

BUMPER: A Tool for Coping with Natural Language Searches of Millions of Bugs and Fixes

<https://bumper-app.com>

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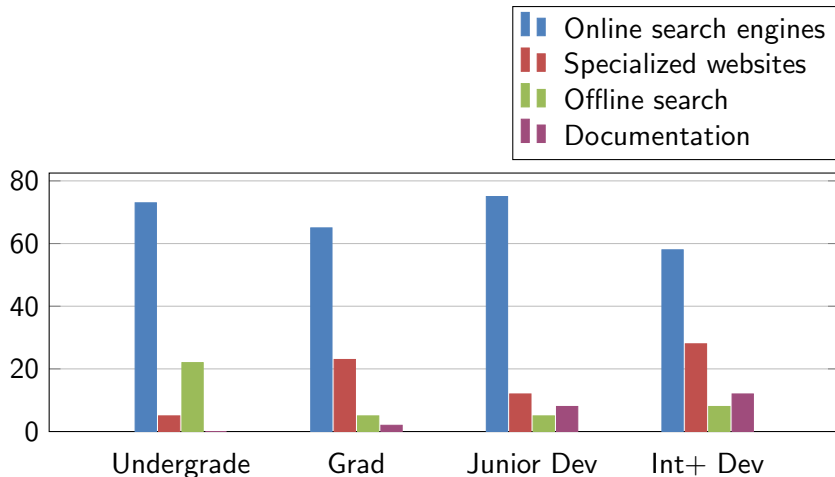
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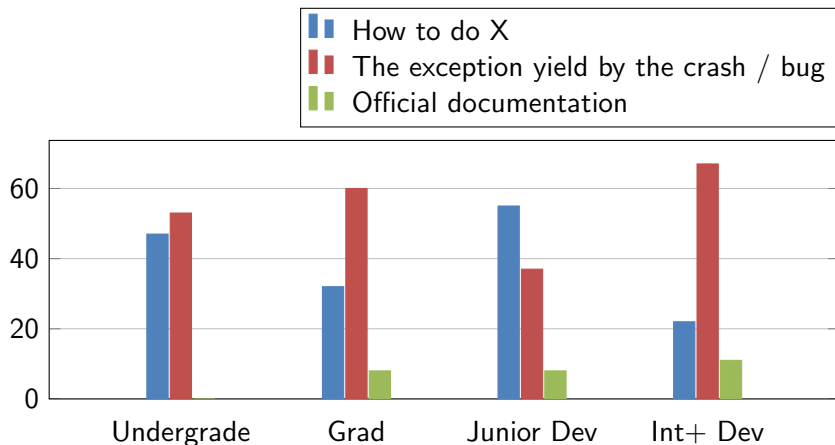
What developers do when facing an unknow bug ?

- In 2015, we surveyed:
 - ① École de Technologie Supérieure, Montréal, Québec, Canada
 - ② Université du Québec À Montréal, Montréal, Québec, Canada
 - ③ Concordia University, Montréal, Québec, Canada
 - ④ Participants of 2015 the Consortium for Software Engineering Research, Toronto, Ontario, Canada.
- When facing an unknown bug, crash or exception, where do you look for informations ?
- When facing an unknown bug, crash or exception, what are you searching for ?
- Surveyed 150 people and received 89 responses (59%)

When facing an unknown bug, crash or exception, where do you look for informations ?



When facing an unknown bug, crash or exception, what are you searching for?



- Results are not surprising.
 - 1 Online searches
 - 2 How to do X
 - 3 Copy/past the exception at hand
- Usually, a solution is quickly found, but ...
- Pain in navigating between bug report systems and code versionning systems.

- BUMPER: BUg Metarepository search engine for develoPErs and Researchers
 - Aggregates information from bug report and code versionning systems
 - Online Search Engine with million bug reports AND fixes from major open-source repositories
 - Apache Software Foundation, Netbeans, Eclipse, Gnome, FireFox, Chrome, Kde, ...
 - Imports bugs reports from Bugzilla, JIRA and Github, ... and fixes from SVN, Mercurial, Git, ...
 - Natural language for developers
 - Advanced API for researchers

BUMPER Data (as of now)

Dataset	R/F BR	CS	Files	Projects
Gnome	550,869	1,231,354	367,245	512
Netbeans	53,258	122,632	30,595	39
Apache	49,449	106,366	38,111	349
Eclipse	78,830	184,900	21,712	190
Total	732,406	1,645,252	457,663	1,930

Google-like usage for developers

bumper

Find Out How Others Fixed It

Type your search



SHOWCASE

ADVANCED QUERY MODE

API

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ABOUT

Bug reports and bug fixes, side by side

Null Pointer Exception

About 27626 results (0.01 seconds)

LANGUAGES  DATASETS 

DOWNLOAD 

▲ **NullPointerException at org.netbeans.api.java.source.JavaSource\$JavaSourceAccessorImpl.
38** https://netbeans.org/bugzilla/show_bug.cgi?id=189412 **java, netbeans, java**

▼ Build: NetBeans IDE 6.9 (Build 201006101454) VM: Java HotSpot(TM) Client VM, 16.2-b04, Java(TM) SE Runtime Environment, 1.6.0_19-b04 OS: Windows 7 Stacktrace: java.lang.NullPointerException...

▲ **NullPointerException at org.netbeans.modules.java.source.usages.LuceneIndex\$DirCache.clc
10** https://netbeans.org/bugzilla/show_bug.cgi?id=189499 **java, netbeans, java**

▼ Build: NetBeans IDE Dev (Build 201008130001) VM: Oracle JRockit(R), R28.0.1-21-1333993-1.6.0_20-20100512-2131-windowsx86_64, Java(TM) SE Runtime Environment, 1.6.0_20-b02 OS: Windows 7...

