

Address, City, State, and/or Zip

3405 Michigan Union 530 S. State Street

Current City

-  Ann Arbor, Michigan
51,001 like this · 752,64...
-  Lake Ann, Michigan
785 like this · 8,350 wer...
-  Saint Ann'S Bay, Saint A...
742 like this · 3,583 wer...
-  Saint Ann, Missouri
533 like this · 3,920 wer...

Location
Where in the world are you?

家乡 :
安庆
安顺
安康

SKYHOOK
WIRELESS



YAHOO!
BOSS

Google
Developers

Positioning

Spatial Computing – University of Minnesota



We'll cover the following content-based positioning-related topics:

- 1 **Geoparsing**: Extracting place names from natural language text
- 2 “**Home Locations**”: The dynamics of location fields in user profiles (and more)

Spatial Computing (@Spati...)

Twitter, Inc. (US) https://twitter.com/spatialcompmooc/

Google

Search Twitter

6 8 134 1

Tweets Tweets & replies Photos & videos

Spatial Computing @SpatialCompMOOC · Sep 29
Module 2 opens in < 1 hour! This week, we'll cover the crit
spatial query languages (think SQL, but optimized for spati

Spatial Computing @SpatialCompMOOC · Sep 25
Learn more about your instructors at their websites: @bhecht
/1t0OUpV and Dr. Shekhar: bit.ly/1t0OUpU

Spatial Computing @SpatialCompMOOC · Sep 22
Welcome to Module 1 of the University of Minnesota's Spa
MOOC!

Who to follow · Refresh · View all

reed.co.uk @reedcouk

A screenshot of a Twitter profile page for "Spatial Computing (@SpatialCompMOOC)". The profile picture shows a globe with various locations marked. The bio reads: "The Twitter account for the University of Minnesota's Spatial Computing MOOC taught by Dr. @bhecht and Dr. Shashi Shekhar". Below the bio, there are links to "Minneapolis, MN" (with a red arrow pointing to it), "coursera.org/course/spatial...", and "1 Photo or video". A thumbnail image shows a classroom setting with students at desks. The header shows the account has 6 tweets, 8 replies, 134 photos/videos, and 1 follower. The "Tweets" tab is selected. Three tweets are listed, each with a profile picture, author name, date, and a truncated message. The first tweet discusses Module 2 opening. The second tweet promotes instructors' websites. The third tweet welcomes users to Module 1.

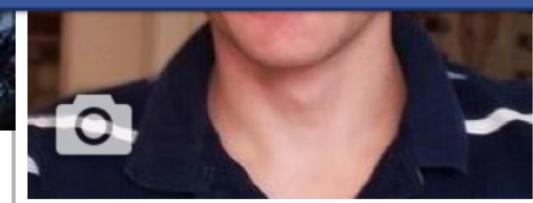


Brent Hecht



Brent

Home



Brent Hecht

[Update Info](#)[View Activity Log](#)

10+

[Timeline](#)[About](#)[Photos](#)[Friends 460](#)[More ▾](#)

About

[Overview](#)[Work and Education](#)

Places You've Lived

[Contact and Basic Info](#)[Family and Relationships](#)[Details About You](#)[Life Events](#)

CURRENT CITY AND HOMETOWN

Current City



Minneapolis, Minnesota

Friends

[Save Changes](#)[Cancel](#)

+ Add your hometown

OTHER PLACES LIVED

+ Add a place

Slides for Spatial Computing
(BY Brent Hecht)



[Timeline](#)[About](#)[Photos](#)[Friends 29 Mutual](#)[More ▾](#)

ABOUT

Assistant Professor at University of Minnesota - Twin Cities

Past: Northwestern University and Microsoft Research

Studied Computer Science at Northwestern University

Past: University of California, Santa Barbara and Macalester College

Lives in Minneapolis, Minnesota

PHOTOS · 100



Brent Hecht shared a link.

March 10

A Crash Course in Modern Geography for Researchers and Practitioners

Thanks to the rise of ubiquitous computing, location-based ser content, and related phenomena, geography plays an increase the work of HCI researchers and practitioners. Through recent integrate the geography and HCI communities like last year'...

SITES.GOOGLE.COM

[Unlike](#) · [Share](#)

You and 6 others like this.



Brent Hecht

March 3

Happy to announce that Steph and I are engaged! — w





Edit Profile

Name

Brent

H

Picture



Change Picture

Username

www.pinterest.com/

bjhecht

About You

Location

Website

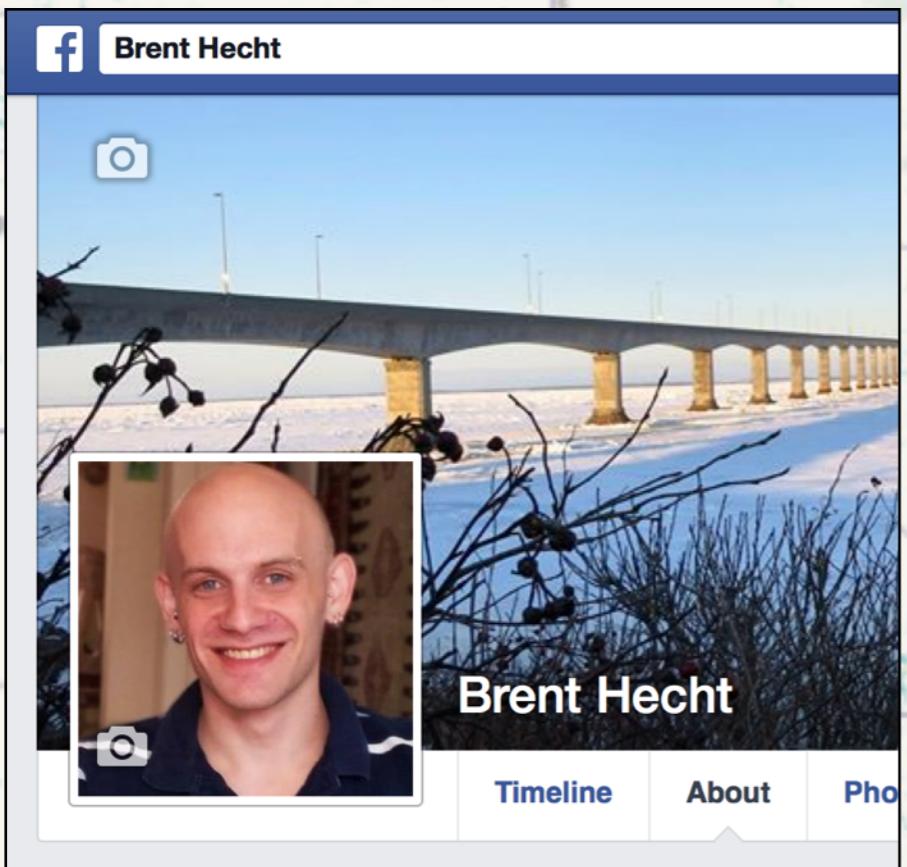
Verify Website

Visit [Account Settings](#) to change your password, email address, and Facebook and Twitter settings.

Cancel

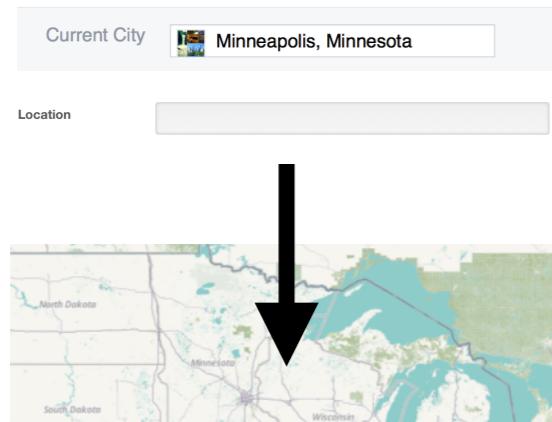
Save Profile

Slides for Spatial Computing
(By Brent Hecht)



Slides for Spatial/Computing MOOC
(By Brent Hecht)

Structure of the rest of this video:



Go over **how** to use location fields to position users.

