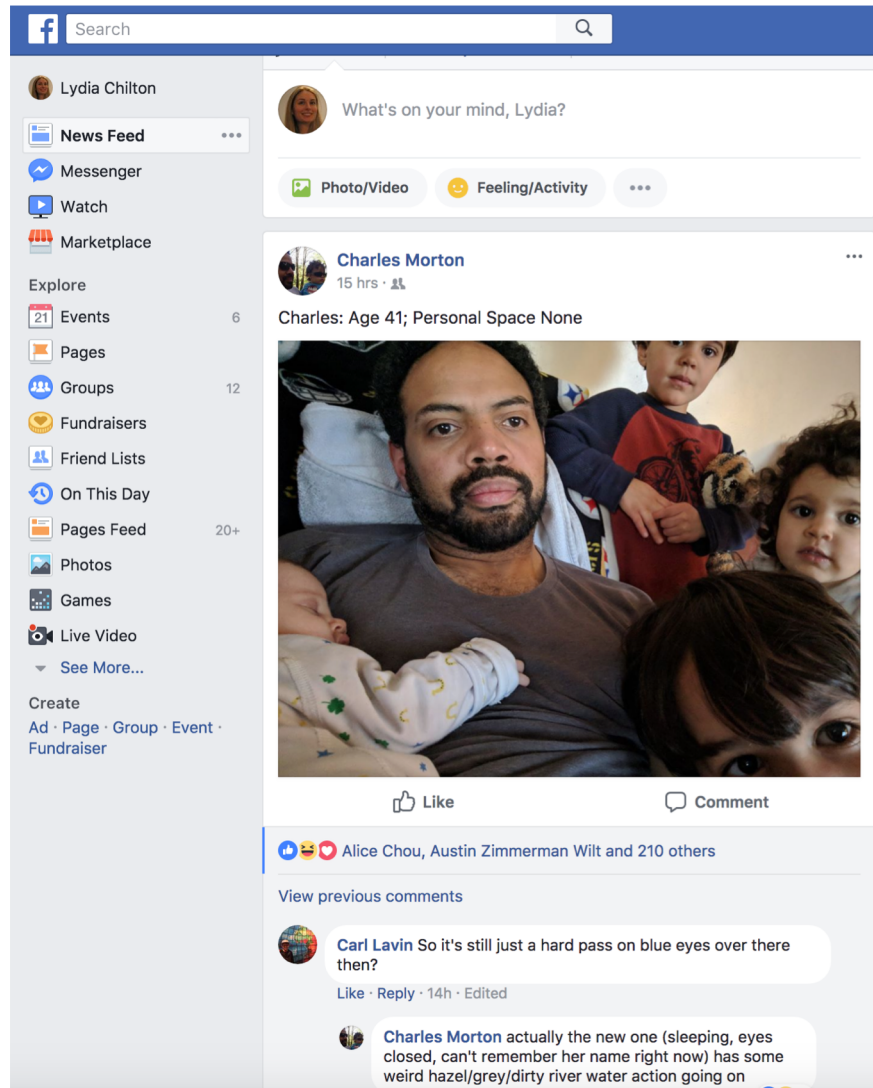


The screenshot shows a Facebook news feed. At the top, there is a search bar and a navigation menu with options like News Feed, Messenger, Watch, and Marketplace. The main content is a post by Charles Morton, 15 hours old, with a privacy setting of 'Personal Space None'. The post features a photo of a man with a beard and children. Below the photo are 'Like' and 'Comment' buttons. A notification indicates that Alice Chou, Austin Zimmerman Wilt, and 210 others have reacted. There are two comments visible: one from Carl Lavin asking about blue eyes, and one from Charles Morton himself mentioning a child's eye condition.

## 1. Like



# DELETE: How do users delete data in Facebook?



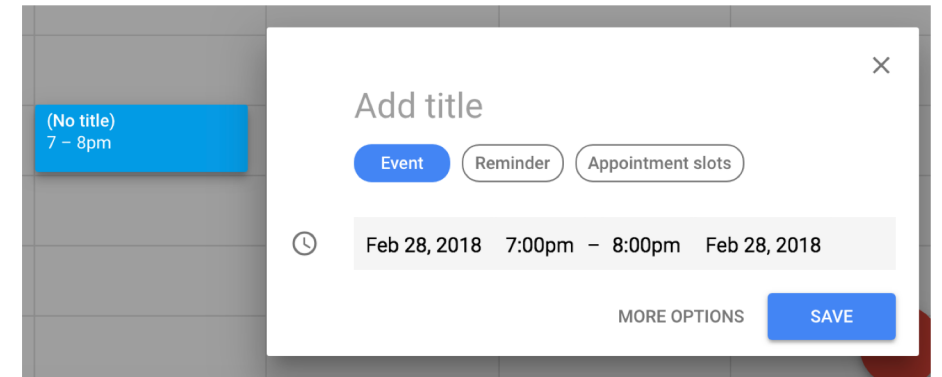
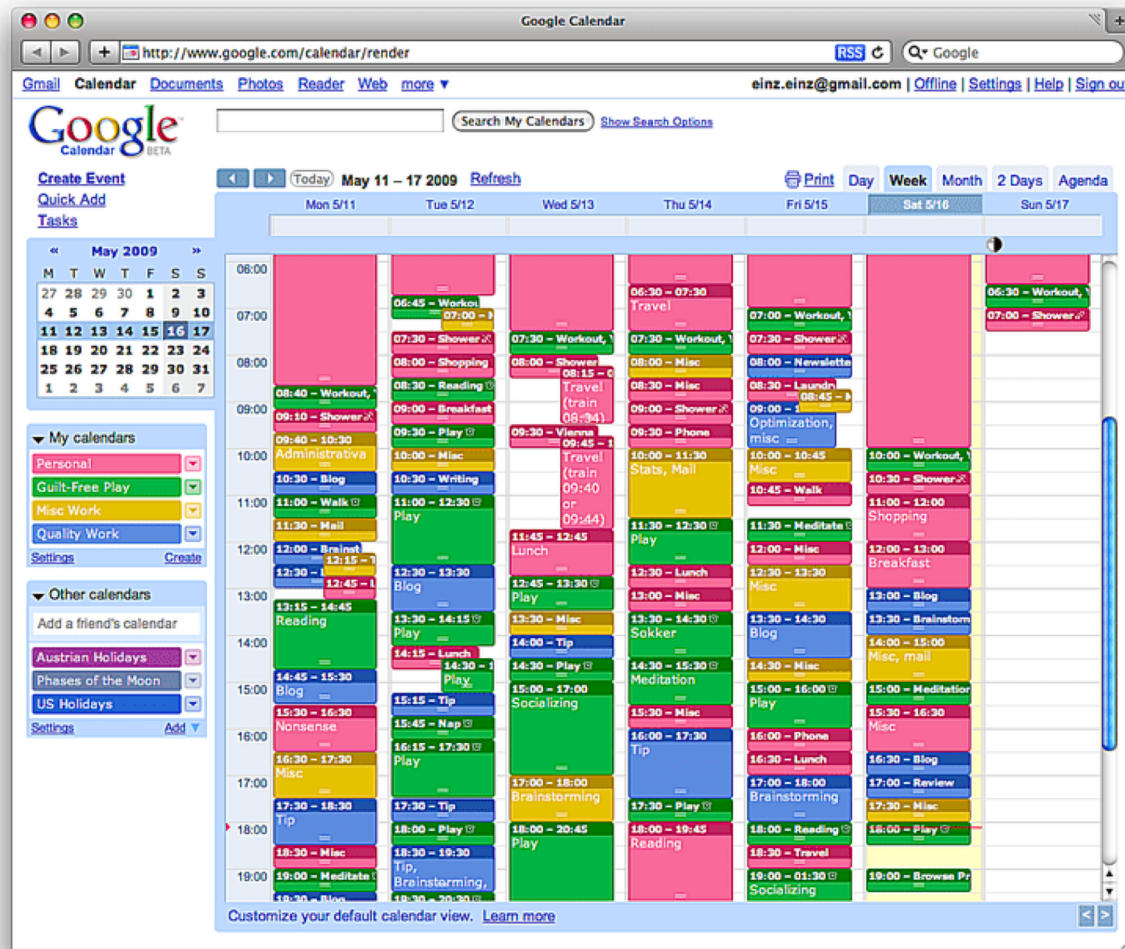
1. Delete the post?

# Google Calendar is a database of events



Creator	Start date	End Date	Title
Chilton	Feb 28, 7pm	Feb 28, 8pm	Dinner with Lee
Chilton	Feb 14, 4pm	Feb 17, 12pm	National Academy of Sciences event
...			

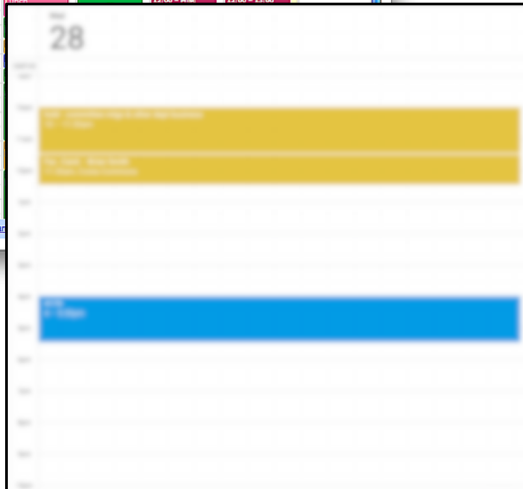
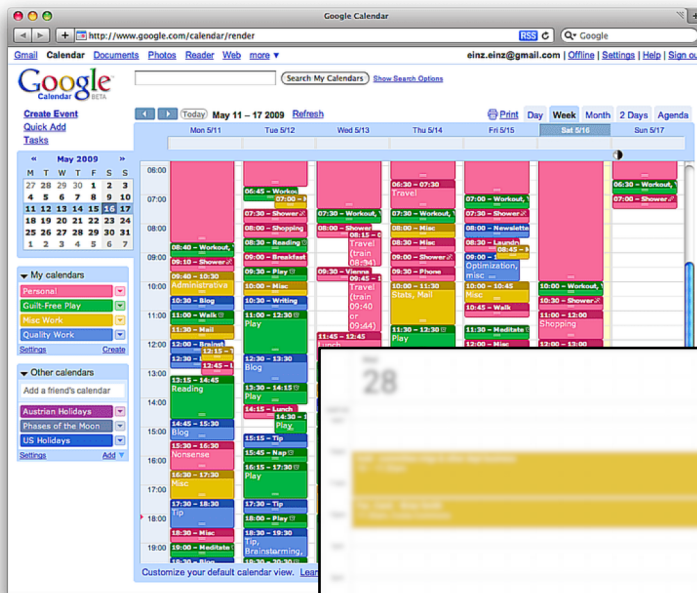
# CREATE: How do users create data in Calendar?



# READ: How do users read data in Calendar?

How do they see different portions of the database?

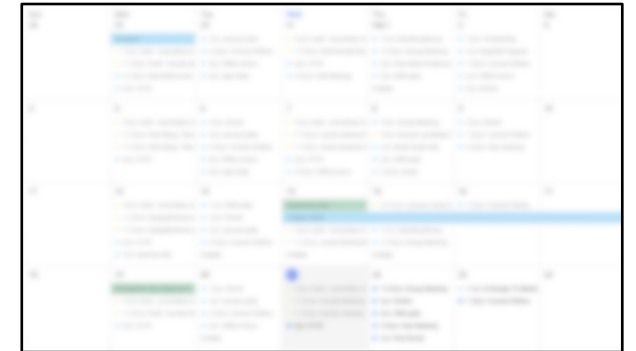
1. Load the page
2. Choose different views