▲ **Enable collecting thread cpu timestamps by default
4** https://netbeans.org/bugzilla/show_bug.cgi?id=189621 **java, netbeans, profiler**

▼ Given the fact that thread cpu timestamps are available to JVM (1.6+) on all major operating systems and obtaining them is reasonably quick [1] we can enable collecting them by default.

▲ **NullPointerException at java.util.Arrays\$ArrayList.<init>
2** https://netbeans.org/bugzilla/show_bug.cgi?id=177814 **java, netbeans, platform**

▼ Build: NetBeans IDE Dev (Build 200811281400) VM: Java HotSpot(TM) Client VM, 1.4.2...

176129.80dc07f52485 #189412 NullPointerException at
org.netbeans.api.java.source.JavaSource\$JavaSourceAccessorImpl.setJavaSource
• java.source/src/org/netbeans/modules/java/source/JavaSourceAccessor.java
• java.source/src/org/netbeans/modules/java/source/parsing/JavadocParserResult.java

(2) files, (10) insertions, (4) deletions

Index: java.source/src/org/netbeans/modules/java/source/JavaSource
Accessor.java

```
@@ -84,6 +84,7 @@  
import org.openide.text.PositionRef;  
import org.openide.util.Exceptions;  
import org.openide.util.Mutex;  
+import org.openide.util.Parameters;
```

```
/**  
 *
```

Index: java.source/src/org/netbeans/modules/java/source/JavaSource
Accessor.java

```
@@ -316,9 +317,14 @@  
}  
}
```

```
@Override  
- public void run(Result result, SchedulerEvent event) {  
+ public void run(@NonNull Result result, SchedulerEvent ev
```

SHOWCASE

ADVANCED QUERY MODE

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Using BUMPER for bug-fixing tasks

When I run the CSVReader with a simple main like this:

Listing 1: Java Bug

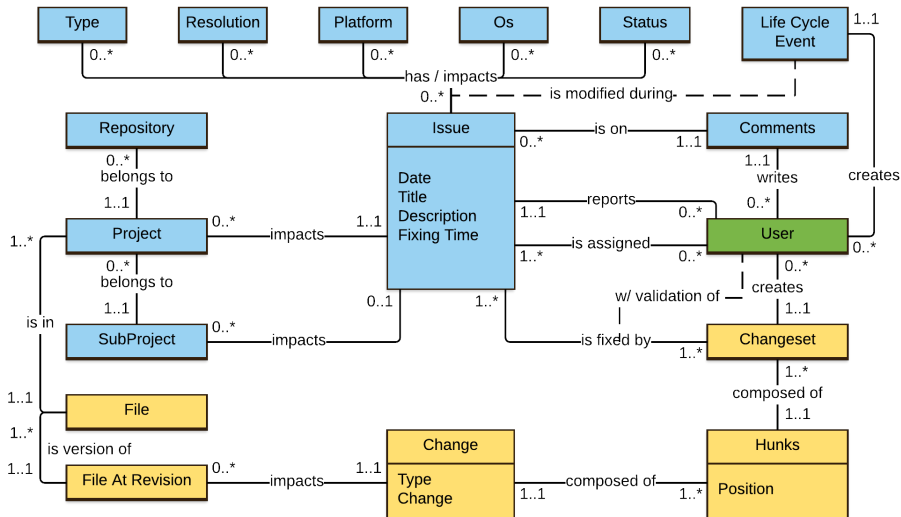
```
CsvFileUtils csvFileUtils = 1
    new CsvFileUtils(" quebec.txt" ); 2
3
for (int i = 0; i < 2000; i++) { 4
    printArray(csvFileUtils 5
        .readOneLine()); 6
} 7
```

*I got the following Exception: Exception in thread "main"
java.lang.NullPointerException at
CsvFileUtils.readLine(CsvFileUtils.java:22) at
Main.main(Main.java:11). Can you please fix CsvFileUtils ?*

Using BUMPER for bug-fixing tasks (cont'd)

- New survey (20 developers, 40% response rate)
- Find a suitable code snippet to fix the bug using:
 - Google search engine
 - Bumper search engine
- Google 6.94 minutes and 7.57 web pages
- BUMPER 4.5 minutes and 1 web page (<https://bumper-app.com>)

BUMPER Metamodel



API Usage for researchers

- All fields are indexed for fast search
- Two special indexes:
 - `report_t`: Contains a concatenation of all the bug-related fields
 - `fix_t`: Contains a concatenation of all the fix-related fields
- Search for "*YOUR TERMS*" in bug reports and bug fixes:

(type : "BUG" AND report_t : "YOUR TERMS"
AND - churns : 0)

OR

({!parent which = "type : BUG"}type : "CHANGESET"
AND fix_t : "YOUR TERMS")

- Bug reports with at least one fix having:
 - The word “Exception” in the bug report
 - Belonging to “Axis2” or “ide” projects
 - Reported by “Rich” or is “fixed”
 - With a “major” severity or a fixing time greater than 10 days

*(type : “BUG” AND report_t : “Exception”
AND (project : “Axis2” OR project : “ide”)
AND (reporter : “Rich” OR resolution : “fixed”)
AND (severity : “Major” OR fixing_time : [10 TO *])
AND — churns : 0)*

Conclusion

- <https://bumper-app.com>
- Million bugs and associated fixes
- Apache Software Foundation, Netbeans, Eclipse, Gnome, FireFox, Chrome, Kde, ...
- Imports bugs from Bugzilla, JIRA ... and fixes from SVN, Mercurial, Git, ...
- Natural Language Search for developers
- Advanced API for researchers

QUESTIONS?