Understand the advantages and disadvantages of location field positioning.

Wrap-up positioning with discussion of **location-inference attacks**.

Brent Hecht

Update Info View Activity Log 10+ ...

Timeline About Photos Friends 460 More

CURRENT CITY AND HOMETOWN

Current City



Minneapolis, Minnesota

Save Changes

Cancel

Toponym
(a.k.a. place name)



Add your hometown

OTHER PLACES LIVED



Add a place

(44.98, -93.27)

Machine-readable Representation
(e.g. lat/lon coordinate)

Slides for Spatial Computing
(By Brent Hecht)



Google Maps API Web Services

g+1 174

▼ Google Maps Web Services

Overview

Directions API

Distance Matrix API

Elevation API

Geocoding API

Time Zone API

Client Library

► Support

► Related APIs

The Google Geocoding API

This document discusses the Geocoding API v3. Note that the Geocoding API v2 has been turned down and is no longer available. Users of the Geocoding API v2 service should [upgrade](#) to v3.

This service is also available as part of the [Google Maps JavaScript API](#), or with a [Java client library](#).

[What is Geocoding?](#)

[Before You Begin](#)

[API Key](#)

[Usage Limits](#)

[Geocoding API Request Format](#)

[Geocoding \(Latitude/Longitude Lookup\)](#)

[Geocoding Responses](#)

[JSON Output Formats](#)

[XML Output Formats](#)

[Status Codes](#)

[Error Messages](#)

[Results](#)



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Locations API

Bing | 11 out of 22 rated this helpful – [Rate this topic](#)

Use the Locations API to get location information.

For an example of how to use the Locations API with Bing Maps AJAX Control 7.0, see [Displaying Location Search Results Using the REST Services](#).

In this section

Find a Location by Address	Use these URL templates to get latitude and longitude coordinates for a location by specifying values such as a locality, postal code, and street address.
Find a Location by Point	Use this URL template to get the location information associated with latitude and longitude coordinates.
Find a Location by Query	Use these URL templates to get latitude and longitude coordinates that correspond to location information provided as a query string.
Location Data	Use this description to understand the results returned in the response to a Locations API request.

MapQuest Geocoding API

LICENSED DATA APIs

» GEOCODING API WEB SERVICE

Geocoding is the process of matching addresses with geographic coordinates. easily access the MapQuest geocoder through a simple HTTP request. The Ge functions: address, reverse, and batch.

Geocoding API Resources

[Documentation](#)

Instructions, code samples, and demos all combined in easy-to-follow, easy

[Forums](#)

Discuss and collaborate with developers who are using the Geocoding API.

[Features](#)

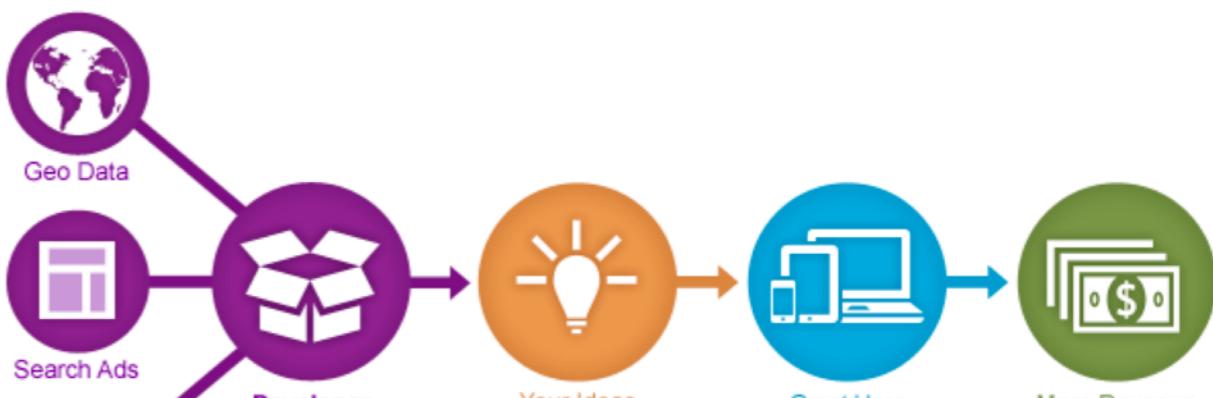
[Address geocoding](#)

Provide either a single-line address or an address broken down into its components. geocodes in order of confidence.



Yahoo BOSS Geo Services

Yahoo BOSS is a suite of services that provides Developers premium API's that can support Search and Content applications. BOSS Geo services include two primary offerings today, Placefinder and PlaceSpotter, which allows developers to geo-enrich their applications and make them more location aware. Learn more about our offerings below.



“200 Union St. SE,
Minneapolis, MN”

“United States”

“Minnesota”

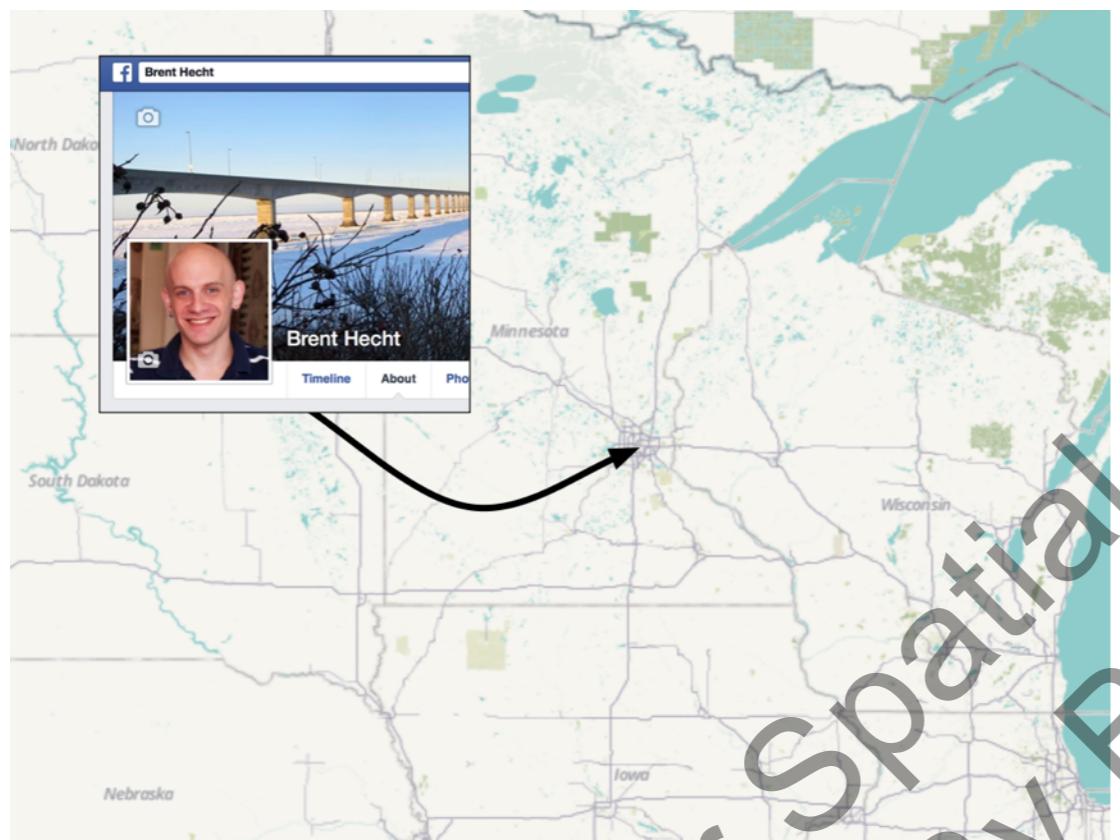
“Minneapolis, MN”