“Day” view



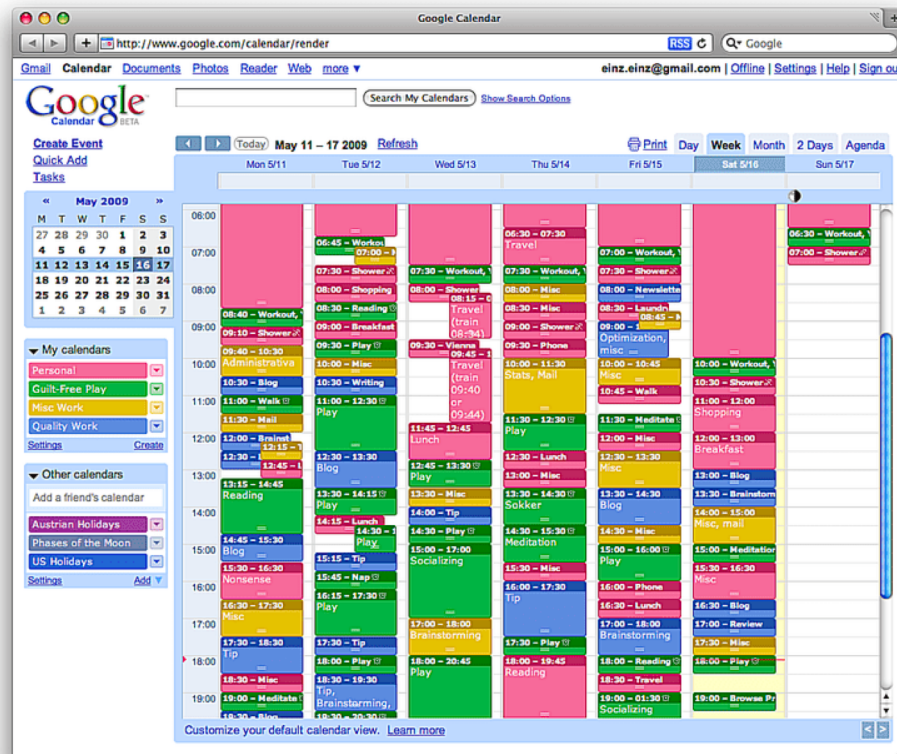
“Week” view



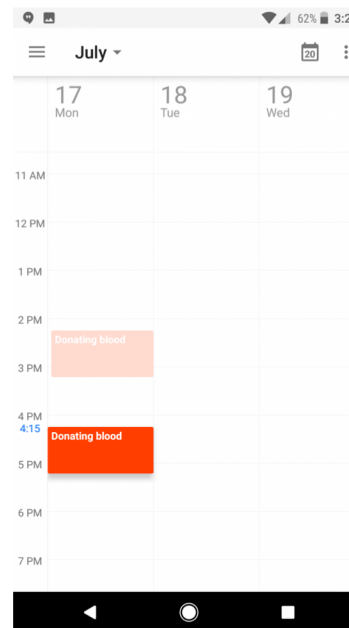
“Month” view



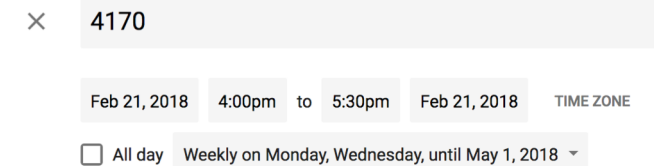
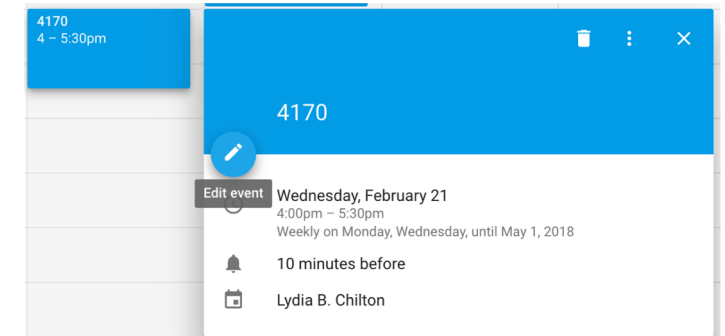
# UPDATE: How do users update data in Calendar?



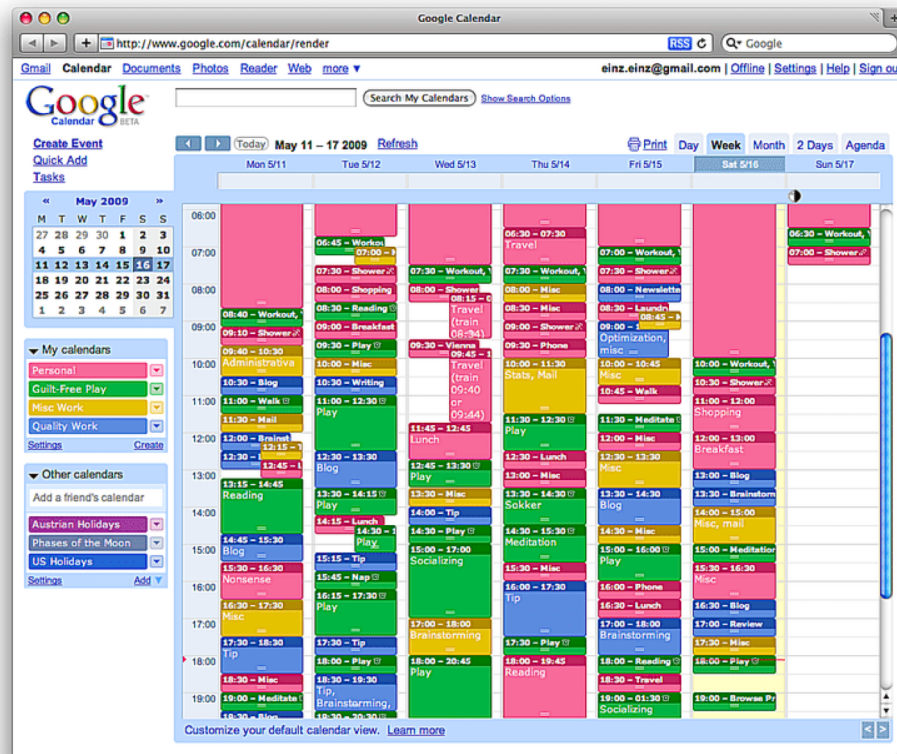
## Drag and drop



## Select an event and edit a form



# DELETE: How do users delete data in Calendar?



Selecting an event and clicking delete



# CRUD: Operations for interacting with a database

## Create


**New Message**

To

From Lydia Chilton <chilton@cs.columbia.edu> ▾

Subject

Hey dude!

 What's on your mind, Lydia?

**Add title**

(No title)  
7 - 8pm

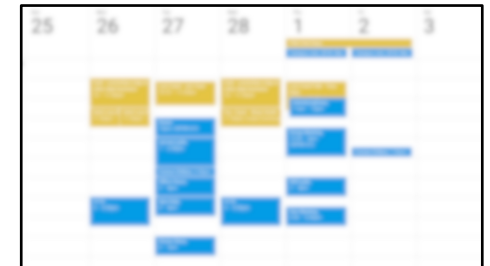
Event  Reminder  Appointment slots

Feb 28, 2018 7:00pm - 8:00pm Feb 28, 2018

MORE OPTIONS

## Read

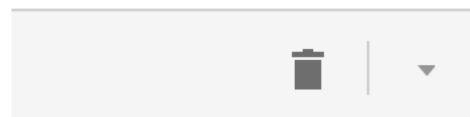
Baldwin, BPS (2)	Bioglovin' - Not that I know of. Sometimes bi
Feldmann, Ann	Fwd: 21st Century Classroom Visit? - Ann
me, Lambert (2)	8th Period - Hey, Jeff. I am planning on doing
me	(no subject) - -- Jeffrey Bernadt District Techn



## Update

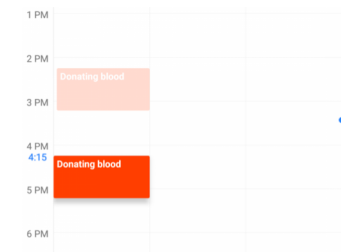


## Delete



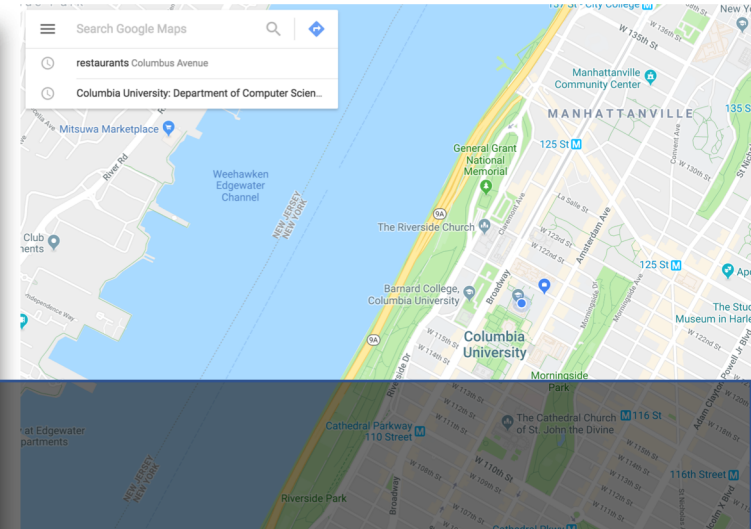
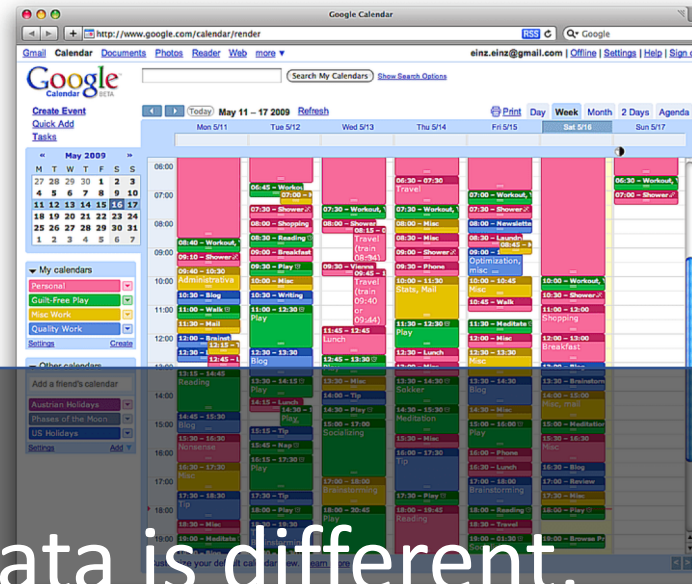
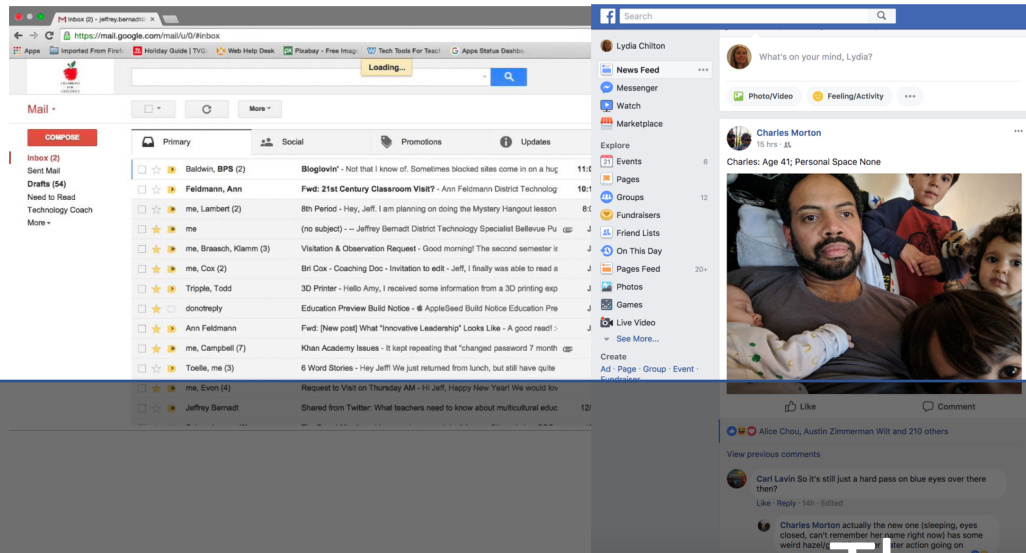
**Delete Post?**

Are you sure you want to delete it?



4170

# From a back-end perspective Facebook, Gmail are very similar. What's different?



The data is different,  
And the information needs they serve are different.

You can drive a lot of human behavior  
with one database update.



# Rendering Templates

Dynamically Generating Webpages from Database Content

# IMDb is a database of movies. (Obviously)



## Featured today




New and Upcoming Superhero Movies and Series

The Most Anticipated Prequels, Sequels, and Spin-Offs

## What to watch

[Get more recommendations >](#)

# What goal are most people trying to achieve on IMDB?



IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Lebowski** (1998) ★ 8.2/10 (609,031) ☆ Rate This

R | 1h 57min | Comedy, Crime | 6 March 1998 (USA)

JEFF BRIDGES JOHN GOODMAN  
JULIANNE MOORE STEVE BUSCEMI JOHN TURTURRO

0:31 Trailer 9 VIDEOS 141 IMAGES

Watch Now  
From \$2.99 (SD) on Prime Video ON DISC

"The Dude" Lebowski, mistaken for a millionaire Lebowski, seeks restitution for his ruined rug and enlists his bowling buddies to help get it.

**Directors:** [Joel Coen](#), [Ethan Coen](#) (uncredited)  
**Writers:** [Ethan Coen](#), [Joel Coen](#)  
**Stars:** [Jeff Bridges](#), [John Goodman](#), [Julianne Moore](#) | [See full cast & crew »](#)

69 Metascore From [metacritic.com](#) | Reviews 1,075 user | 257 critic | Popularity 515 (★ 32)

**Top Rated Movies #167** | 4 wins & 17 nominations. [See more awards »](#)

Look up movie information:

- Who's that actor?
- What's its rating?
- What year did it come out?
- What else did that person direct?



# On IMDB, are there 100,000 static HTML pages sitting around?

IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Chill (1983)** ★ 7.2 /10 28,073 Rate This

R | 1h 45min | Comedy, Drama | 30 September 1983 (USA)



2:02 | Trailer | 1 VIDEO | 76 IMAGES

Watch Now With Prime Video

WATCH NOW ON DISC

A group of seven former college friends gather for a weekend reunion at a South Carolina winter house after the funeral of one of their friends.

