

Evaluating How Developers Use General-Purpose Web-Search for Code Retrieval

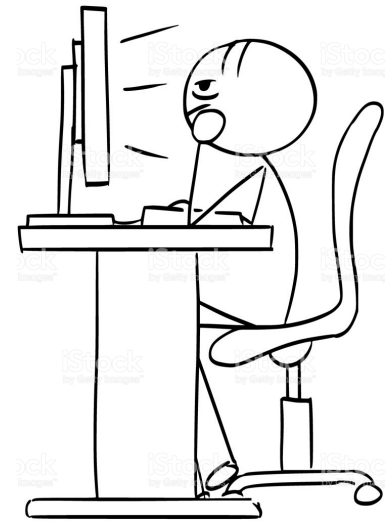
Md Masudur Rahman, Jed Barson, Sydney Paul, Joshua Kayan, Federico Andres Lois, Sebastian Fernandez Quezada, Christopher Parnin, Kathryn T. Stolee, Baishakhi Ray

Date: May 29, 2018



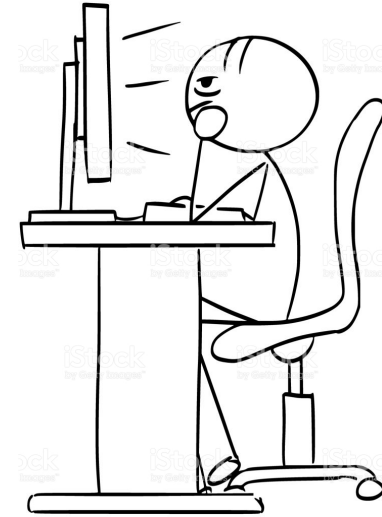
Coding Task

Convert a date string to a time object





string to time





string to time



PHP: strtotime - Manual

php.net/manual/en/function.strptime.php ▼

int strtotime (string \$time [, int \$now = time()]). The function expects to be given a string in an English date format and will try to parse that format into a ...

Supported Date and Time ... · Strptime · PHP: strtotime - Manual

c# - Convert string to Time - Stack Overflow

<https://stackoverflow.com/questions/18919530/convert-string-to-time> ▼

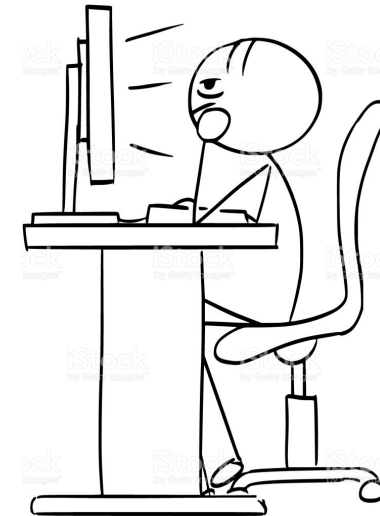
Sep 20, 2013 - "16:23:01" doesn't match the pattern of "hh:mm:ss tt" - it doesn't have an am/pm designator, and 16 clearly isn't in a 12-hour clock. You're ...

How to convert string to time in android?	3 answers	May 26, 2014
python - Convert string into datetime.time object	2 answers	Jan 12, 2013
java - convert String in time to Time object without Date	3 answers	Mar 27, 2011
python - Converting string into datetime	17 answers	Jan 21, 2009
More results from stackoverflow.com		

PHP strtotime() Function - W3Schools

https://www.w3schools.com/php/func_date_strptime.asp ▼

Parameter, Description. time, Required. Specifies a date/time string. now, Optional. Specifies the timestamp used as a base for the calculation of relative dates ...



Search Log

string to time



string to time



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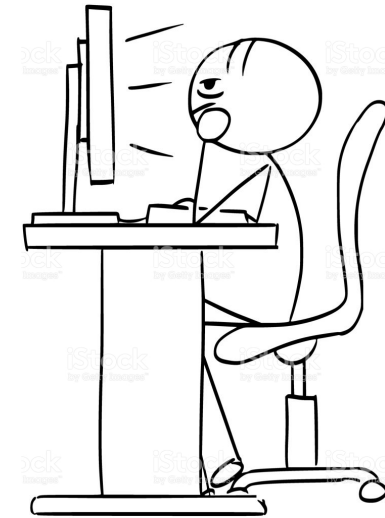
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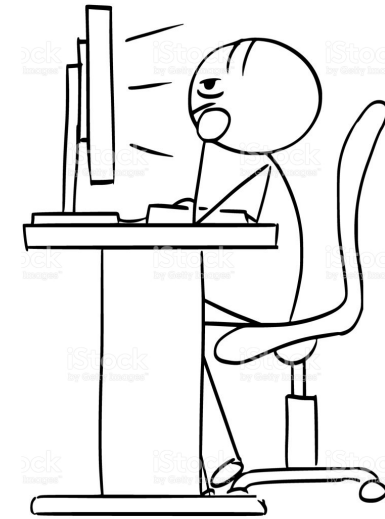
Java