Google
Developers

The Google Geocoding API

```
"address_components" : [
  {
    "long_name" : "Minneapolis",
    "short_name" : "Minneapolis",
    "types" : [ "locality", "political" ]
  },
  {
    "long_name" : "Hennepin County",
    "short_name" : "Hennepin County",
    "types" : [ "administrative_area_level_2", "political" ]
  },
  {
    "long_name" : "Minnesota",
    "short_name" : "MN",
    "types" : [ "administrative_area_level_1", "political" ]
  },
  {
    "long_name" : "United States",
    "short_name" : "US",
    "types" : [ "country", "political" ]
  }
],
"formatted_address" : "Minneapolis, MN, USA",
"geometry" : {
  "bounds" : {
    "northeast" : {
      "lat" : 45.05125,
      "lng" : -93.1945439
    },
    "southwest" : {
      "lat" : 44.890144,
      "lng" : -93.32916299999999
    }
  },
  "location" : {
    "lat" : 44.983334,
    "lng" : -93.26666999999999
  },
  "location_type" : "APPROXIMATE",
  "viewport" : {
    "northeast" : {
      "lat" : 45.05125,
      "lng" : -93.1945439
    },
    "southwest" : {
      "lat" : 44.890144,
      "lng" : -93.32916299999999
    }
  }
}
```



Map users
Slides for Spatial Computing
(By Brent Hecht)

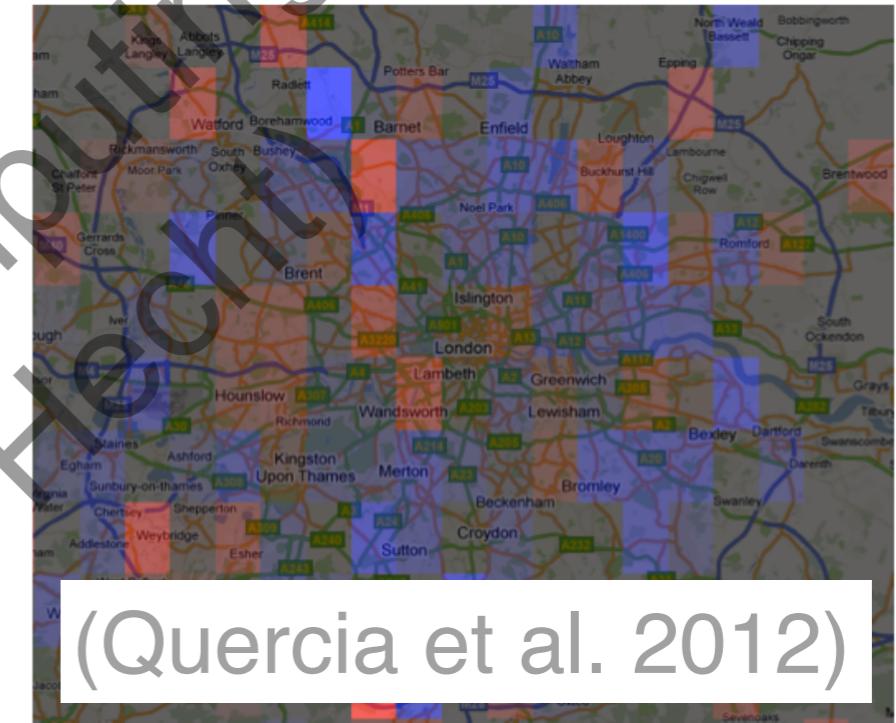


Figure 2. Mapping “Gross Community Happiness” in Greater London (best seen in color).

Do a geographic sentiment analysis

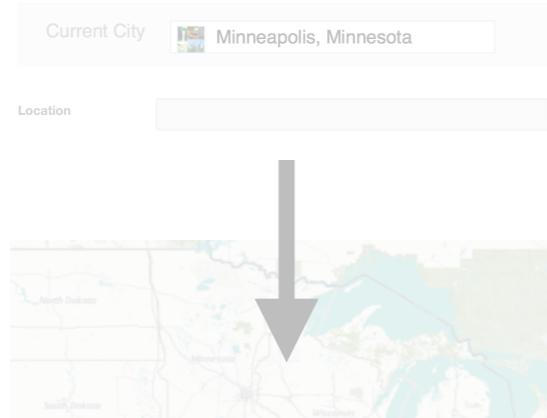
Questions you may be asking yourself
at this point:

What do you mean by **some** applications?

How is **geo/geo ambiguity** dealt with?

Slides for (BY) Brent Hecht
Spatial Computing MOOC

Structure of the rest of this video:



Go over **how** to use location fields to position users.

Understand the **advantages** and **disadvantages** of location field positioning.

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Location Field Positioning



PROS

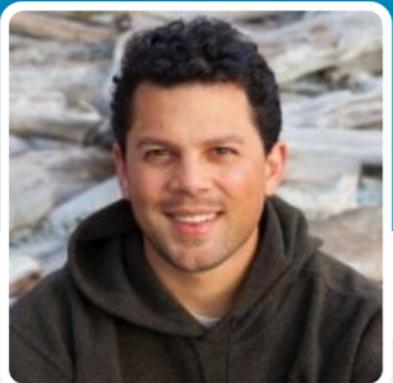


CONS



Many location fields
are blank

Slides for Spatial Computing MOOC
(By Brent Hecht)



Shilad Sen
@shiladsen FOLLOW YOU
Joined September 2010

 Tweet to  Message

No Location



Pedro Pereda Mellado
@PeredaFP FOLLOW YOU
Joined October 2007

 Tweet to  Message

No Location



Colin Kaepernick 
@Kaepernick7
Do not underestimate the determination
of a quiet man - Iain Smith
Joined June 2009

 Tweet to Colin Kaepernick  Message

No Location



jonathan andrade
@golyandrade
Amanecer de la comida, panzon y feliz.
Joined September 2012

 Tweet to jonathan andrade

No Location



Stephanie H
@hashtaghille FOLLOW YOU
Joined March 2011

 Tweet to  Message

No Location



Alyson Glass 
@glassak
I went to Juniata College and now I
don't.
Joined January 2010

 Tweet to Alyson Glass

No Location

18% of Twitter user profiles have
nothing in their location field

(Hecht et al. 2011)

Slides for Spatial Computing Mooc
(By Brent Hecht)

Location Field Positioning



PROS



CONS



Many location fields
are blank

Scale is sometimes
insufficient

Slides for Spatial Computing MOOC
(By Brent Hecht)

Slides for Spatial Computing MOOC

Jessica Vita
@jvitak FOLLOW YOU
Asst Prof at Maryland (@I_UMD). Research HCI/CMC/CSCW, c privacy & identity. s O's/Ravens! PhD fr

Kiri Carini
@tomatopurl FOLLOW YOU
Just an Oregon tree-hugger trying to survive on the flat land of Maryland's Eastern Shore. Employed @ Dorchester County Tourism & UMCES.| #GISTribe