**Director:** Lawrence Kasdan  
**Writers:** Lawrence Kasdan, Barbara Benedek  
**Stars:** Tom Berenger, Glenn Close, Jeff Goldblum | See full cast & crew »

62 Metascore From metacritic.com | 186 user | 61 critic | 4,222 (↑ 509) Popularity

**Nominated for 3 Oscars.** Another 3 wins & 5 nominations. See more awards »


IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Lebowski (1998)** ★ 8.2 /10 609,031 Rate This

R | 1h 57min | Comedy, Crime | 6 March 1998 (USA)



0:31 | Trailer | 9 VIDEOS | 141 IMAGES

Watch Now From \$2.99 (SD) on Prime Video

ON DISC

"The Dude" Lebowski, mistaken for a millionaire Lebowski, seeks restitution for his ruined rug and enlists his bowling buddies to help get it.

**Directors:** Joel Coen, Ethan Coen (uncredited)  
**Writers:** Ethan Coen, Joel Coen  
**Stars:** Jeff Bridges, John Goodman, Julianne Moore | See full cast & crew »

69 Metascore From metacritic.com | 1,075 user | 257 critic | 515 (↓ 32) Popularity

**Top Rated Movies #167** | 4 wins & 17 nominations. See more awards »

IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Short (2015)** ★ 7.8 /10 274,582 Rate This

R | 2h 10min | Biography, Comedy, Drama | 23 December 2015 (USA)



2:05 | Trailer | 39 VIDEOS | 128 IMAGES

Watch Now From \$2.99 (SD) on Prime Video

ON DISC

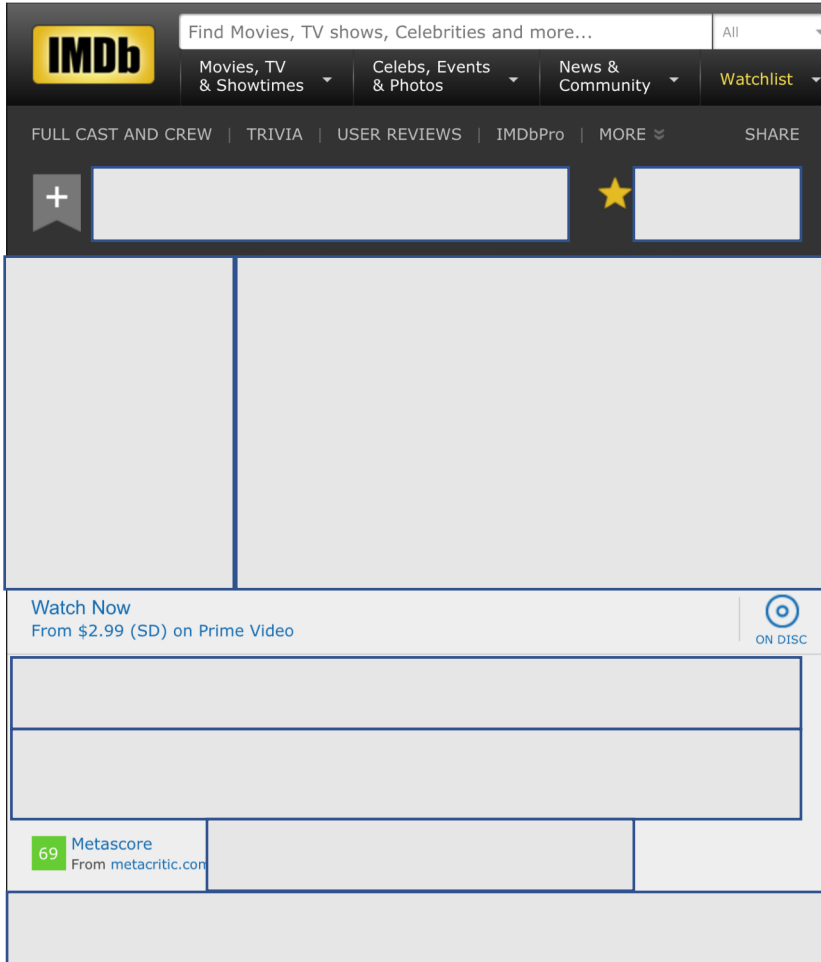
In 2006-7 a group of investors bet against the US mortgage market. In their research they discover how flawed and corrupt the market is.

**Director:** Adam McKay  
**Writers:** Charles Randolph (screenplay), Adam McKay (screenplay) | 1 more credit »  
**Stars:** Christian Bale, Steve Carell, Ryan Gosling | See full cast & crew »

81 Metascore From metacritic.com | 428 user | 454 critic | 434 (★ 47) Popularity

**Won 1 Oscar.** Another 37 wins & 79 nominations. See more awards »

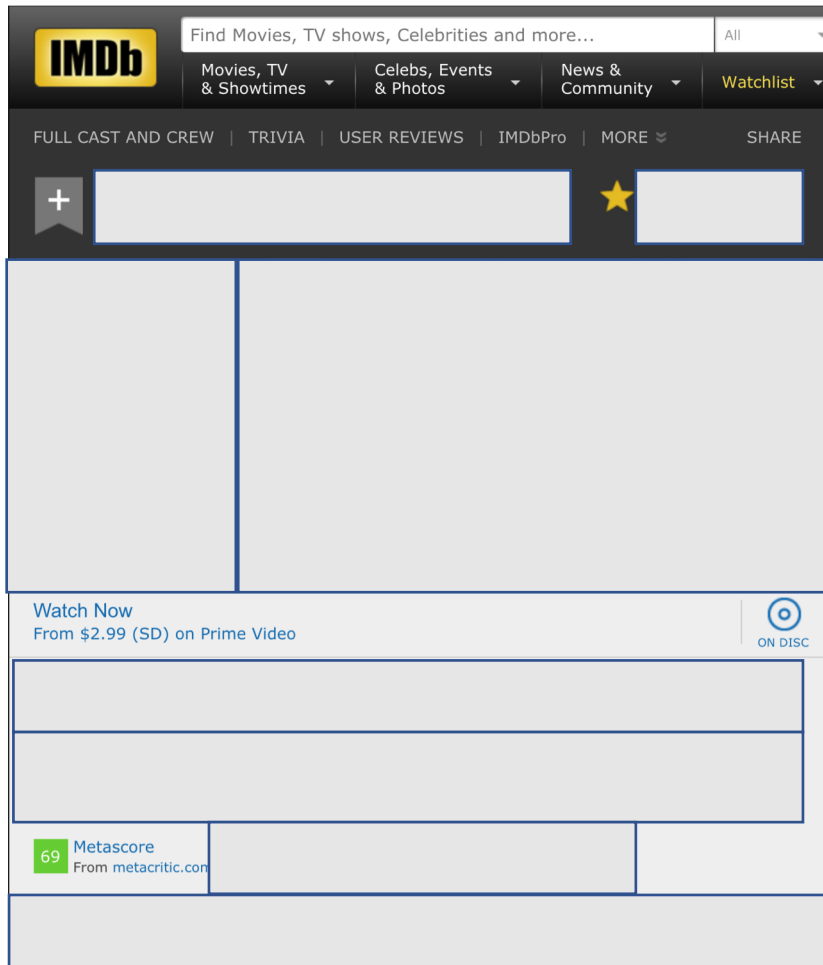
# IMDB uses a template and a database...



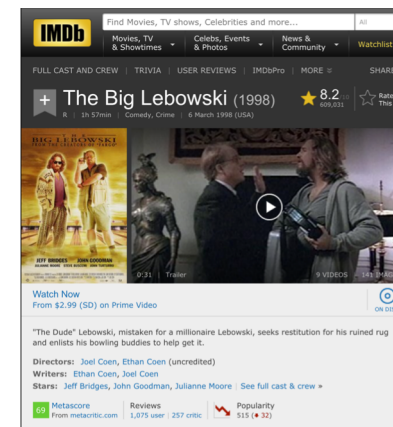
Title	Plot summary	poster	year
The Big Lebowski	"The dude" Lebowski, mistaken...	Lebowski.jpg	1998
The Big Short	In 2006-7 a group of investors...	Big_short.jpg	2015
The Big Chill	A group of 7 former roommates	Big_chill.jpg	1983

# IMDb uses a template and a database...

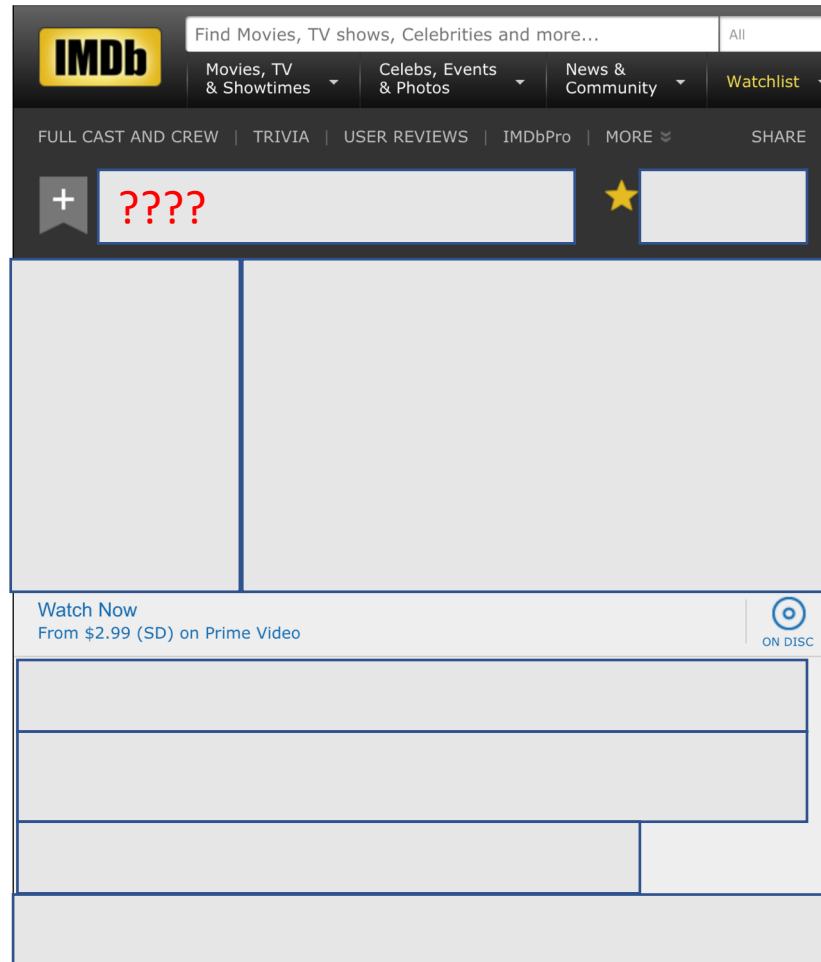
## And fills in the data dynamically on pageload



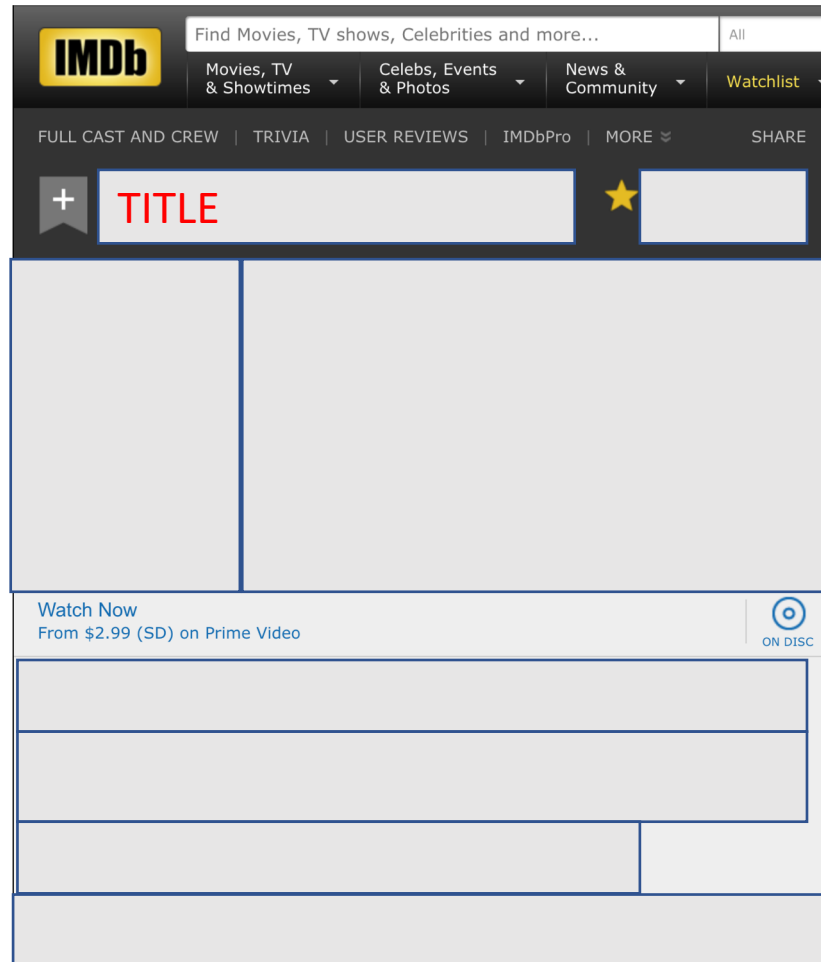
Title	Plot summary	poster	year
The Big Lebowski	"The dude" Lebowski, mistaken...	Lebowski.jpg	1998
The Big Short	In 2006-7 a group of investors...	Big_short.jpg	2015
The Big Chill	A group of 7 former roommates	Big_chill.jpg	1983