Search Log

string to time



string to time using java



Search Log

string to time



string to time using java



Now if you have a **string** of **time** like 15:30:18 , you can **use** a SimpleDateFormat object to parse the **string time** and return a **java.util.Date** object. The pattern of the **string** should be passed to the SimpleDateFormat constructor. In the example below the **string** is formatted as hh:mm:ss (hour:minute:second). Dec 7, 2017

[How do I convert string of time to time object? | Kode Java](#)

<https://kodejava.org/how-do-i-convert-string-of-time-to-time-object/>

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[Convert Java string to Time, NOT Date - Stack Overflow](#)

<https://stackoverflow.com/questions/18604408/convert-java-string-to-time-not-date> ▼

Sep 4, 2013 - Example code in Joda-Time 2.7/Java 8. You can use the following code for changing the **String** value into the time equivalent: `String str = "08:03:10 pm"; DateFormat formatter = new SimpleDateFormat("hh:mm:ss a"); Date date = (Date)formatter.parse(str);`

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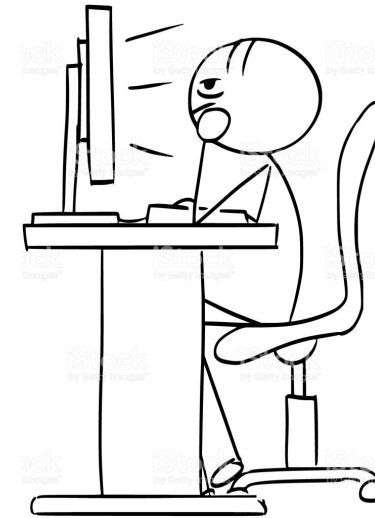
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Search Log

string to time

string to time using java



string

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stackoverflow

NEW

Questions

Developer Jobs

Convert Java string to Time, NOT Date

▲

19

▼

★

5

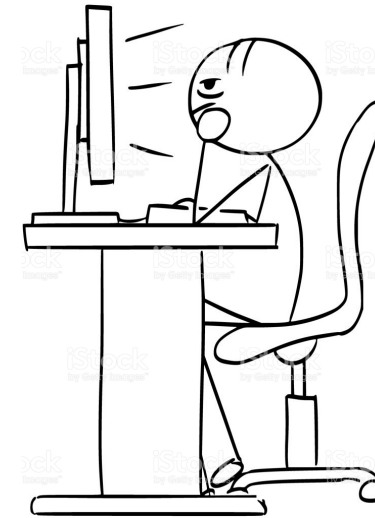
This question already has an answer here:

[Parse clock time in java 8](#) 1 answer

I would like to convert a variable string to a Time type variable like this 17:40

I tried using the code below but this instance is a date type

```
String fajr_prayertime = prayerTimes.get("fajr");
DateFormat formatter = new SimpleDateFormat("HH:mm:ss");
Date date = (Date)formatter.parse(fajr_prayertime);
```



Search Log

string to time
string to time using java



string to time using java



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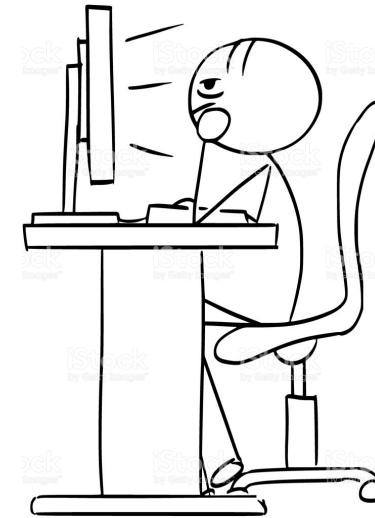
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DateTime

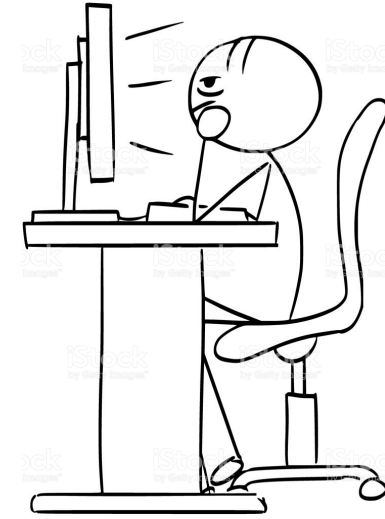
Search Log

string to time

string to time using java



date string to **DateTime** using java



Search Log

string to time
string to time using java



date string to DateTime using java



SimpleDateFormat: Many other custom date formats.

Java **SimpleDateFormat:** Easily get the date, time, or datetime.

Java **SimpleDateFormat** formatting options.