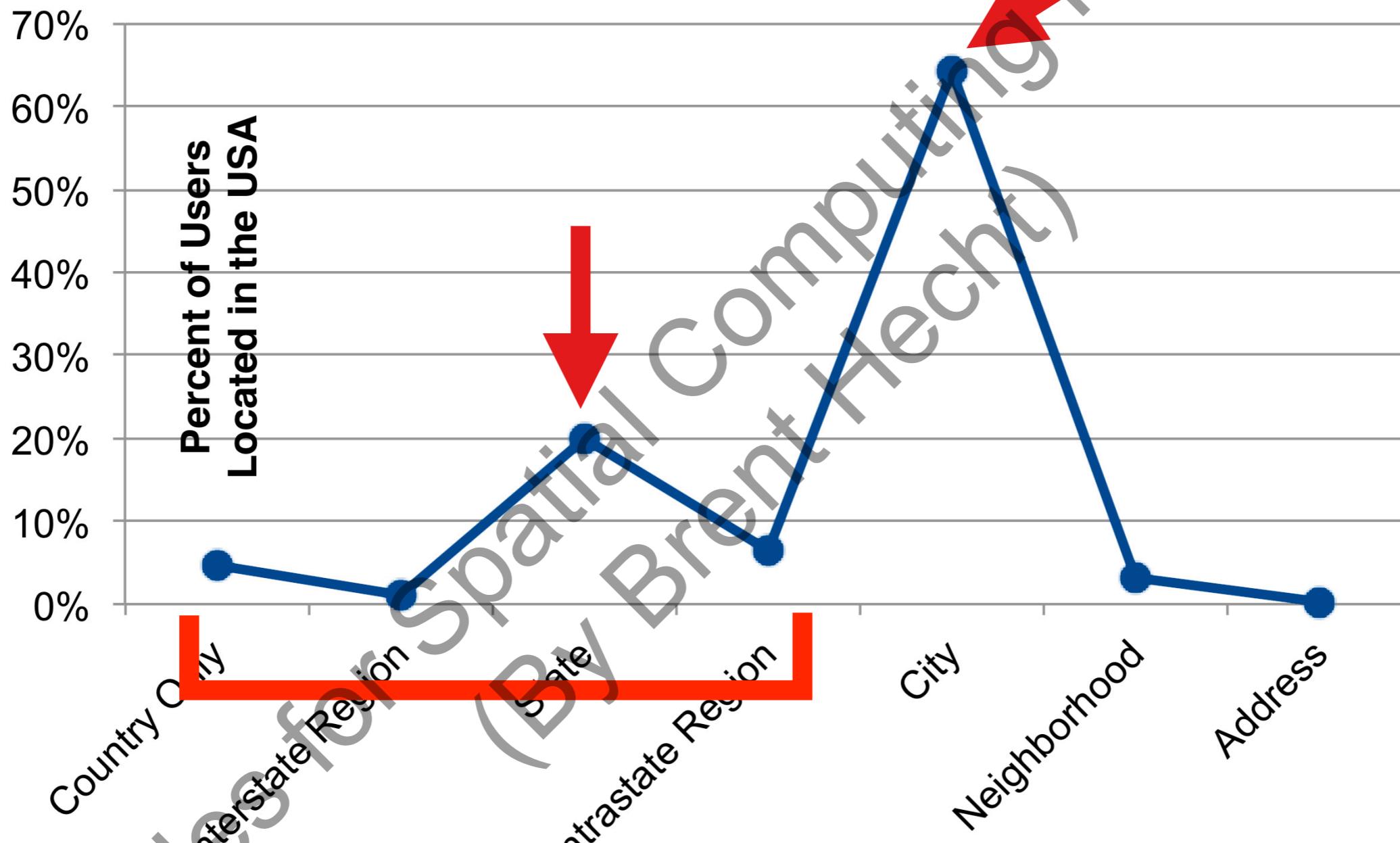
Maryland jessicavitak.com

Maryland goo.gl/qiLtVV

Joined December 2012 Joined March 2008

[Tweet to](#) [Tweet to](#) [Message](#)

Geographic Scale (In Order of Increasing Localness from Left to Right)



(Hecht et al. 2011)

Geoweb Scale Problem

“Alaska”

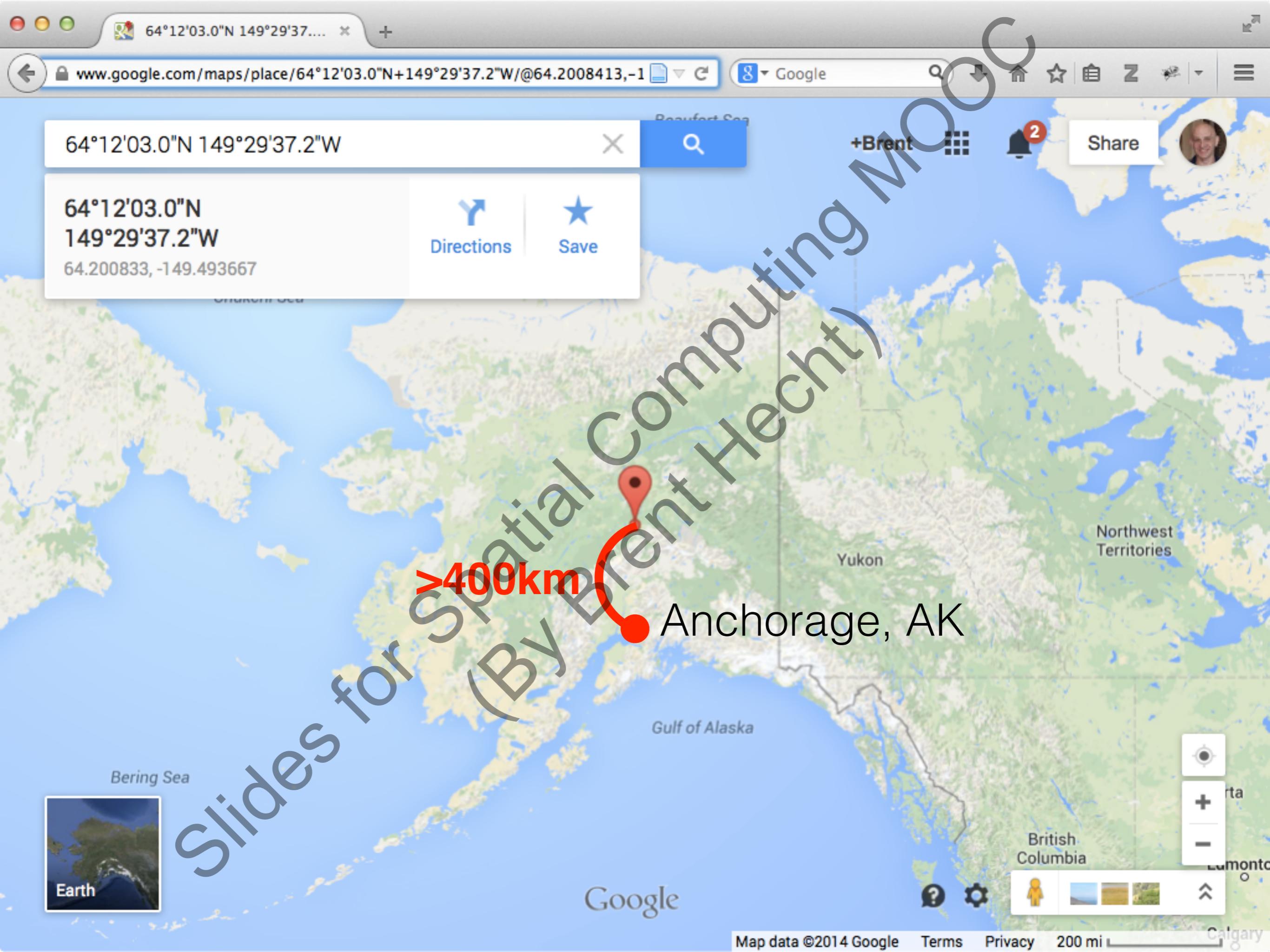
“Minneapolis, MN”

“200 Union St. SE,
Minneapolis, MN”



The Google Geocoding API

```
  "address_components" : [
    {
      "long_name" : "Alaska",
      "short_name" : "AK",
      "types" : [ "administrative_area_level_1", "political" ]
    },
    {
      "long_name" : "United States",
      "short_name" : "US",
      "types" : [ "country", "political" ]
    }
  ],
  "formatted_address" : "Alaska, USA",
  "geometry" : {
    "bounds" : {
      "northeast" : {
        "lat" : 71.3902351,
        "lng" : -129.9945562
      },
      "southwest" : {
        "lat" : 51.214766,
        "lng" : 172.4445167
      }
    },
    "location" : {
      "lat" : 64.20084129999999,
      "lng" : -149.4936733
    },
    "location_type" : "APPROXIMATE",
    "viewport" : {
      "northeast" : {
        "lat" : 71.3902351,
        "lng" : -129.9945562
      },
      "southwest" : {
        "lat" : 51.214766,
        "lng" : 172.4445167
      }
    }
  },
  "types" : [ "administrative_area_level_1", "political" ]
```



Slides for Spatial Computing MOOC
(By Brent Hecht)

Google

Geoweb Scale Problem

The GSP occurs when latitude and longitude coordinates – the foundation of spatial representations on the geoweb – are not appropriate for the desired scale of a given spatial computing research project or application.