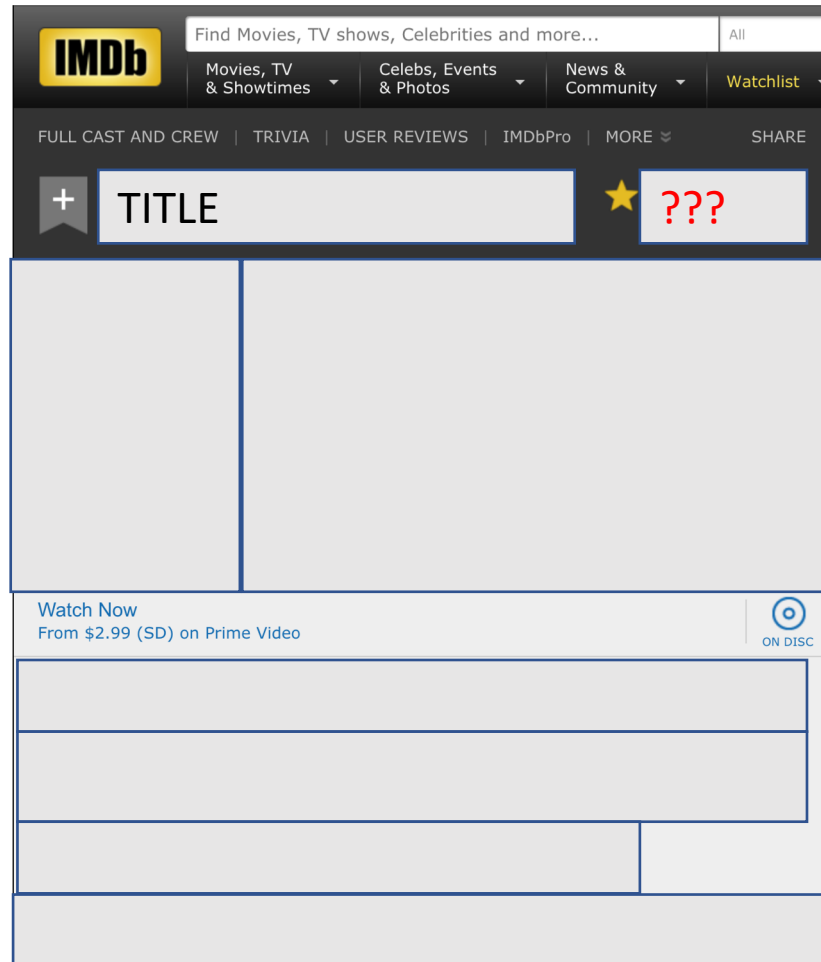
# What goes in the template?



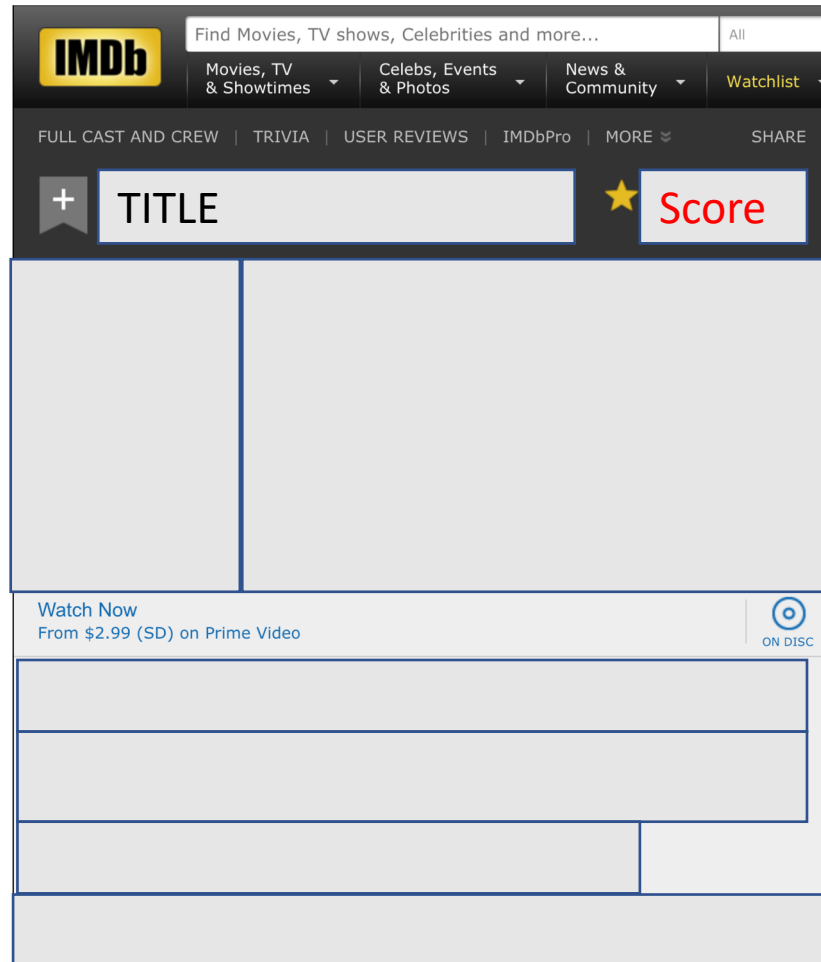
# What goes in the template?



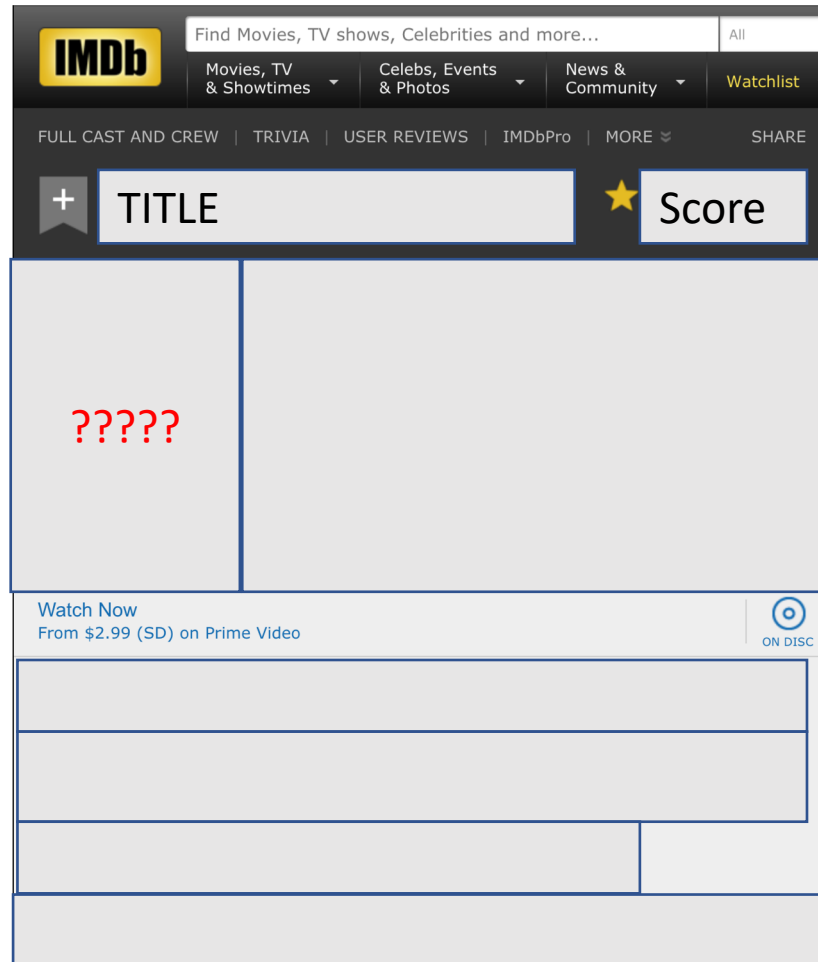
# What goes in the template?



# What goes in the template?



# What goes in the template?

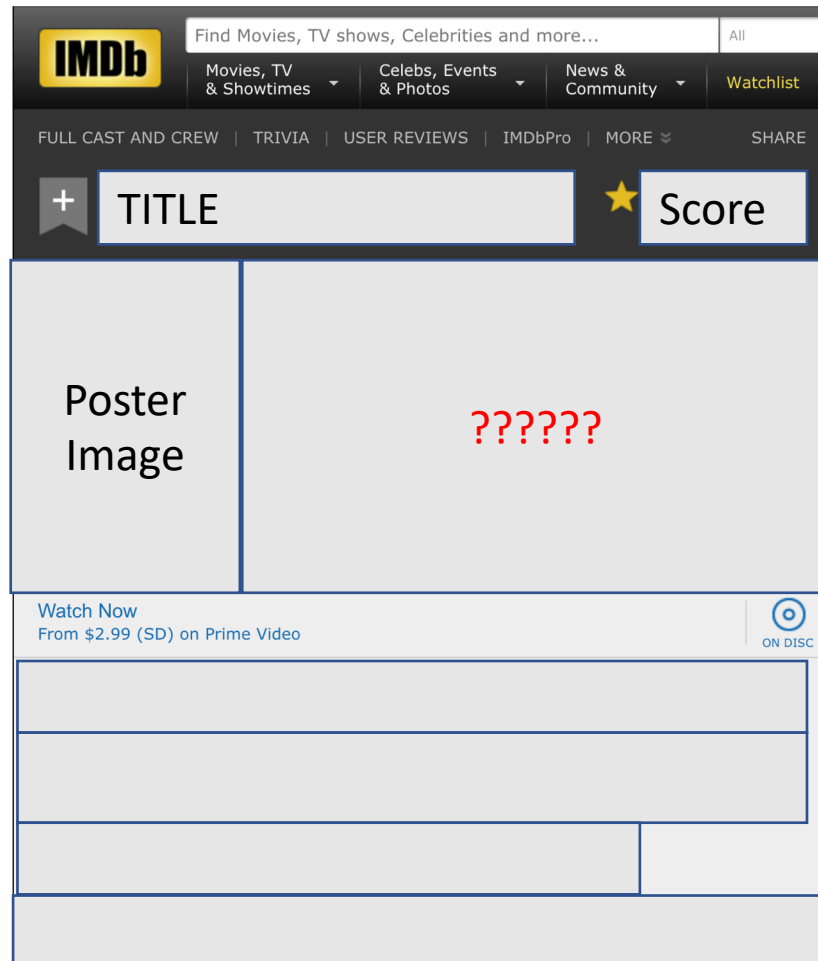




# What goes in the template?



# What goes in the template?



# What goes in the template?



# IMDB uses a template and dynamically fills the template from a database query

IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Lebowski (1998)** ★ 8.2<sup>10</sup>  
609,031 Rate This

R | 1h 57min | Comedy, Crime | 6 March 1998 (USA)

**BIG LEBOWSKI**  
FROM THE CREATORS OF "FARGO"

JEFF BRIDGES JOHN GOODMAN  
JULIANNE MOORE STEVE BUSCEMI JOHN TURTURRO

0:31 Trailer 9 VIDEOS 141 IMAGES

Watch Now  
From \$2.99 (SD) on Prime Video

ON DISC

[Empty rectangular boxes representing a template structure]

# Anyone remember the other categories?

IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Lebowski (1998)** ★ 8.2<sup>10</sup>  
609,031 Rate This

R | 1h 57min | Comedy, Crime | 6 March 1998 (USA)

**BIG LEBOWSKI**  
FROM THE CREATORS OF "FARGO"

JEFF BRIDGES JOHN GOODMAN  
JULIANNE MOORE STEVE BUSCEMI JOHN TURTURRO

0:31 Trailer 9 VIDEOS 141 IMAGES

Watch Now  
From \$2.99 (SD) on Prime Video

ON DISC

[Empty rectangular boxes representing missing content]

# Anyone remember the other categories?

IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Lebowski (1998)** ★ 8.2<sup>10</sup>  
609,031 Rate This

R | 1h 57min | Comedy, Crime | 6 March 1998 (USA)