The opposite direction: Use **SimpleDateFormat** to convert from String to Date. Mar 15, 2018

[Java SimpleDateFormat example: How to convert a Date to a ...](https://alvinalexander.com/java/simpledateformat-convert-date-to-string-formatted-parse)

<https://alvinalexander.com/java/simpledateformat-convert-date-to-string-formatted-parse>

[About this result](#) [Feedback](#)

[How to convert Date String to DateTime in Java? - Stack Overflow](https://stackoverflow.com/questions/.../how-to-convert-date-string-to-datetime-in-java)

<https://stackoverflow.com/questions/.../how-to-convert-date-string-to-datetime-in-java>

Aug 29, 2015 - And now you should do this : String string = "Sun Oct 05 20:59:57 BRT 2014";

`DateTimeFormatter formatter = DateTimeFormat.forPattern("EEE MMM dd HH:mm:ss z yyyy"); Date dt = formatter.parse(string); //if you want to use DateTime do it DateTime dt = formatter.parse(string); System.`

Convert **String** datetime to **Date** in java?

5 answers Dec 3, 2015

datetime - how to convert **String** into **Date** time format ...

6 answers Jun 4, 2013

java - How to convert **String** of **datetime** to **date** using ...

4 answers Jul 5, 2012

java - Converting a **date string** to a **DateTime** object ...

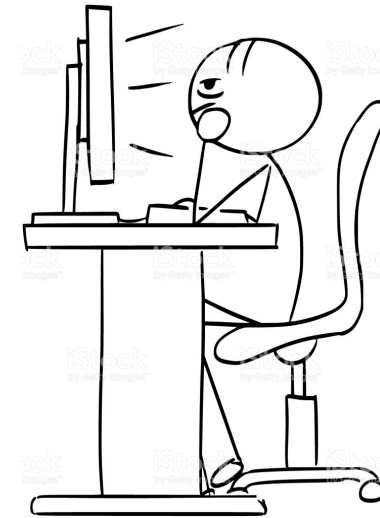
9 answers Jun 6, 2011

[More results from stackoverflow.com](#)

[How to convert String to Date – Java – Mkyong.com](https://www.mkyong.com/java/how-to-convert-string-to-date-java/)

<https://www.mkyong.com/java/how-to-convert-string-to-date-java/>

Jul 7, 2013 - In this tutorial, we will show you how to convert a **String** to `java.util.Date` `//get date time + timezone ZonedDateTime zonedDateTime = instant.`



Search Log

string to time

string to time using java

date string to DateTime using java



date string to DateTime using java



SimpleDateFormat: Many other custom date formats.

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Search Log

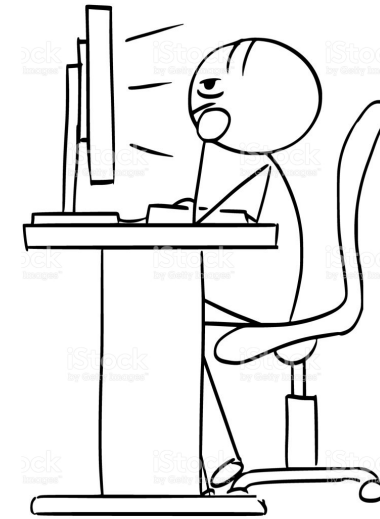
string to time

string to time using java

date string to DateTime using java



date string to DateTime using [Joda Time library](#)



Search Log

string to time
string to time using java
date string to DateTime using java



date string to DateTime using Joda Time library



java - Converting a date string to a DateTime object using Joda ...

<https://stackoverflow.com/.../converting-a-date-string-to-a-datetime-object-using-joda-...> ▼

Jun 6, 2011 - vote 409. Use DateTimeFormat : DateTimeFormatter formatter = DateTimeFormat.

forPattern("dd/MM/yyyy HH:mm:ss"); DateTime dt = formatter.parseDateTime(string);

android - Joda Time String to Date and time conversion

May 24, 2017

java - Convert Date to DateTime using Joda

Oct 11, 2016

jodatime - How to convert string to datetime in java using joda ...

Oct 25, 2014

java - Using Joda-Time Library to Convert String to DateTime ...

Jul 19, 2012

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Joda-Time - Java date and time API - User Guide

joda-time.sourceforge.net/userguide.html ▼

We then say a few words about the role of interfaces in the library design, which is a ... The millisecond instant can be converted to any date time field using a Chronology. The initialization string must be in a format that is compatible with the ...

[Architecture Overview](#) · [Chronology](#) · [Interface usage](#) · [Working with DateTime](#)

Joda-Time – Java date and time API - Formatting - Joda.org

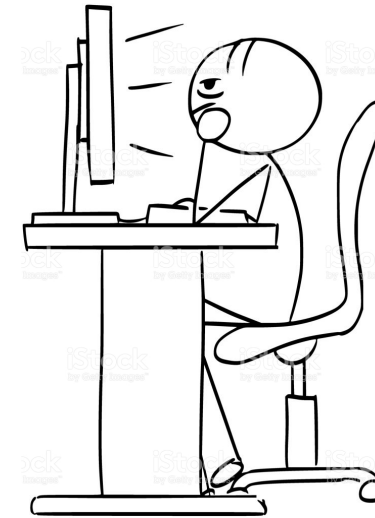
www.joda.org/joda-time/key_format.html ▼

Oct 6, 2013 - Joda-Time provides a comprehensive formatting system. ... the case where the application needs to format a date-time in a manner appropriate ...