(Hecht and Gergle 2011)

Slides for Spatial Computing MOOC

```
        "types" : [ "administrative_area_level_1", "political" ]  
    },  
    {  
        "long_name" : "United States",  
        "short_name" : "US",  
        "types" : [ "country", "political" ]  
    }  
,  
    "formatted_address" : "Alaska, USA",  
    "geometry" : {  
        "bounds" : {  
            "northeast" : {  
                "lat" : 71.3902351,  
                "lng" : -129.9945562  
            },  
            "southwest" : {  
                "lat" : 51.214766,  
                "lng" : 172.4445167  
            }  
        },  
        "location" : {  
            "lat" : 64.20084129999999,  
            "lng" : -149.4936733  
        },  
        "location_type" : "APPROXIMATE",  
        "viewport" : {  
            "northeast" : {  
                "lat" : 71.3902351,  
                "lng" : -129.9945562  
            },  
            "southwest" : {  
                "lat" : 51.214766,  
                "lng" : 172.4445167  
            }  
        },  
        "types" : [ "administrative_area_level_1", "political" ]  
    }  
}
```

Location Field Positioning



PROS



CONS



Many location fields
are blank

Scale is sometimes
insufficient

Lots of non-geographic
information

Slides for Spatial Computing MOOC
(By Brent Hecht)

16% of Twitter location fields contain
non-geographic information

(Hecht et al. 2011)

Slides for Spatial Computing Mooc
(By Brent Hecht)

Location: “Loserville :)”

Location: “With God”

Location: “Middle Earth”

Location: “justin biebers heart”

Slides for Spatial Computing Height
(By Brent Hecht)

Popular Culture References

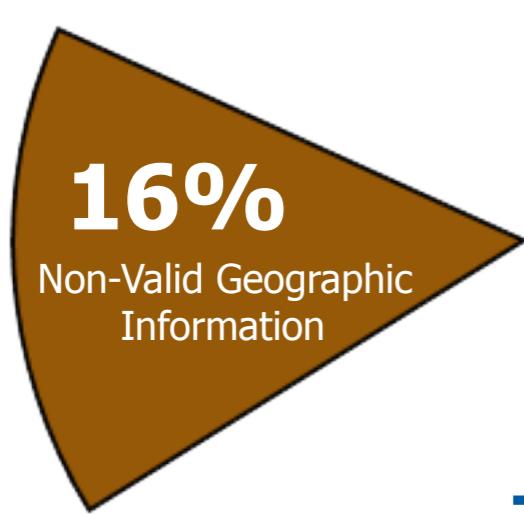
“BieberTown”
“PLZ Justin follow me”
“Bieberland...love!”
“JaeJoongs heart”
“Next to Waldo :D”
“Schrute Farms”

Privacy References

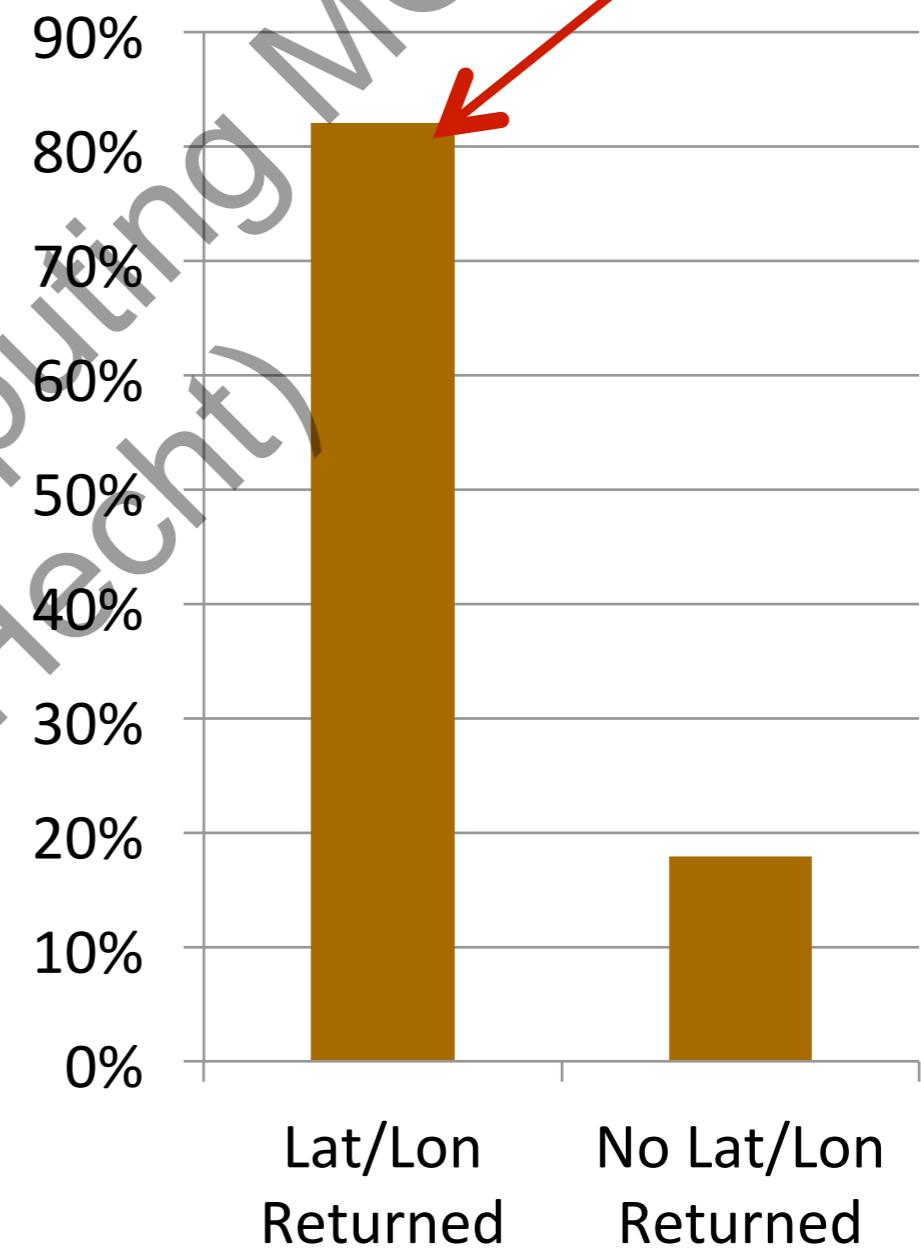
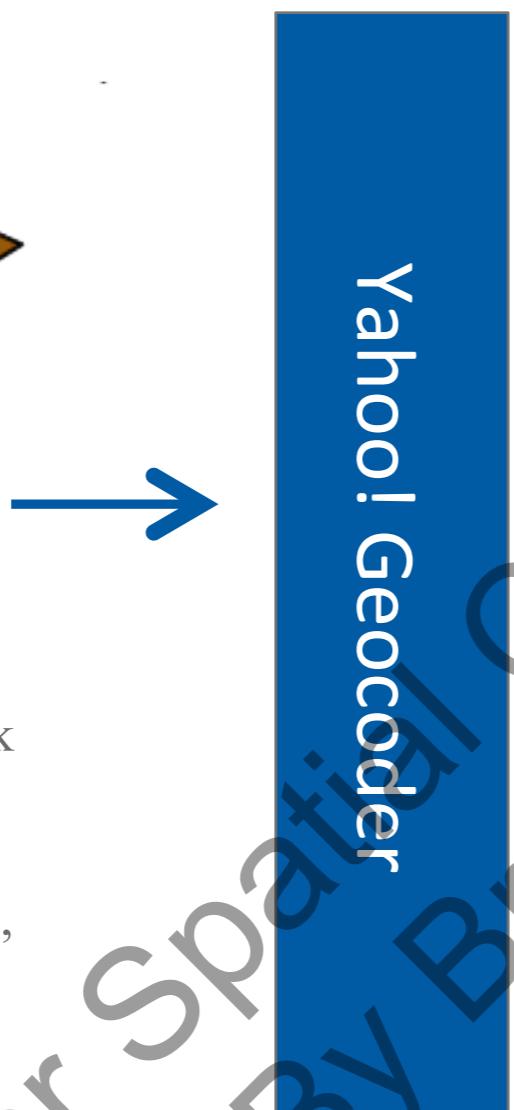
“Stalker City”
“MindingMyOwn”
“UM...STALKER!”
“kgb answers”
“stalker much?”
“for me to know n u to find
out”