**BIG LEBOWSKI**  
FROM THE CREATORS OF "FARGO"

JEFF BRIDGES JOHN GOODMAN  
JULIANNE MOORE STEVE BUSCEMI JOHN TURTURRO

0:31 Trailer 9 VIDEOS 141 IMAGES

Watch Now  
From \$2.99 (SD) on Prime Video

ON DISC

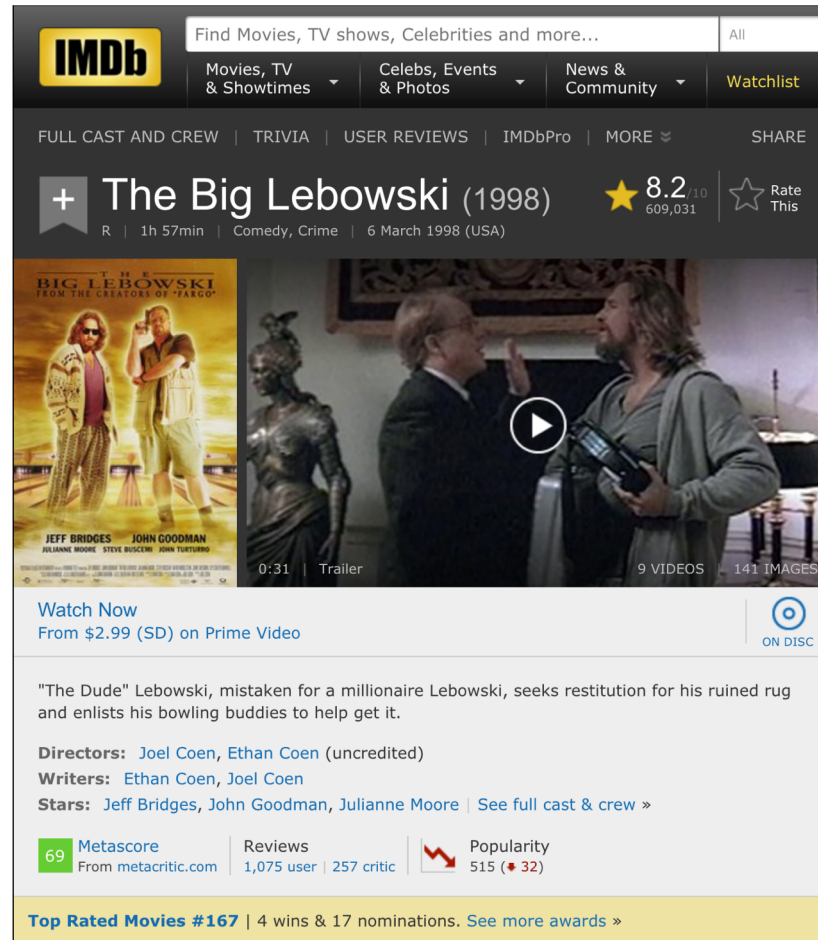
**Plot summary**

**Main creatives**

**Reviews**

**Awards**

# Anyone remember the other categories?



IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Lebowski** (1998) ★ 8.2<sub>10</sub> 609,031 ☆ Rate This

R | 1h 57min | Comedy, Crime | 6 March 1998 (USA)

**Watch Now**  
From \$2.99 (SD) on Prime Video ON DISC

"The Dude" Lebowski, mistaken for a millionaire Lebowski, seeks restitution for his ruined rug and enlists his bowling buddies to help get it.

**Directors:** [Joel Coen](#), [Ethan Coen](#) (uncredited)  
**Writers:** [Ethan Coen](#), [Joel Coen](#)  
**Stars:** [Jeff Bridges](#), [John Goodman](#), [Julianne Moore](#) | [See full cast & crew »](#)

**69** Metascore From metacritic.com | **Reviews** 1,075 user | 257 critic | **Popularity** 515 (▲ 32)

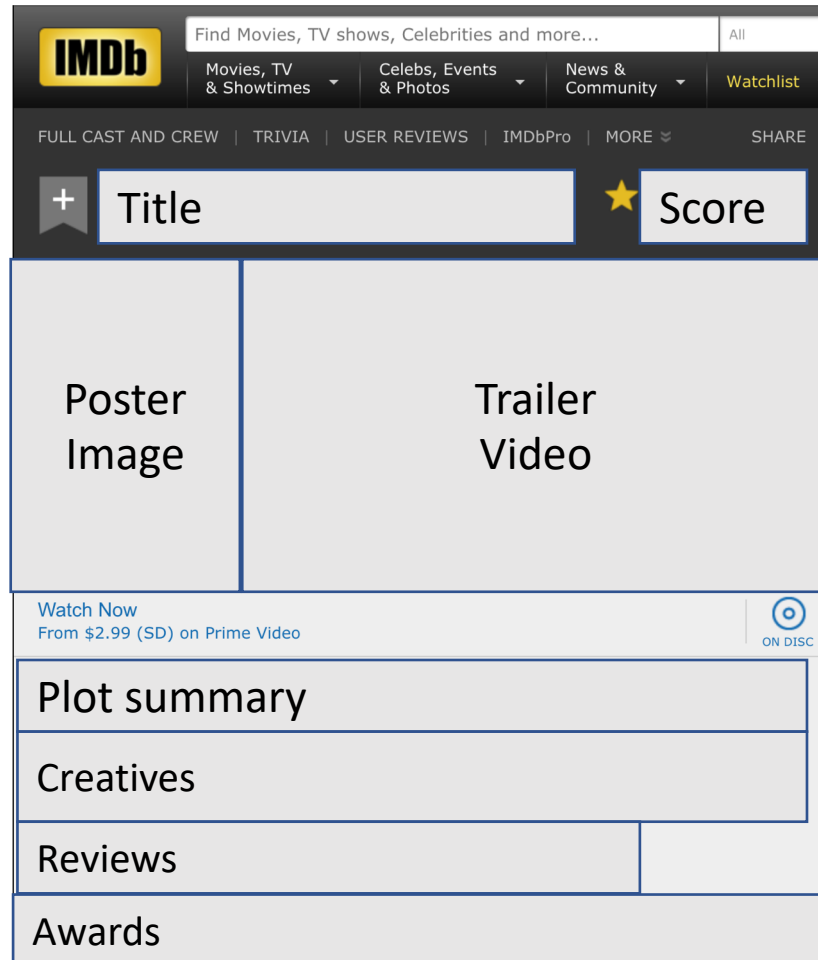
**Top Rated Movies #167** | 4 wins & 17 nominations. [See more awards »](#)

# IMDB Template

The image shows a screenshot of an IMDb movie page template. The header includes the IMDb logo, a search bar with the text "Find Movies, TV shows, Celebrities and more...", and navigation links for "Movies, TV & Showtimes", "Celebs, Events & Photos", "News & Community", and "Watchlist". Below the header are links for "FULL CAST AND CREW", "TRIVIA", "USER REVIEWS", "IMDbPro", "MORE", and "SHARE". The main content area features a title placeholder `{{movie.title}}` with a plus icon and a score placeholder `{{Score}}` with a star icon. Below this are two large boxes: the left one contains the code `` and the right one contains `<video src="{{movie.trailer}}">`. A "Watch Now" section follows, with text "From \$2.99 (SD) on Prime Video" and an "ON DISC" icon. The bottom section consists of several stacked boxes containing placeholders: `{{movie.plot_summary}}`, `{{movie.main_creatives}}`, `{{movie.reviews}}`, and `{{movie.awards}}`.



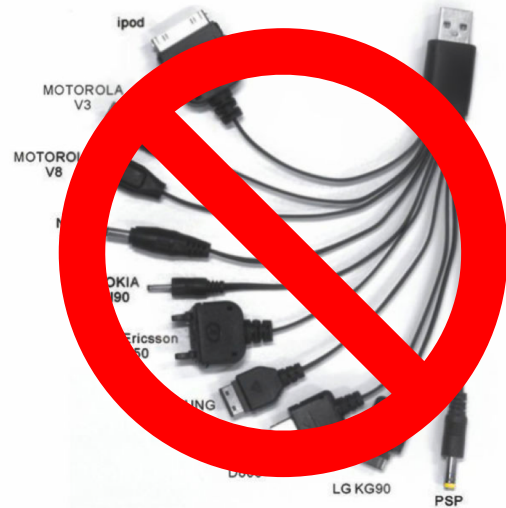
# Templates are standardizations. What can go wrong?



# Pros and cons of standardization

## Pro: Simpler.

Frees you from worrying about millions of options



## Con:

Standards might not fit all the options.



# How should template display the creatives?

The screenshot shows the IMDb page for the movie 'The Big Short' (2015). The page includes a search bar, navigation tabs, and a header with the movie title, year, and a star rating. Below the header, there are two large placeholder boxes for images. At the bottom, there is a section for credits with the following text:

**Director:** Adam McKay  
**Writers:** Charles Randolph (screenplay), Adam McKay (screenplay) | 1 more credit »  
**Stars:** Christian Bale, Steve Carell, Ryan Gosling | See full cast & crew »

A blue-bordered template overlay is present, consisting of a vertical bar on the left side of the main content area and a horizontal bar at the bottom, partially overlapping the credits section.

The screenshot shows the IMDb page for the movie 'The Big Lebowski' (1998). The page includes a search bar, navigation tabs, and a header with the movie title, year, and a star rating. Below the header, there are two large placeholder boxes for images. At the bottom, there is a section for credits with the following text:

and enlists his bowling buddies to help get it.  
**Stars:** Jen Bridges, John Goodman, Julianne Moore | See full cast & crew »

A red text overlay '?????????' is positioned above the stars section. A blue-bordered template overlay is present, consisting of a vertical bar on the left side of the main content area and a horizontal bar at the bottom, partially overlapping the credits section.

You can have multiple directors.  
Directors needs to be a list.

The screenshot shows the IMDb page for the movie "The Big Short (2015)". The page includes the IMDb logo, a search bar, and navigation tabs for "Movies, TV & Showtimes", "Celebs, Events & Photos", "News & Community", and "Watchlist". Below the navigation is a menu with "FULL CAST AND CREW", "TRIVIA", "USER REVIEWS", "IMDbPro", "MORE", and "SHARE". The movie title "The Big Short (2015)" is displayed with a star rating and a placeholder for a rating. Below the title, the genre "Biography, Comedy, Drama" and release date "23 December 2015 (USA)" are shown. The main content area is mostly obscured by a large grey placeholder. At the bottom, the "Director" field is populated with "Adam McKay". The "Writers" field lists "Charles Randolph (screenplay), Adam McKay (screenplay) | 1 more credit »". The "Stars" field lists "Christian Bale, Steve Carell, Ryan Gosling | See full cast & crew »".

The screenshot shows the IMDb page for the movie "The Big Lebowski (1998)". The page includes the IMDb logo, a search bar, and navigation tabs for "Movies, TV & Showtimes", "Celebs, Events & Photos", "News & Community", and "Watchlist". Below the navigation is a menu with "FULL CAST AND CREW", "TRIVIA", "USER REVIEWS", "IMDbPro", "MORE", and "SHARE". The movie title "The Big Lebowski (1998)" is displayed with a star rating and a placeholder for a rating. Below the title, the genre "Comedy, Crime" and release date "6 March 1998 (USA)" are shown. The main content area is mostly obscured by a large grey placeholder. At the bottom, the "Directors" field is populated with "Joel Coen, Ethan Coen (uncredited)".

# Standardization is hard. Expect to **iterate** on your templates

IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Chill (1983)** ★ 7.2 <sup>10</sup>/<sub>28,073</sub> ☆ Rate This

R | 1h 45min | Comedy, Drama | 30 September 1983 (USA)



2:02 | Trailer | 1 VIDEO | 76 IMAGES

Watch Now With Prime Video

WATCH NOW ON DISC

A group of seven former college friends gather for a weekend reunion at a South Carolina winter house after the funeral of one of their friends.

**Director:** [Lawrence Kasdan](#)  
**Writers:** [Lawrence Kasdan](#), [Barbara Benedek](#)  
**Stars:** [Tom Berenger](#), [Glenn Close](#), [Jeff Goldblum](#) | [See full cast & crew](#) »

62 **Metascore** From [metacritic.com](#) | **Reviews** 186 user | 61 critic | **Popularity** 4,222 (♦ 509)

**Nominated for 3 Oscars.** Another 3 wins & 5 nominations. [See more awards](#) »



IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Lebowski (1998)** ★ 8.2 <sup>10</sup>/<sub>609,031</sub> ☆ Rate This

R | 1h 57min | Comedy, Crime | 6 March 1998 (USA)



0:31 | Trailer | 9 VIDEOS | 141 IMAGES

Watch Now From \$2.99 (SD) on Prime Video

ON DISC

"The Dude" Lebowski, mistaken for a millionaire Lebowski, seeks restitution for his ruined rug and enlists his bowling buddies to help get it.

**Directors:** [Joel Coen](#), [Ethan Coen](#) (uncredited)  
**Writers:** [Ethan Coen](#), [Joel Coen](#)  
**Stars:** [Jeff Bridges](#), [John Goodman](#), [Julianne Moore](#) | [See full cast & crew](#) »

69 **Metascore** From [metacritic.com](#) | **Reviews** 1,075 user | 257 critic | **Popularity** 515 (♦ 32)

**Top Rated Movies #167** | 4 wins & 17 nominations. [See more awards](#) »

IMDb Find Movies, TV shows, Celebrities and more... All

Movies, TV & Showtimes | Celebs, Events & Photos | News & Community | Watchlist

FULL CAST AND CREW | TRIVIA | USER REVIEWS | IMDbPro | MORE | SHARE

**The Big Short (2015)** ★ 7.8 <sup>10</sup>/<sub>274,582</sub> ☆ Rate This

R | 2h 10min | Biography, Comedy, Drama | 23 December 2015 (USA)



2:05 | Trailer | 39 VIDEOS | 128 IMAGES

Watch Now From \$2.99 (SD) on Prime Video

ON DISC

In 2006-7 a group of investors bet against the US mortgage market. In their research they discover how flawed and corrupt the market is.