DateTimeFormat (Joda-Time 2.9.9 API) - Joda.org

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Creates a format that outputs a medium date format. ... The pattern string is described above in the class level javadoc. It is very similar to SimpleDateFormat ...



Search Log

string to time

string to time using java

date string to DateTime using java

date string to DateTime using Joda...



date string to DateTime using Joda Time library



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Architecture Overview · Chronology · Interface usage · Working with DateTime

Use DateTimeFormat :

409

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```

share improve this answer

edited Aug 22 '13 at 11:02



JodaStephen





date string to DateTime using Joda Time library



java - Converting a date string to a DateTime object using Joda ...

<https://stackoverflow.com/.../converting-a-date-string-to-a-datetime-object-using-joda-...> ▼

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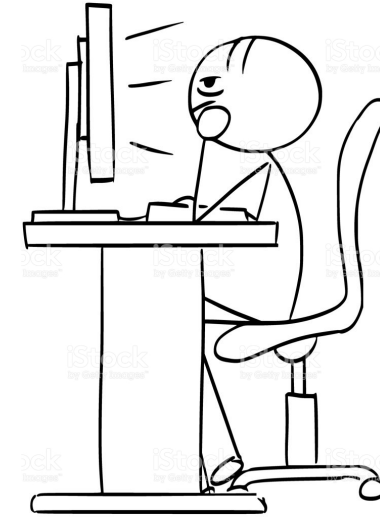
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world cup fixtures



Search Log

string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda ...



world cup fixtures



FIFA World Cup

Group Stage · Matchday 1 of 3

MATCHES

NEWS

STANDINGS

STATS

<div><div></div><div>Russia</div></div> <div><div></div><div>Saudi Arabia</div></div>	<div>6/14</div> <div>11:00 AM</div>	<div><div></div><div>Egypt</div></div> <div><div></div><div>Uruguay</div></div>	<div>6/15</div> <div>8:00 AM</div>
<div><div></div><div>Morocco</div></div> <div><div></div><div>Iran</div></div>	<div>6/15</div> <div>11:00 AM</div>	<div><div></div><div>Portugal</div></div> <div><div></div><div>Spain</div></div>	<div>6/15</div> <div>2:00 PM</div>
<div><div></div><div>France</div></div> <div><div></div><div>Australia</div></div>	<div>6/16</div> <div>6:00 AM</div>	<div><div></div><div>Argentina</div></div> <div><div></div><div>Iceland</div></div>	<div>6/16</div> <div>9:00 AM</div>

All times are in Eastern Time

Feedback

Matches, news, and standings



string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda ...
world cup fixtures

World Cup fixtures: The full schedule for **Russia 2018** Football News ...
www.skysports.com/football/.../world-cup-fixtures-the-full-schedule-for-russia-2018 ▼
3 days ago - Dates, kick-off times and stadiums - get the full schedule for the 2018 World Cup in Russia. The draw has been made for next summer's ...



place to visit in gothenburg



Search Log

string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda ...
world cup fixtures



place to visit in gothenburg



Things to do in Gothenburg



Liseberg

Amusement park with rides & a garden



Haga, Gothenburg

Candlelit pubs & Skansen Kronan



Universeum

Vast science center with rainforest zone



Slottsskogen

A park opened in 1874 with a free zoo

More things to do



Search Log

string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda ...
world cup fixtures
place to visit in gothenburg

Gothenburg attractions - TripAdvisor

https://www.tripadvisor.com/Attractions-g189894-Activities-Gothenburg_Vastra_Gota...

Book your tickets online for the top things to do in Gothenburg, Sweden on TripAdvisor: See 20160 traveler reviews and photos of Gothenburg tourist attractions.

[Southern Goteborg Archipelago](#) · [Slottsskogen](#) · [Botanical Garden](#) · [Universeum](#)

12 Top-Rated Tourist Attractions in Gothenburg | PlanetWare

<https://www.planetware.com/tourist-attractions-/gothenburg-s-bhs-gote.htm>

12 Top-Rated Tourist Attractions in Gothenburg. 1 Liseberg Amusement Park. Liseberg Amusement Park claes krantz / photo modified. 2 Slottsskogen. Reindeer at Slottsskogen. 3 The Southern Archipelago. 4 Gothenburg Botanical Garden (Botaniska) 5 The Gothenburg Museum of Art (Goteborgs Konstmuseum) 6 Editor's Pick Haga. 7 ...