Negative Emotions Towards Current Location

“preferably anywhere but here”
“a hole in the ground”
“swirling in the abyss”
“Loserville :)”



“Stalker City”, “NONE YA BISNESS”, “Justin Biebers Heart”, “The Void”, “Redneck Hell”, “In the Middle of Nowhere”, “yer mum”, “BSNBC”, “in God’s Graces”, etc...



(Hecht et al. 2011)

Location Field Positioning



PROS



CONS



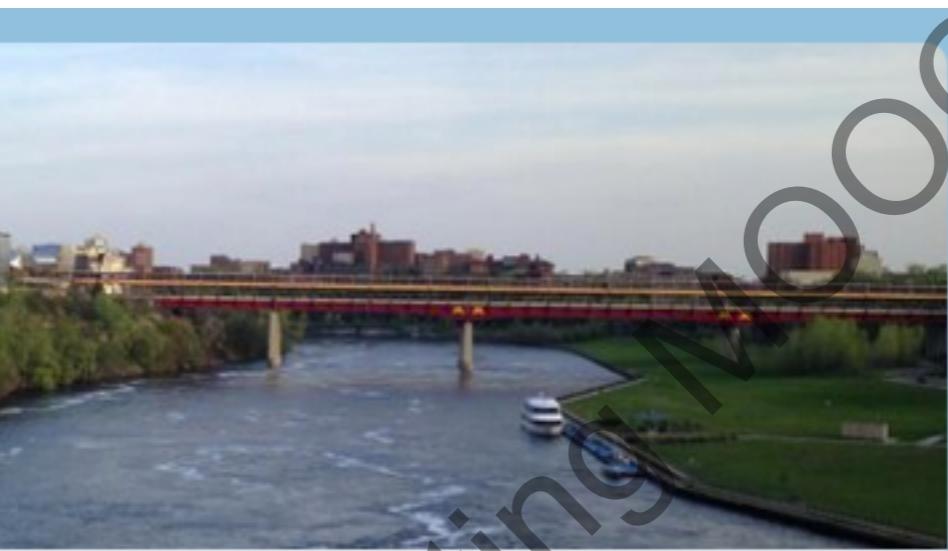
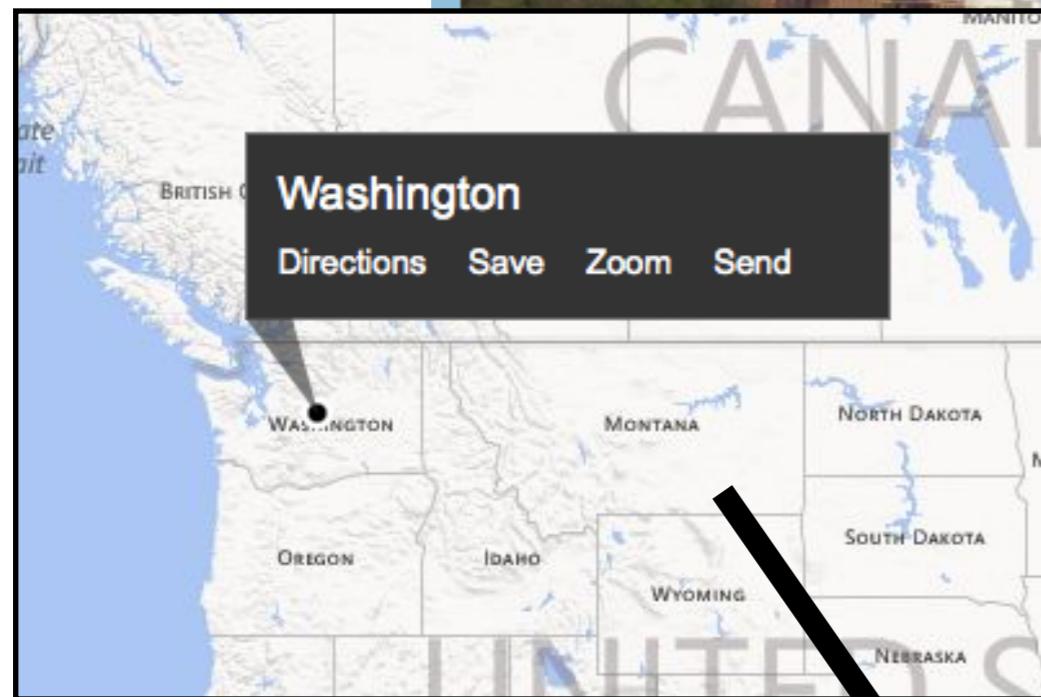
Many location fields
are blank

Scale is sometimes
insufficient

Lots of non-geographic
information

Disambiguation is hard

Slides for Spatial Computing MOOC
(By Brent Hecht)



Spatial Computing

@SpatialCompMOOC

8 FOLLOWING

133 FOLLOWERS

6

8

133

I headed to Washington to do some
apple picking, jamming out to Chicago!
[#spatialcomputing](#) [#spatialitiesmusic](#) [#itsjammin](#)



42

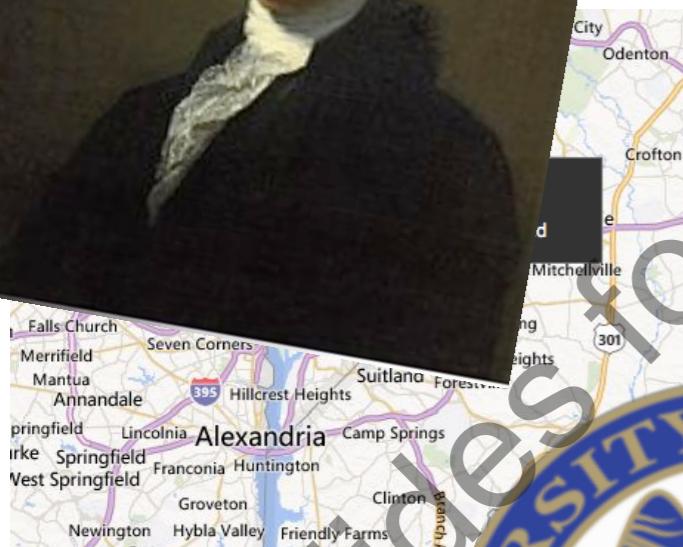
Tweet

Slides for BYSParents.com/Spatial Computing MOOC

Toponym Ambiguity

one place name (*toponym*) → more than one place

“Washington”



Slices for Spatial Computing
(By Laurent Hécht)

Location Field Positioning



PROS



Sometimes is only way
to position users

CONS



Many location fields
are blank

Scale is sometimes
insufficient

Lots of non-geographic
information

Disambiguation is hard

Slides for Spatial
(By Brent Hecht)

Location Field Positioning

PROS

Sometimes is
only way to
position users

CONS

- Many location fields
are blank
- Scale is sometimes
insufficient
- Lots of non-geographic
information
- Disambiguation is hard

Slides for Spatial Computing MOOC
(BY Brent Hecht)

Only easily
accessible
geographic
information

No geotags!