**Director:** [Adam McKay](#)  
**Writers:** [Charles Randolph](#) (screenplay), [Adam McKay](#) (screenplay) | [1 more credit](#) »  
**Stars:** [Christian Bale](#), [Steve Carell](#), [Ryan Gosling](#) | [See full cast & crew](#) »

81 **Metascore** From [metacritic.com](#) | **Reviews** 428 user | 454 critic | **Popularity** 434 (♦ 47)

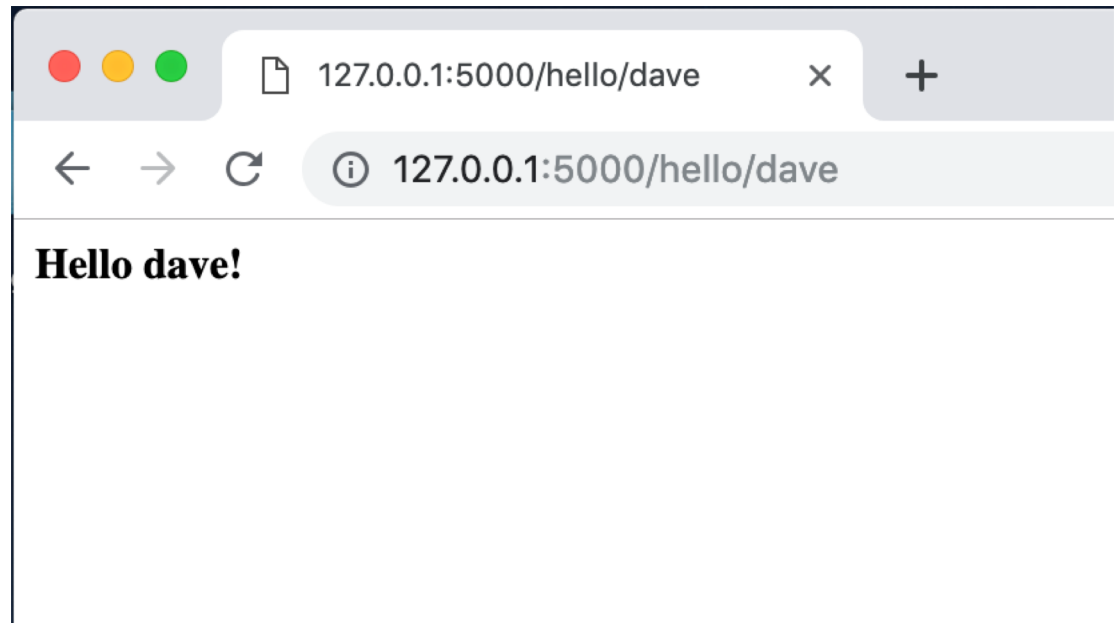
**Won 1 Oscar.** Another 37 wins & 79 nominations. [See more awards](#) »

# Implementing Templates in Flask

# How to render a template with data

```
server.py x hello.html x
1 from flask import Flask
2 from flask import render_template
3 app = Flask(__name__)
4
5 @app.route('/')
6 def hello_world():
7     return 'Hello World'
8
9 @app.route('/hello/<name>')
10 def hello(name=None):
11     return render_template('hello.html', name=name)
12
13 if __name__ == '__main__':
14     app.run()
15
16
```

```
server.py x hello.html x
1 <html>
2 <head></head>
3 <body>
4
5 <b>Hello {{name}}!</b>
6 </body>
7 </html>
8
9
```



# You can also send objects to templates

```
from flask import Flask
from flask import render_template
from flask import Response, request, jsonify
app = Flask(__name__)

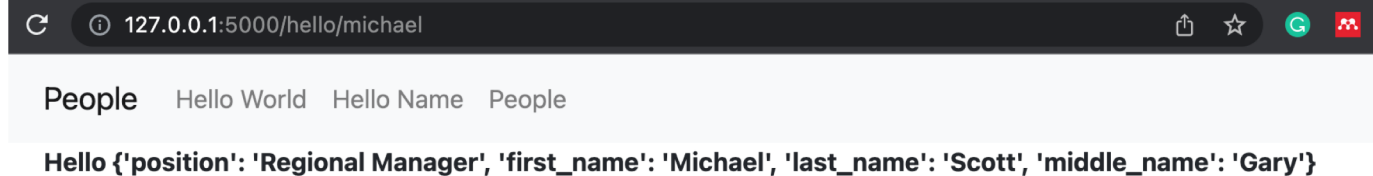
employees = {
    "michael":{
        "first_name": "Michael",
        "middle_name": "Gary",
        "last_name":"Scott",
        "position": "Regional Manager",
    },
    "dwight":{
        "first_name": "Dwight",
        "middle_name": "Kurt",
        "last_name":"Schrute",
        "position": "Assistant to the Regional Manager"
    }
}

# ROUTES
@app.route('/hello/<name>')
def hello_name(name=None):
    global employees

    employee = employees[name]

    return render_template('hello_name.html', employee=employee)
```

```
1 {% extends "layout.html" %}
2
3 {% block content %}
4
5 <b>Hello {{employee}} </b>!
6
7 {% endblock %}
8
9
```



The screenshot shows a web browser window with the address bar displaying '127.0.0.1:5000/hello/michael'. The page content includes a navigation menu with 'People', 'Hello World', 'Hello Name', and 'People'. Below the menu, the rendered output is displayed: 'Hello {'position': 'Regional Manager', 'first\_name': 'Michael', 'last\_name': 'Scott', 'middle\_name': 'Gary'}'.



# And access data within the object

```
from flask import Flask
from flask import render_template
from flask import Response, request, jsonify
app = Flask(__name__)

employees = {
    "michael":{
        "first_name": "Michael",
        "middle_name": "Gary",
        "last_name":"Scott",
        "position": "Regional Manager",
    },
    "dwight":{
        "first_name": "Dwight",
        "middle_name": "Kurt",
        "last_name":"Schrute",
        "position": "Assistant to the Regional Manager"
    }
}

# ROUTES
@app.route('/hello/<name>')
def hello_name(name=None):
    global employees

    employee = employees[name]

    return render_template('hello_name.html', employee=employee)
```

```
1  {% extends "layout.html" %}
2
3  {% block content %}
4
5  <b>Hello {{employee.first_name}} </b>!
6
7  {% endblock %}
8
9
```

127.0.0.1:5000/hello/michael

People Hello World Hello Name People

**Hello Michael !**

# And access it multiple times

```
from flask import Flask
from flask import render_template
from flask import Response, request, jsonify
app = Flask(__name__)

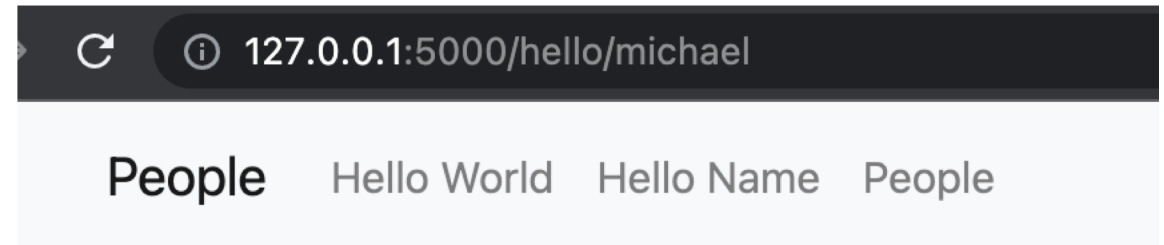
employees = {
    "michael":{
        "first_name": "Michael",
        "middle_name": "Gary",
        "last_name":"Scott",
        "position": "Regional Manager",
    },
    "dwight":{
        "first_name": "Dwight",
        "middle_name": "Kurt",
        "last_name":"Schrute",
        "position": "Assistant to the Regional Manager"
    }
}

# ROUTES
@app.route('/hello/<name>')
def hello_name(name=None):
    global employees

    employee = employees[name]

    return render_template('hello_name.html', employee=employee)
```

```
1  {% extends "layout.html" %}
2
3  {% block content %}
4
5  <b>Hello {{employee.first_name}} {{employee.last_name}}</b>!
6  <div>
7      Congrats on being the {{employee.position}}
8  </div>
9
10 {% endblock %}
11
```



**Hello Michael Scott!**

Congrats on being the Regional Manager

# You can even loop over data.

## How can we show all Michael's awards?

```
from flask import Flask
from flask import render_template
from flask import Response, request, jsonify
app = Flask(__name__)

employees = {
    "michael":{
        "first_name": "Michael",
        "middle_name": "Gary",
        "last_name":"Scott",
        "position": "Regional Manager",
        "awards": [
            "Dundee 2001: Best Manager",
            "Dundee 2002: Best Manager",
            "Dundee 2003: Best Manager",
            "Dundee 2004: Best Manager",
        ],
    },
    "dwight":{
        "first_name": "Dwight",
        "middle_name": "Kurt",
        "last_name":"Schrute",
        "position": "Assistant to the Regional Manager"
    }
}

# ROUTES
@app.route('/hello/<name>')
def hello_name(name=None):
    global employees

    employee = employees[name]

    return render_template('hello_name.html', employee=employee)
```

```
1  {% extends "layout.html" %}
2
3  {% block content %}
4
5  <b>Hello {{employee.first_name}} {{employee.last_name}}</b>!
6  <div>
7      Congrats on being the {{employee.position}}
8  </div>
9  <br>
10
11 <div>
12     Awards:
13     <ul>
14         {% for award in employee.awards %}
15             <li>{{award}}</li>
16         {% endfor %}
17     </ul>
18 </div>
19
20 {% endblock %}
21
22
```

People Hello World Hello Name People

**Hello Michael Scott!**

Congrats on being the Regional Manager

Awards:

- Dundee 2001: Best Manager
- Dundee 2002: Best Manager
- Dundee 2003: Best Manager
- Dundee 2004: Best Manager

# Templates are a great way to show all the information of a database element

People Hello World Hello Name People

**Hello Michael Scott!**

Congrats on being the Regional Manager

Awards:

- Dundee 2001: Best Manager
- Dundee 2002: Best Manager
- Dundee 2003: Best Manager
- Dundee 2004: Best Manager

# Implementing Search on the Server

# What if we wanted to return all employees with any type of manager role. How do we search?

```
from flask import Flask
from flask import render_template
from flask import Response, request, jsonify
app = Flask(__name__)

employees = {
    "michael":{
        "first_name": "Michael",
        "middle_name": "Gary",
        "last_name":"Scott",
        "position": "Regional Manager",
    },
    "dwight":{
        "first_name": "Dwight",
        "middle_name": "Kurt",
        "last_name":"Schrute",
        "position": "Assistant to the Regional Manager"
    },
}

# ROUTES
@app.route('/hello/<name>')
def hello_name(name=None):
    global employees

    employee = employees[name]

    return render_template('hello_name.html', employee=employee)
```

1. Give the route a search term rather than a name. (like "manager" "instead of "Michael")
2. Iterate over all the employees and find the matching ones.
3. Return an array of results (not just one result)
4. You could display the array of results using a template, but you could also just dynamically create the list in JavaScript. Both are fine.

# Homework 6 & 7: Building a CRUD Application

# HW6: Search Application **Functionality**

- **Search** Data
- **View** Data
- **Create** Data
- **Update** Data
- **Delete** Data



# Pick a dataset and put 10 items in it by hand.

**NBA All-Stars**



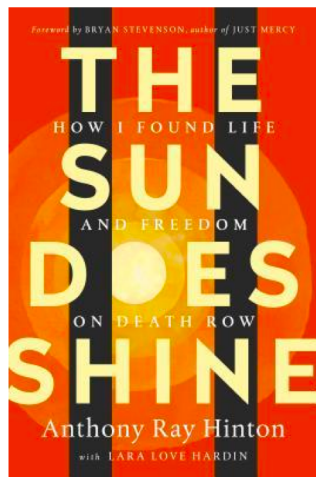
**Affordable make-up**



**Academy Award Winning Films**



**Book I want to read**



**Independent Coffee Shops in NYC**



**Fauvist Paintings**



# Have a user need in mind. Who needs this data? Why?

## **Family-owned** Ice cream parlors in the US



A college student is graduating and wants to road trip from NYC to Florida. Along the way, they want to find top-rated family-owned ice cream parlors so they can write about it for their travel blog.

# More specific needs are easier to design for.

Yoga poses



A person who has exercised is looking to make a part of their body more flexible.