Code Query

Code

Query

string to time

string to time using java

date string to DateTime using java

date string to DateTime using Joda Time library


Search Task

Code

Search Task

Convert a date string to a DateTime object using Joda Time library

Query



string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda Time library

Code vs Non-code

Code

Query

string to time

string to time using java

date string to DateTime using java

date string to DateTime using Joda Time library

Non-Code

Query

world cup fixtures

place to visit in gothenburg

hotel in gothenburg

General Purpose Search Engine for Code Retrieval



Query

string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda Time library

Query

world cup fixtures
place to visit in gothenburg
hotel in gothenburg

Research Goal



- Query characteristics
- User behavior

Query

string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda Time library

Query

world cup fixtures
place to visit in gothenburg
hotel in gothenburg

Dataset



Query Search Log

Chrome plugin



string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda Time library
world cup fixtures
place to visit in gothenburg
hotel in gothenburg

Users: **310** (mostly developer)

Consist of **code** and **non-code** queries

Total query: **150K**

Dataset



Query Search Log

string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda Time library
world cup fixtures
place to visit in gothenburg
hotel in gothenburg

No label

Code or Non-code ?

Dataset



Query Search Log

string to time
string to time using java
date string to DateTime using java
date string to DateTime using Joda Time library
world cup fixtures
place to visit in gothenburg
hotel in gothenburg

No label

Code or Non-code ?

Query Classifier

Intent-based Query Classification

Code Intent Analysis

Query:

javascript function to get mp3 play length

Code Intent Analysis

Query:

javascript	function	to	get	mp3	play	length

CodeScore
?

Code Intent Analysis

Query:

javascript	function	to	get	mp3	play	length	CodeScore
17	7	0	6	5	8	3	?

Token Code Intent

$$f(x) = \begin{cases} 1 + \log_2(n), & \text{if } x \in S \\ 0, & \text{if } x \notin S \end{cases}$$



S = set of code related tags
n = popularity of a tag

Why is document.write considered a "bad practice"?

I know document.write is considered bad practice; and I'm hoping to 3rd party vendor as to why they shouldn't use document.write in imp

javascript

Code Intent Analysis

Query:

javascript	function	to	get	mp3	play	length
17	7	0	6	5	8	3

CodeScore

46

Token Code Intent

$$f(x) = \begin{cases} 1 + \log_2(n), & \text{if } x \in S \\ 0, & \text{if } x \notin S \end{cases}$$



Query Code Intent

$$cscore(Q) = \sum_{i=1}^m f(x_i)$$

Query Code Score

Query	Code Score
string to time	12
string to time using java	20
date string to DateTime using java	22.5
world cup fixtures	0
messi curly goal	2.6
place to visit in gothenburg	0

Query Code Score

Query	Code Score	Label
string to time	12	?
string to time using java	20	?
date string to DateTime using java	22.5	?
world cup fixtures	0	?
messi curly goal	2.6	?
place to visit in gothenburg	0	?

Query Code Score

Query	Code Score	Label
string to time	12	?
string to time using java	20	?
date string to DateTime using java	22.5	?
world cup fixtures	0	?
messi curly goal	2.6	?
place to visit in gothenburg	0	?

Classifier Evaluation

- ☑ Manually annotated 380 queries

Threshold = 10

Precision: 87%

Recall: 86%

F1-score: 87%

Query Code Score

Query	Code Score	Label
string to time	12	Code
string to time using java	20	Code
date string to DateTime using java	22.5	Code
world cup fixtures	0	Non-code
messi curly goal	2.6	Non-code
place to visit in gothenburg	0	Non-code

Classifier Evaluation

- ☑ Manually annotated 380 queries

Threshold = 10

Precision: 87%

Recall: 86%

F1-score: 87%



Query Code Score

Query	Code Score	Label
string to time	12	Code
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date string to DateTime using java	22.5	Code
world cup fixtures	0	Non-code
messi curly goal	2.6	Non-code
place to visit in gothenburg	0	Non-code

Classifier Evaluation

- ☑ Manually annotated 380 queries

Threshold = 10

Precision: 87%

Recall: 86%

F1-score: 87%

Annotated Data



Code : 89K (59%)
Non-code : 61K (41%)



Research Questions

Query Characteristics



RQ1. How do query characteristics differ for code and non-code queries?

User Behavior



RQ2. How do search behaviors vary for code and non-code related queries?

RQ3. How do task sessions vary for code and non-code related search tasks?