••••• T-Mobile LTE 11:14 92%

Brad Paisley AVAILABLE NOW

MOONSHINE In The Trunk

Following

Brad Paisley @BradPaisley

In 1972, a crack commando unit was sent to prison by a military court for a crime they didn't commit. I was also born.

Nashville, TN bradpaisley.com

87 FOLLOWING 2.9M FOLLOWERS

Tweets Photos Favorites

Brad Paisley @BradPaisley 14h

I see you're shocked I used an emoji. I'm sorry. It's just..so convenient on the new IOS. I regret any pain or confusion it may have caused.

112 713

Brad Paisley @BradPaisley 15h

Got to ride on a real fire truck and everything! Take that @carrieunderwood

#cmaawards youtube.com/watch?

Timelines Notifications Messages Me

Location Field Positioning

PROS

Sometimes is
only way to
position users

Unique
spatiotemporal scale

CONS

Many location fields
are blank

Scale is sometimes
insufficient

Lots of non-geographic
information

Disambiguation is hard

Go Gophers! Beat
the Badgers!

Doing some
recording for
@SpatialComp
MOOC

At dentist appt.
#toothfail

OMG! Just
drove on a lake!
#itscold



Brent Hecht

@bhecht

Assistant Professor of Computer
Science at the University of
Minnesota

Slices for Spatial Computing Mooc
(BY Brent Koech)



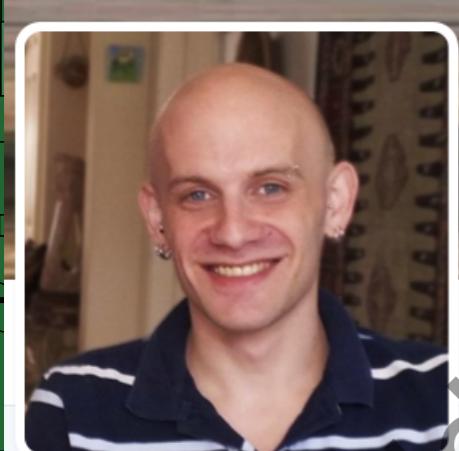
Go Gophers! Beat
the Badgers!

Doing some
recording for
@SpatialComp
MOOC

At dentist appt.
#toothfail

OMG! Just
drove on a lake!
#itscold

Headed to
#Amsterdam!

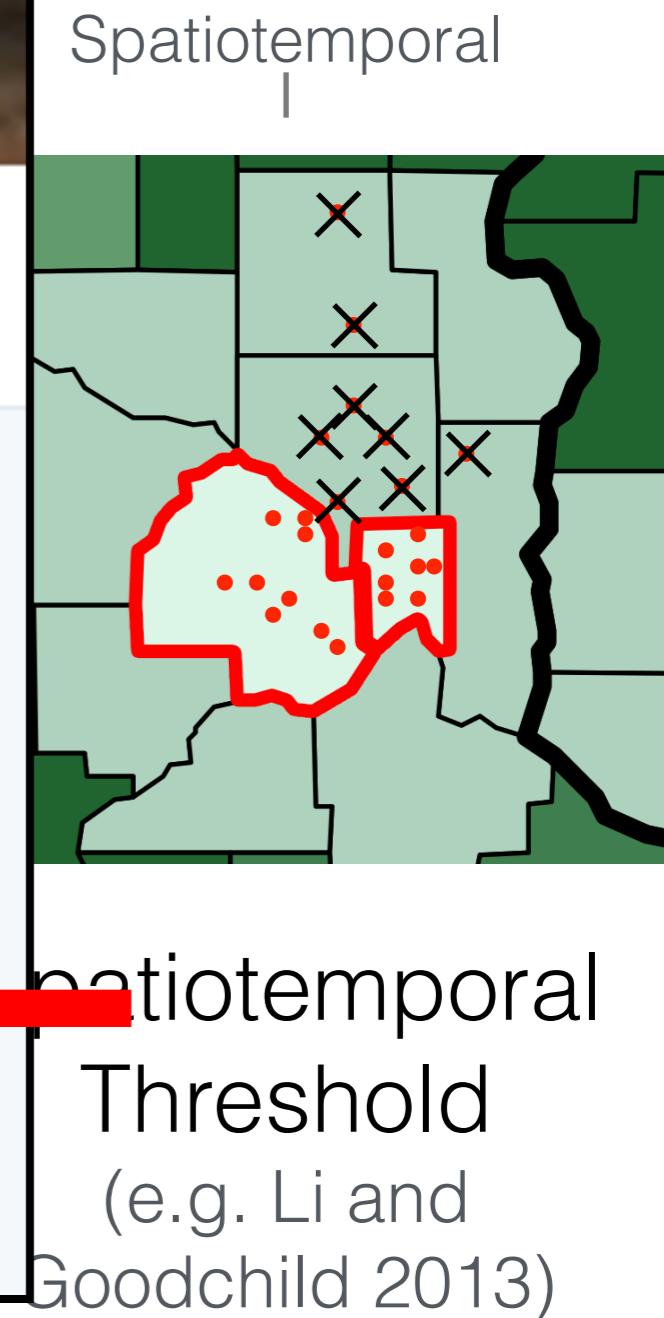
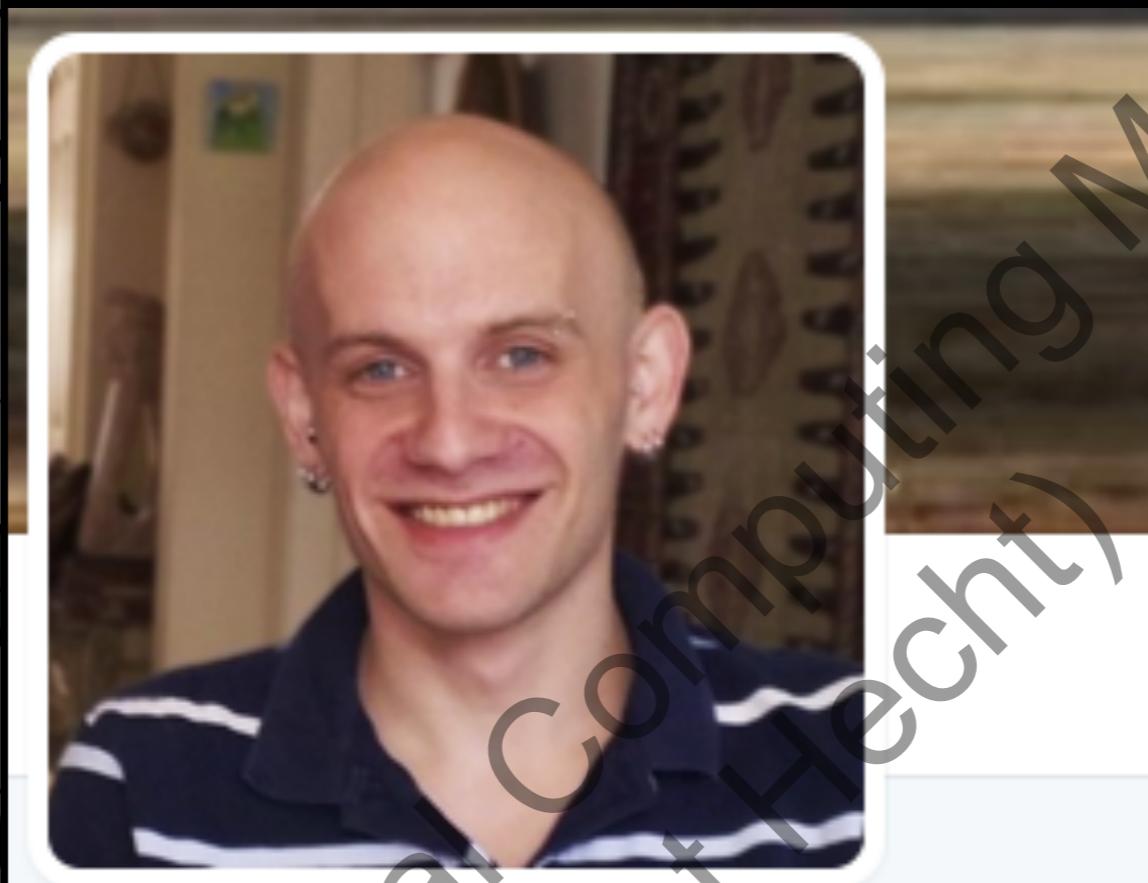
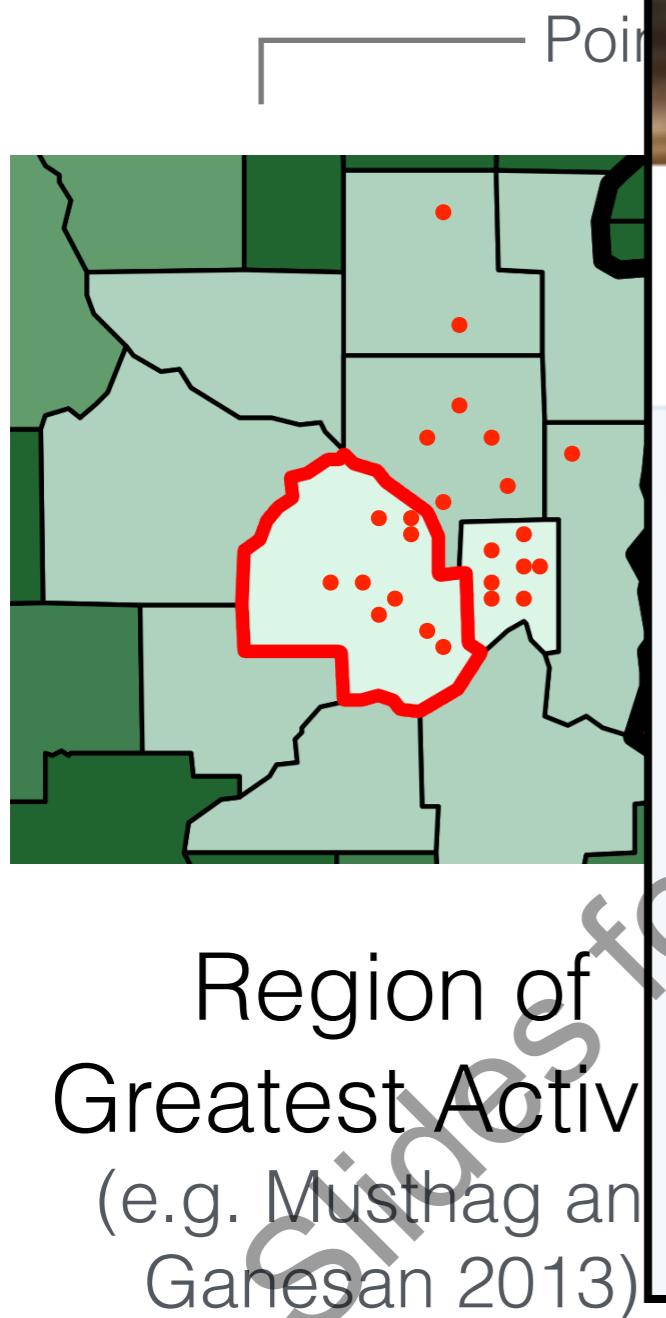