Top players for the 2019 baseball season



Someone who wants to prepare for his or her fantasy baseball draft

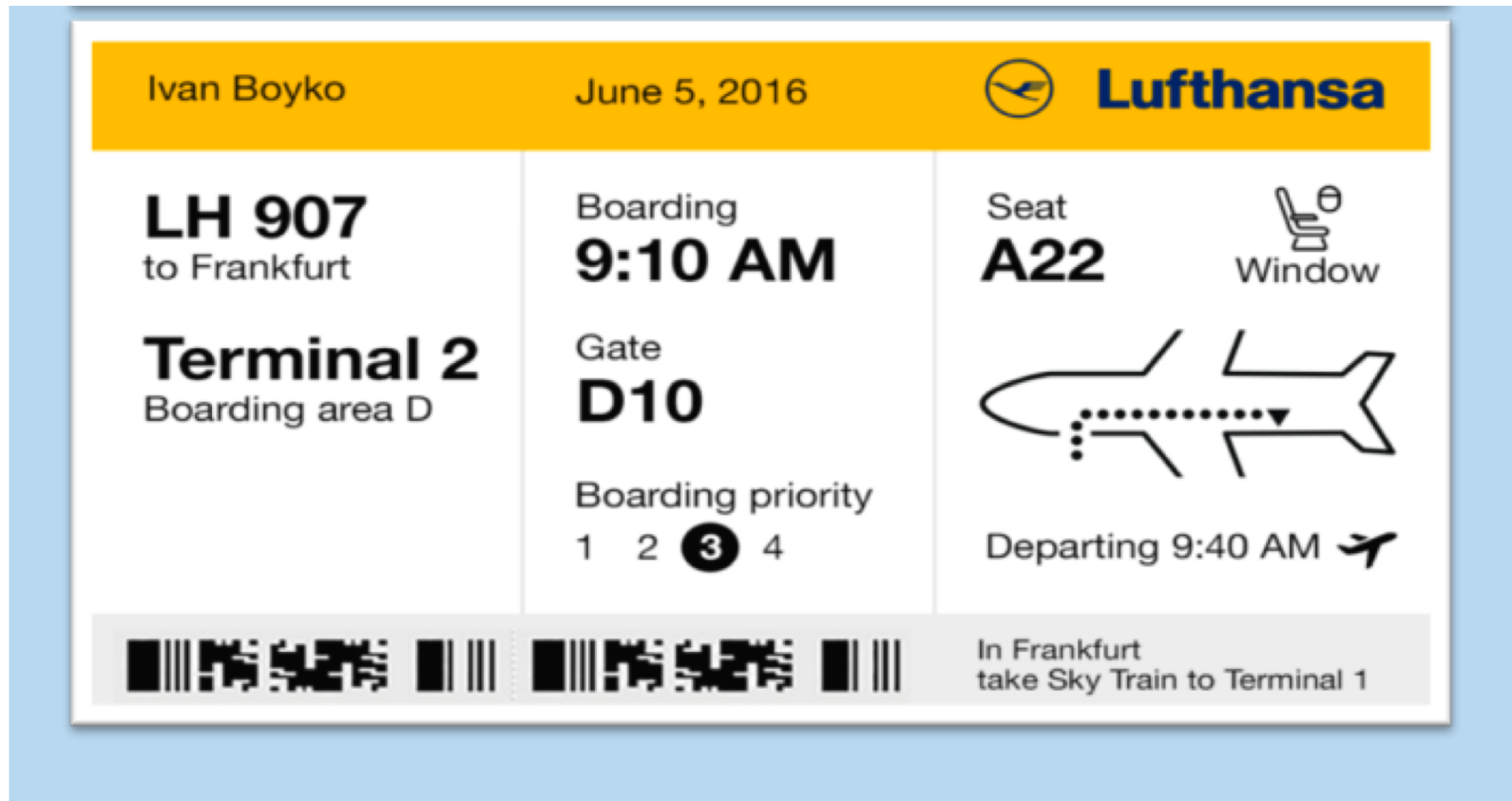
US Elections in 2018



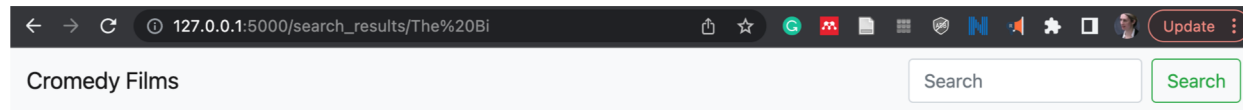
1. Any civically minded citizen or citizen who wants to be more well-read about our politics
2. A political candidate who wants to see how she or he will perform in their district based on the results in the 2018 election.

**It is easier to make design decisions when the goal is clear.**  
**What data to store, what interactions to enable.**

Remember, to do good design, we need to know what the users goal is.



# HW6: Enable searching over data and viewing individual data elements (like IMDB).



## Search Results for "The Bi"

The Big Lebowski  
The Big Short



## The Big Lebowski ( 1998)



Score: 8.1 / 10

When 'The Dude' Lebowski is mistaken for a millionaire Lebowski, two thugs urinate on his rug to coerce him into paying a debt he knows nothing about. While attempting to gain recompense for the ruined rug from his wealthy counterpart, he accepts a one-time job with high pay-off. He enlists the help of his bowling buddy, Walter, a gun-toting Jewish-convert with anger issues. Deception leads to more trouble, and it soon seems that everyone from porn empire tycoons to nihilists want something from The Dude.

Director(s):

- Joel Coen
- Ethan Coen

Stars:

- Jeff Bridges
- John Goodman
- Julianne Moore

Genres:

- Comedy
- crime
- buddy

It doesn't have to be pretty,  
Just functional

I implemented this by starting with the “people” example and adding to it.

- When starting with another code base, be really sure to do iterative programming!
- Don't just delete stuff that you think you might need. It can create errors.

# Weird thing in Flask to watch out for...



## TypeError

`TypeError: Undefined is not JSON serializable`

### Traceback (most recent call last)

```
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1836, in __call__
    return self.wsgi_app(environ, start_response)
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1820, in wsgi_app
    response = self.make_response(self.handle_exception(e))
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1403, in handle_exception
    reraise(exc_type, exc_value, tb)
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1817, in wsgi_app
    response = self.full_dispatch_request()
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1477, in full_dispatch_request
    rv = self.handle_user_exception(e)
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1381, in handle_user_exception
    reraise(exc_type, exc_value, tb)
```

```
1  {% extends "layout.html" %}
2
3  {% block content %}
4
5  <script>
6      let data = {{data|tojson}}
7      console.log(data)
8  </script>
9
10
11  <b>Hello {{employee.first_name}} {{employee.last_name}}</b>!
12  <div>
13      Congrats on being the {{employee.position}}
14  </div>
15  <br>
16
```

Let's comment it out, and try again



**YOU MEAN THAT COMMENTS**

**CAN GENERATE BUGS?**

```
{% extends "layout.html" %}

{% block content %}

<script>
    // let item = {{employees|tojson}}
    // console.log(item)
</script>
```

TypeError

Traceback (

File "/User  
return

File "/User  
respon

File "/User  
rerais

File "/User  
respon

File "/User  
rv = S

File "/User  
rerais

File "/User  
rv = S

File "/User

imgflip.com

**WHY????????**



# Even when commented out, Flask will still replace all the `{{}}` syntax in the template with data (or die trying).



## TypeError

TypeError: Undefined is not JSON serializable

### Traceback (most recent call last)

```
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1836, in __call__
    return self.wsgi_app(environ, start_response)
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1820, in wsgi_app
    response = self.make_response(self.handle_exception(e))
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1403, in handle_exception
    reraise(exc_type, exc_value, tb)
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1817, in wsgi_app
    response = self.full_dispatch_request()
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1477, in full_dispatch_request
    rv = self.handle_user_exception(e)
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1381, in handle_user_exception
    reraise(exc_type, exc_value, tb)
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1475, in full_dispatch_request
    rv = self.dispatch_request()
File "/Users/lydiachilton/Library/Python/2.7/lib/python/site-packages/flask/app.py", line 1461, in dispatch_request
```

```
1 {% extends "layout.html" %}
2
3 {% block content %}
4
5 <script>
6     // let item = {{employees|tojson}}
7     // console.log(item)
8
9 </script>
```

# Hint: How did I store my employees?

```
1 from flask import Flask
2 from flask import render_template
3 from flask import Response, request, jsonify
4 app = Flask(__name__)
5
6 employees = {
7     "michael":{
8         "first_name": "Michael",
9         "middle_name": "Gary",
10        "last_name":"Scott",
11        "position": "Regional Manager",
12    },
13    "dwight":{
14        "first_name": "Dwight",
15        "middle_name": "Kurt",
16        "last_name":"Schrute",
17        "position": "Assistant to the Regional Manager"
18    },
19 }
20
21 # ROUTES
22 @app.route('/people')
23 def people():
24     return render_template('people.html', data=data)
25
26
27 @app.route('/hello/<name>')
28 def hello_name(name=None):
29     global employees
30
31     employee = employees[name]
32
33     return render_template('hello_name.html', employee=employee)
34
35
36
```

As a dictionary with the name as the key.

Advice:

- Definitely store your data as a dictionary. Why?
- Do not use the name/title as the key. Why?

# Homework 6: Search Application Functionality

## Warm up: What data will you pick?

You must pick a dataset that someone might want to search. Your dataset needs to have at least 10 items in it. We suggest you create them by hand, like the list of local business were in the log\_sales application. Typically, 10 items are not enough to need search functionality for, but we are going to implement it anyway.

Each data item needs to have multiple fields. At the minimum, this must include:

- An id
- A short title or name for the item (movie title, restaurant name, etc)
- A link to media (image, video, or gif).
  - For large media files, you must provide an external link (like a link to a youtube video). Do NOT download the file and submit it with the assignment because if you did that, it will take your grader forever to download all the assignments.
- A text paragraph of explanation (At least 4 sentences)
- Some sort of numerical data (a year, a price, a rating, etc.)
- A list of some kind of data (such as a list of reviews for the movie, list of popular dishes at the restaurant, a list of similar restaurants nearby, etc)

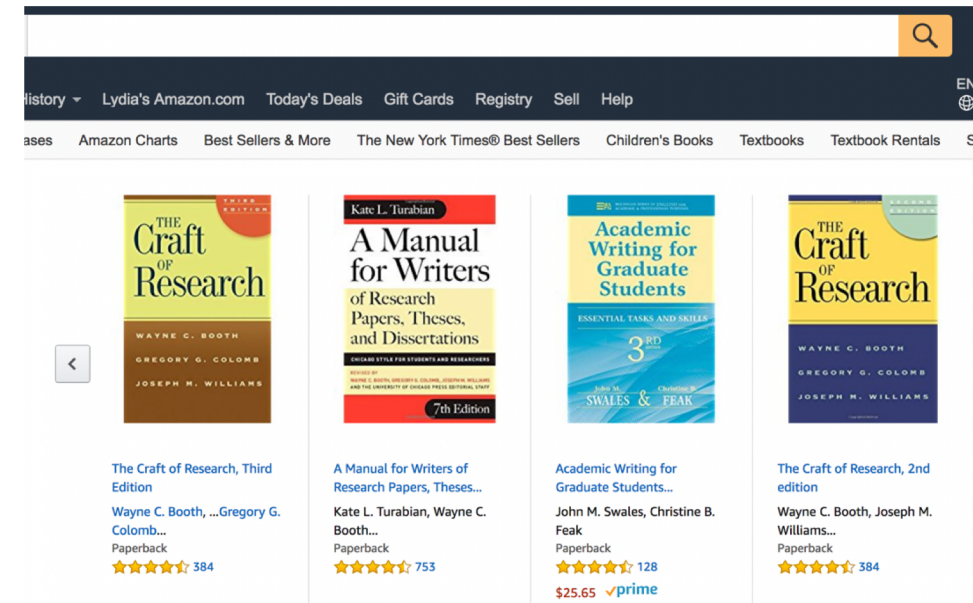
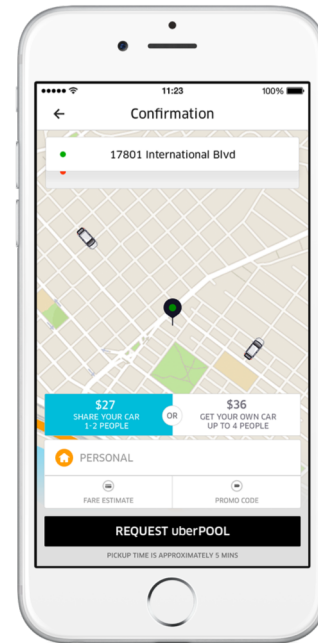
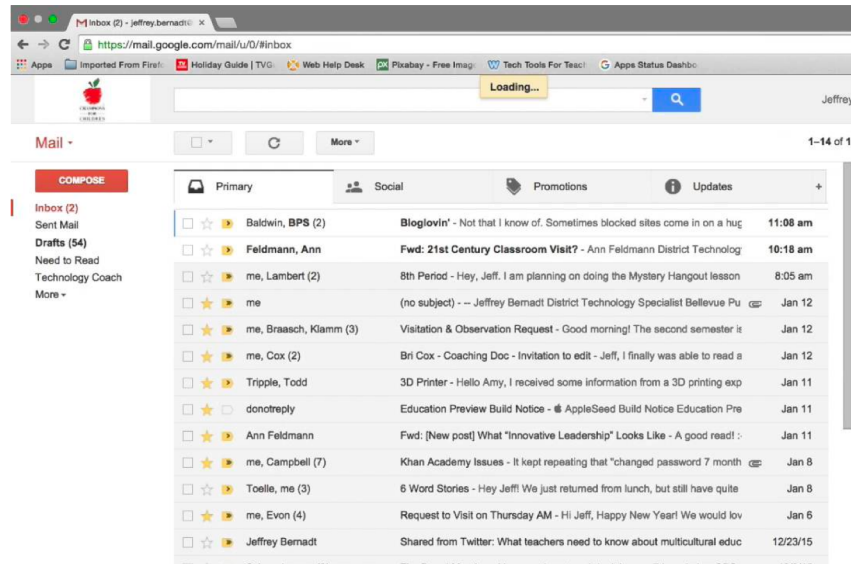
## Main: Code AND a video

### What to submit:

1. Write a short sentence describing your participation on Monday (unless instructed otherwise by your section TA).
2. Hw6\_UNI.zip: A Flask project containing:
  - server.py
  - templates/ (and the HTML templates you need)
  - static/ (and any static files you need)
3. A link to a YouTube video showing off the functionality of your site.