Results

RQ1: Query Characteristics

Code

date string to DateTime using java

date string to DateTime using Joda Time library

javascript function to get mp3 play length

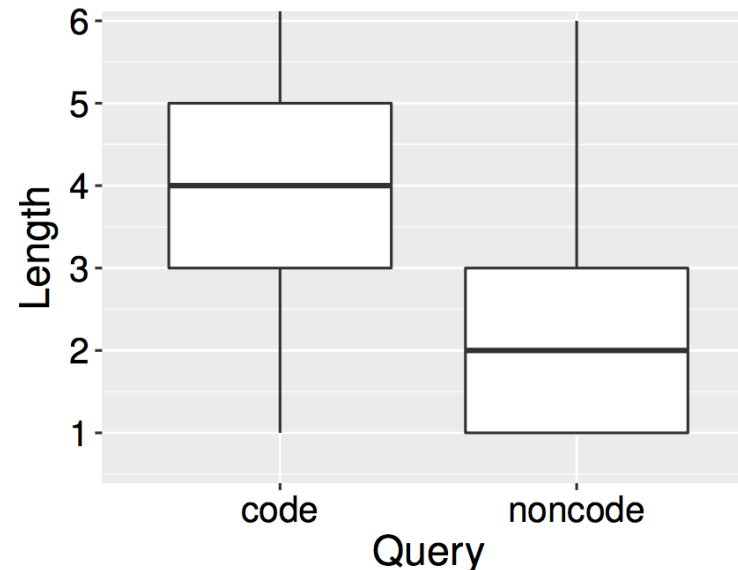
☑ Code queries often longer
(more tokens) than non-code

Non-code

world cup fixtures

messi curly goal

hotel in gothenburg



RQ1: Query Characteristics

Code

date string to DateTime using **java**

date string to DateTime using Joda **Time library**

javascript function to get mp3 play **length**

Non-code

world cup fixtures

messi curly goal

hotel in gothenburg

RQ1: Query Characteristics

Code

date string to DateTime using java
date string to DateTime using Joda Time library
javascript function to get mp3 play length

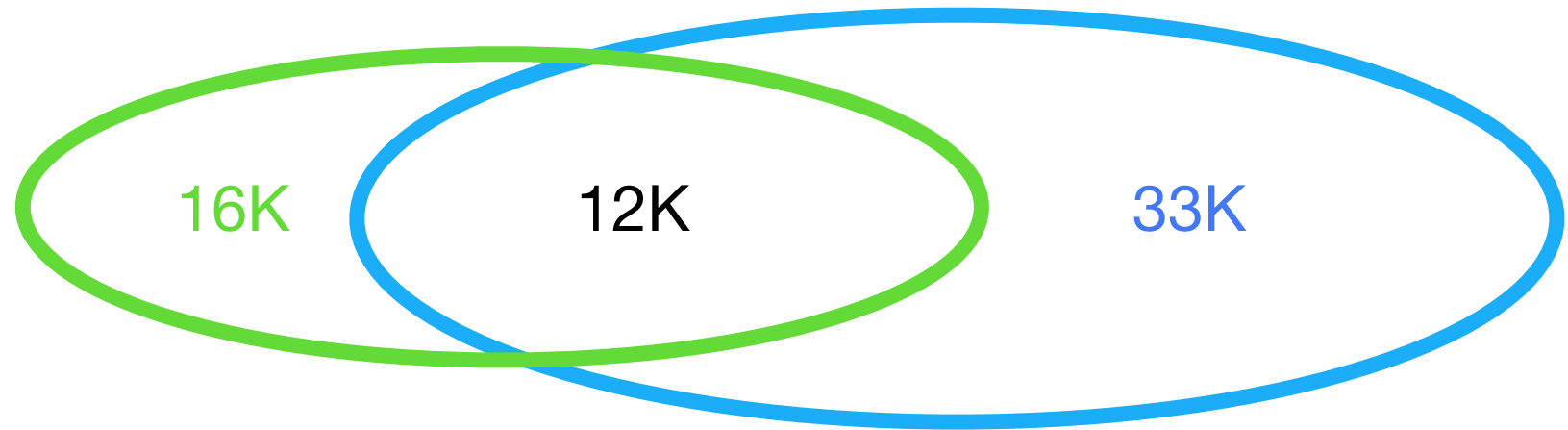
Non-code

world cup fixtures
messi curly goal
hotel in gothenburg

RQ1: Query Characteristics

Code

Non-code



- ☑ Code queries contain less vocabulary (unique tokens) than non-code

RQ2: Query Search Behavior

	Query	# term added	# term deleted
Code	string to time	-	-
	string to time using java	2	-
	date string to DateTime using Joda Time library	4	2
Non-code	hotel in gothenburg	-	-
	best hotel in gothenburg	1	-