Brent Hecht

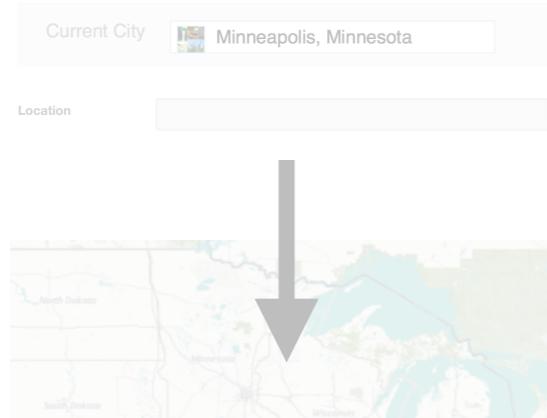
@bhecht

Assistant Professor of Computer
Science at the University of
Minnesota

Data-driven ways to determine home regions



Structure of the rest of this video:



Go over **how** to use location fields to position users.

Understand the **advantages** and **disadvantages** of location field positioning.

Wrap-up positioning with discussion of **location-inference attacks**.



Ayim Notellingü

@geoprivacy

I never reveal my location

TWEETS

5

FOLLOWING

39

FOLLOWERS

1

Tweets

Tweets & replies

6 Ayim Notellingü @geoprivacy · 35s

Just picked up some local wild boar from Lunds!

6 Ayim Notellingü @geoprivacy · 52s

Just had Snickers-on-a-stick at the fair, youbetcha!

6 Ayim Notellingü @geoprivacy · 1m

Still happy the Gophers won last night!

6 Ayim Notellingü @geoprivacy · 2m

Sure am loving these cheese curds!

Slides for Spatial Computing MOOC
(By Brent Hecht)



Ayim Notellingü

@geoprivacy

📍 I never reveal my location

TWEETS

5

FOLLOWING

39

FOLLOWERS

1

Tweets

Tweets & replies



Ayim Notellingü @geoprivacy · 35s

Just picked up some local wild rice from Lunds!



Ayim Notellingü @geoprivacy · 52s

Just had Snickers-on-a-stick at the fair, youbetcha!



Ayim Notellingü @geoprivacy · 1m

Still happy the Gophers won last night!



Ayim Notellingü @geoprivacy · 2m

Sure am loving these cheese curds!

Slides for Spatial Computing MOOC
(By Brent Hecht)

Sampling Strategy	Model Selection	Accuracy	Baseline Accuracy	% of Baseline Accuracy
Country-Uniform-2500	Calgari	72.71%	25.00%	291%
Country-Uniform-2500	Count	68.44%	25.00%	274%
Country-Random-20K	Calgari	88.86%	82.08%	108%
Country-Random-20K	Count	72.78%	82.08%	89%
State-Uniform-500	Calgari	30.28%	5.56%	545%
State-Uniform-500	Count	20.15%	5.56%	363%
State-Random-20K	Calgari	24.83%	15.06%	165%
State-Random-20K	Count	27.31%	15.06%	181%

Table 2: A summary of results from the country-scale and state-scale experiments. The better performing model selection algorithm is bolded for each experiment. The CALGARI result reported is the best generated by $\text{Min}U = 2$ or $\text{Min}U = 5$.

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The profile card for The Current features a background image of a concert crowd with the text "MORE THAN MUSIC". It includes the station's logo and a "Following" button.

TheCurrent verified

@TheCurrent

The Current, a non-commercial radio station in Minnesota, plays the best new music next to the music you already love, from local to legendary. 89.3...

The profile card for the Minnesota State Fair features a background image of a horse and a ferris wheel. It includes the fair's logo and a "Following" button.

Minnesota State Fair

@mnstatefair

The official Twitter of the Great Minnesota Get-Together. Visit us A 27-Labor Day, Sept. 7, 2015! #mnstatefair



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