Summary

# The main goal of many websites is to interact with data.



# CRUD: Operations for interacting with a database

## Create


**New Message**

To

From Lydia Chilton <chilton@cs.columbia.edu> ▾

Subject

Hey dude!

 What's on your mind, Lydia?

**Add title**

(No title)  
7 - 8pm

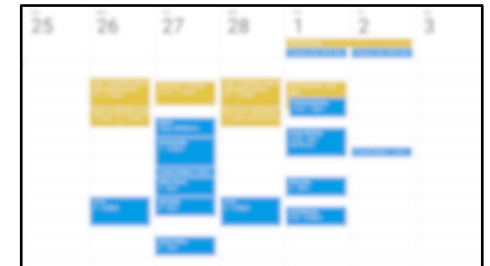
Event  Reminder  Appointment slots

Feb 28, 2018 7:00pm - 8:00pm Feb 28, 2018

MORE OPTIONS

## Read

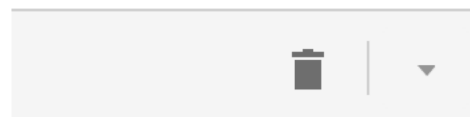
Baldwin, BPS (2)	Bioglovin' - Not that I know of. Sometimes bi
Feldmann, Ann	Fwd: 21st Century Classroom Visit? - Ann
me, Lambert (2)	8th Period - Hey, Jeff. I am planning on doing
me	(no subject) - -- Jeffrey Bernadt District Techn



## Update

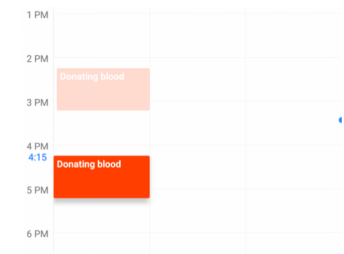


## Delete



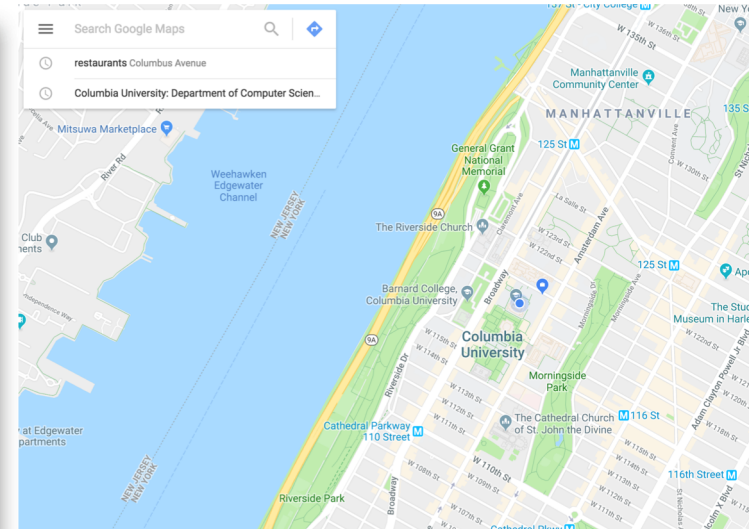
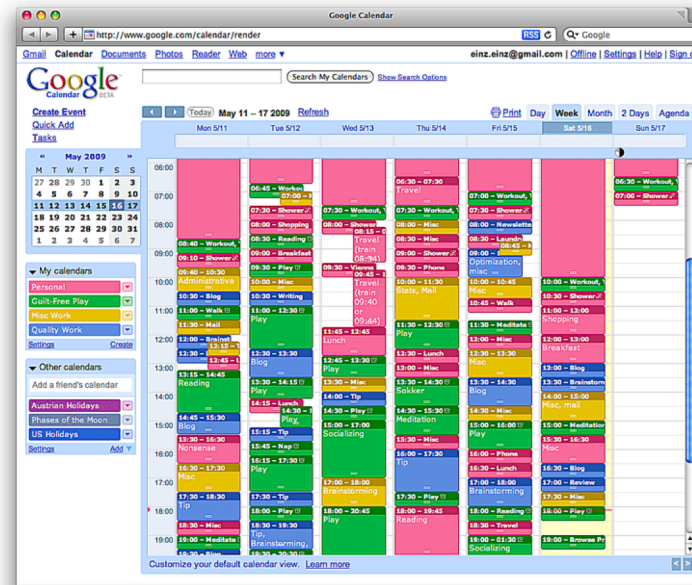
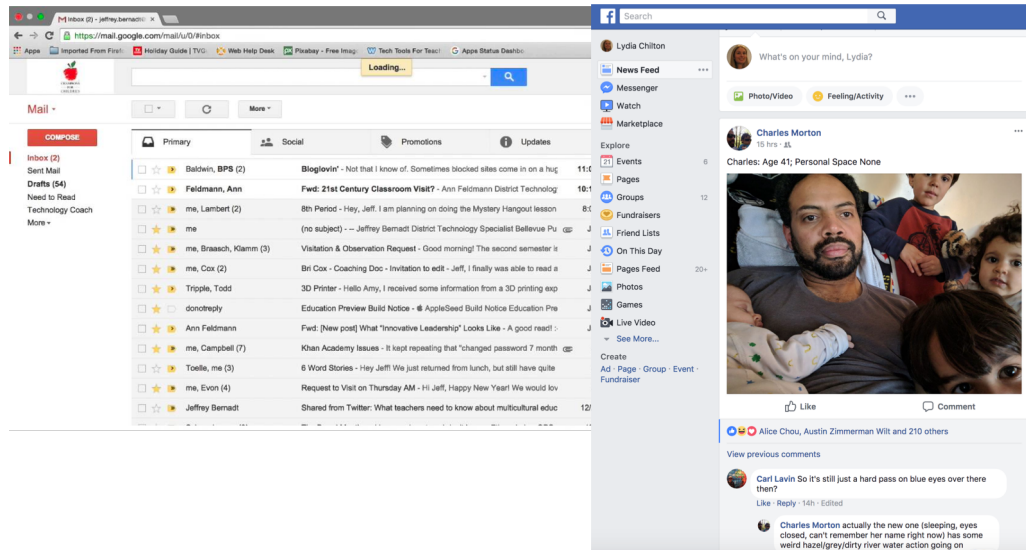
**Delete Post?**

Are you sure you want to delete it?



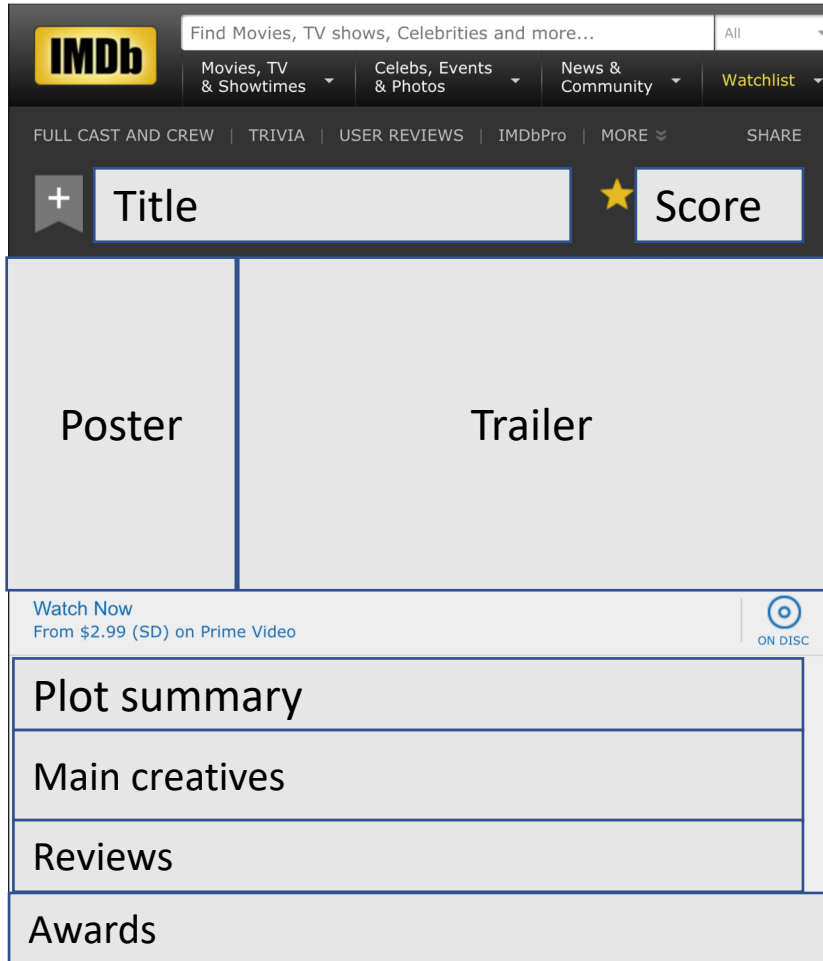
4170

# From a back-end perspective Database-backed websites are very similar.



## But they serve different data and different information needs

# Use templates to dynamically generate pages from data in the database



Title	Plot summary	poster	year
The Big Lebowski	"The dude" Lebowski, mistaken...	Lebowski.jpg	1998
The Big Short	In 2006-7 a group of investors...	Big_short.jpg	2015
The Big Chill	A group of 7 former roommates	Big_chill.jpg	1983

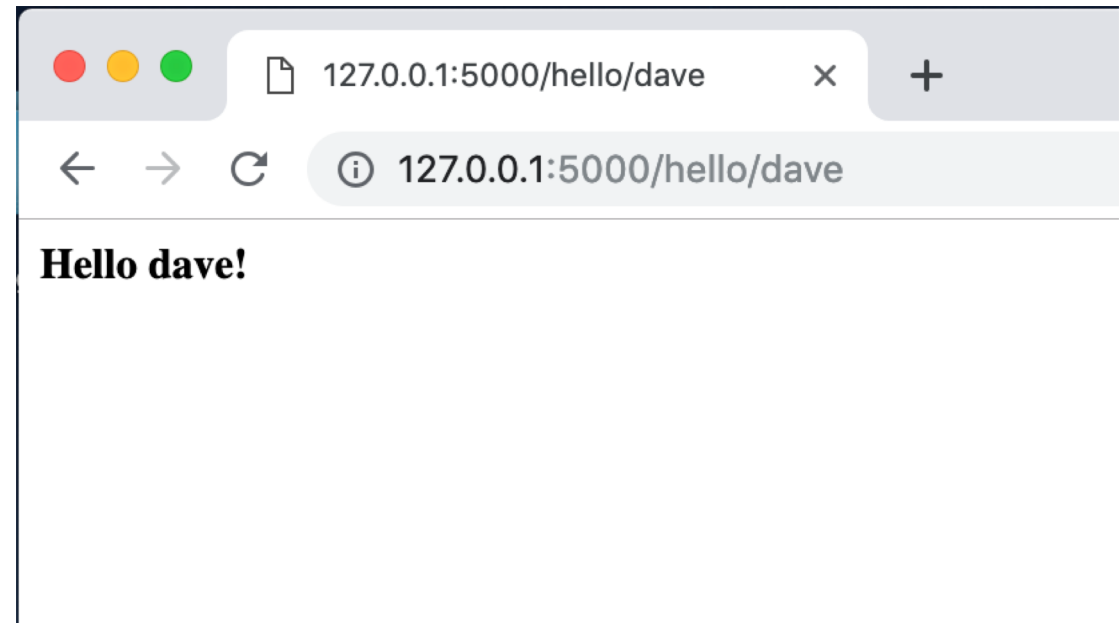




# How to render a template with data

```
server.py x hello.html x
1 from flask import Flask
2 from flask import render_template
3 app = Flask(__name__)
4
5 @app.route('/')
6 def hello_world():
7     return 'Hello World'
8
9 @app.route('/hello/<name>')
10 def hello(name=None):
11     return render_template('hello.html', name=name)
12
13 if __name__ == '__main__':
14     app.run()
15
16
```

```
server.py x hello.html x
1 <html>
2 <head></head>
3 <body>
4
5 <b>Hello {{name}}!</b>
6 </body>
7 </html>
8
9
```



# Homework 6: Search Application Functionality

## Warm up: What data will you pick?

You must pick a dataset that someone might want to search. Your dataset needs to have at least 10 items in it. We suggest you create them by hand, like the list of local business were in the log\_sales application. Typically, 10 items are not enough to need search functionality for, but we are going to implement it anyway.

Each data item needs to have multiple fields. At the minimum, this must include:

- An id
- A short title or name for the item (movie title, restaurant name, etc)
- A link to media (image, video, or gif).
  - For large media files, you must provide an external link (like a link to a youtube video). Do NOT download the file and submit it with the assignment because if you did that, it will take your grader forever to download all the assignments.
- A text paragraph of explanation (At least 4 sentences)
- Some sort of numerical data (a year, a price, a rating, etc.)
- A list of some kind of data (such as a list of reviews for the movie, list of popular dishes at the restaurant, a list of similar restaurants nearby, etc)

## Main: Code AND a video

### What to submit:

1. Write a short sentence describing your participation on Monday (unless instructed otherwise by your section TA).
2. Hw6\_UNI.zip: A Flask project containing:
  - server.py
  - templates/ (and the HTML templates you need)
  - static/ (and any static files you need)
3. A link to a YouTube video showing off the functionality of your site.