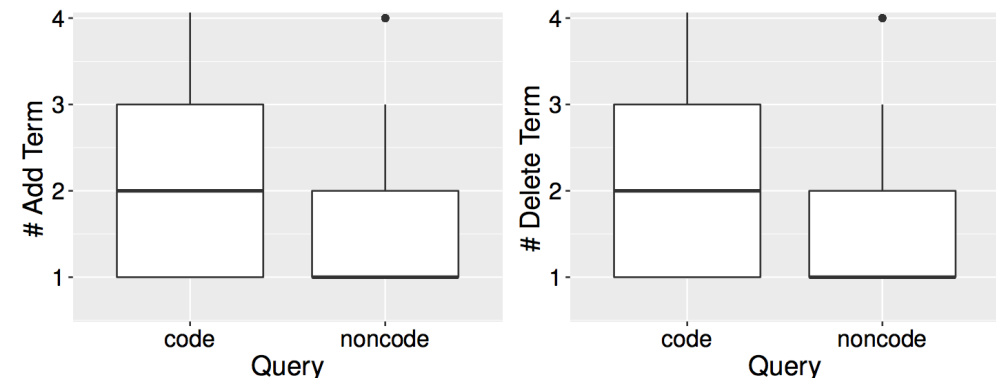
RQ2: Query Search Behavior

	Query	# term added	# term deleted	
Code	string to time	-	-	
	string to time using java	2	-	
	date string to DateTime using Joda Time library	4	2	<i>Edited query</i>
Non-code	hotel in gothenburg	-	-	
	best hotel in gothenburg	1	-	

RQ2: Query Search Behavior

	Query	# term added	# term deleted
Code	string to time	-	-
	string to time using java	2	-
	date string to DateTime using Joda Time library	4	2
Non-code	hotel in gothenburg	-	-
	best hotel in gothenburg	1	-

- ☑ User often add/delete more terms (avg. 2) to a code compared to non-code (avg. 1)



RQ2: Query Search Behavior

	Query	# term added	# term deleted	Code Score
Code	string to time	-	-	12
	string to time using java	2	-	20
	date string to DateTime using Joda Time library	4	2	30.5

RQ2: Query Search Behavior

	Query	# term added	# term deleted	Code Score
Code	string to time	-	-	12
	string to time using java	2	-	20
	date string to DateTime using Joda Time library	4	2	30.5



Edit query to increase code intent

RQ3: Task Search Behavior

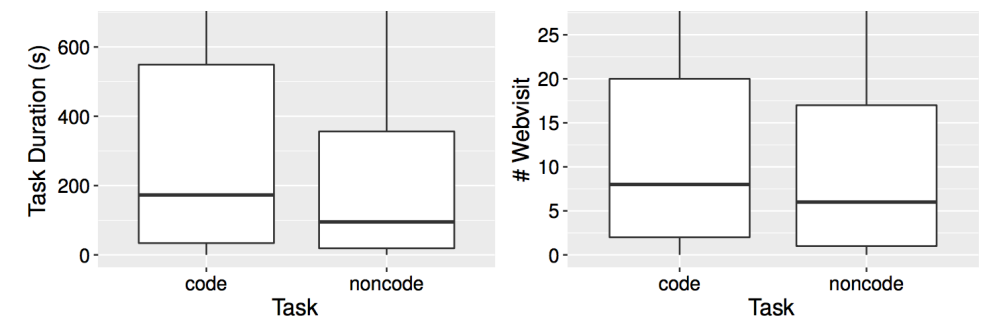
	Query	# query	Task intent
Code Task	string to time	4	Converting a date string to a Time object
	string to time using java		
	date string to DateTime		
	using Joda Time library		
Non-code Task	hotel in gothenburg	2	Hotel booking in Gothenburg
	best hotel in gothenburg		

☑ *More queries required to complete a code task*

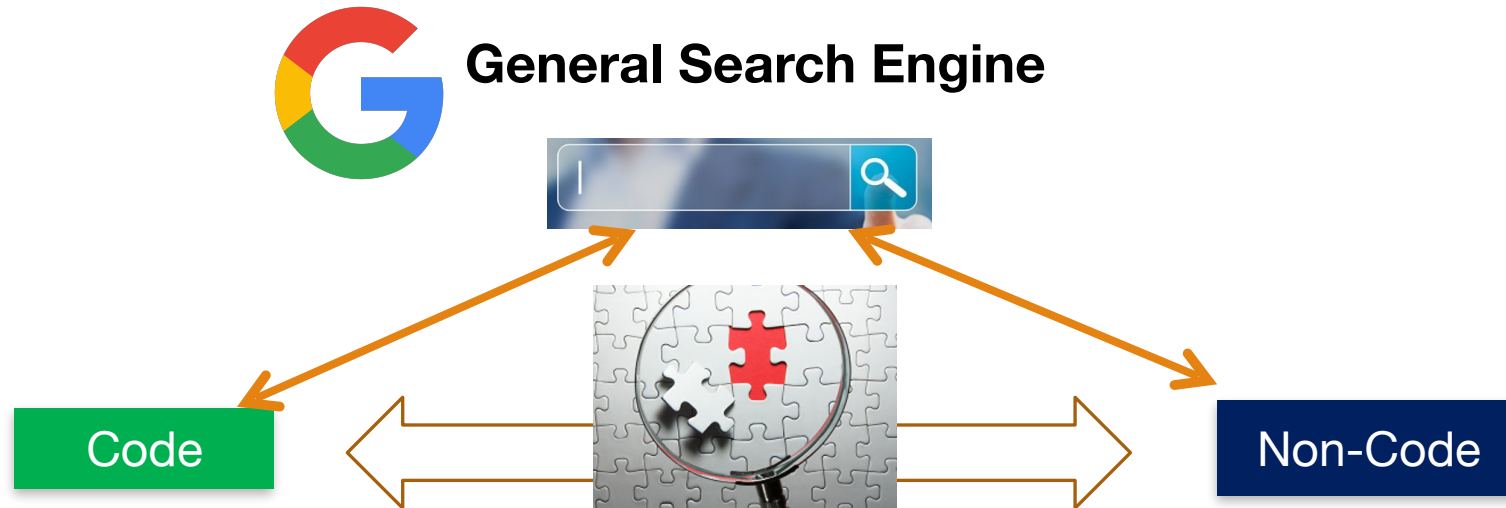
RQ3: Task Search Behavior

	Query	Task intent	Search duration (minute)	# web visit
Code Task	string to time	Converting a date string to a Time object	6	15
	string to time using java			
	date string to DateTime			
	using Joda Time library			
Non-code Task	hotel in gothenburg	Hotel booking in Sweden	2	5
	hotel in stockholm			

☑ More time and website visit required to complete code related tasks



Summary



- ✓ Code queries are **linguistically different**
- ✓ Users **modify** code queries **more often**
- ✓ Users give significantly **more effort** for code **task**

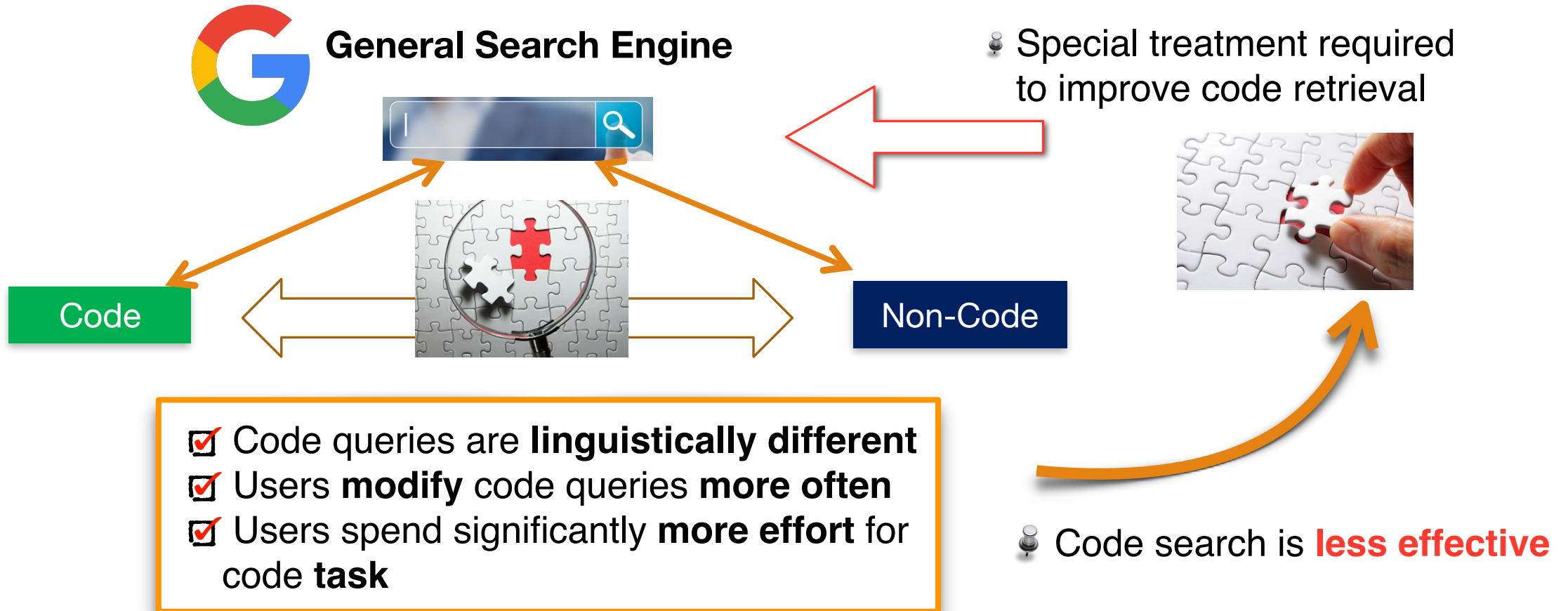
Summary



- ✓ Code queries are **linguistically different**
- ✓ Users **modify** code queries **more often**
- ✓ Users spend significantly **more effort** for code **task**

📌 Code search is **less effective**

Summary



Question?

