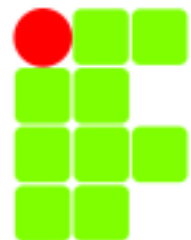




“Mineração de repositórios do Github para construir Sistemas de Recomendação em Engenharia de Software”

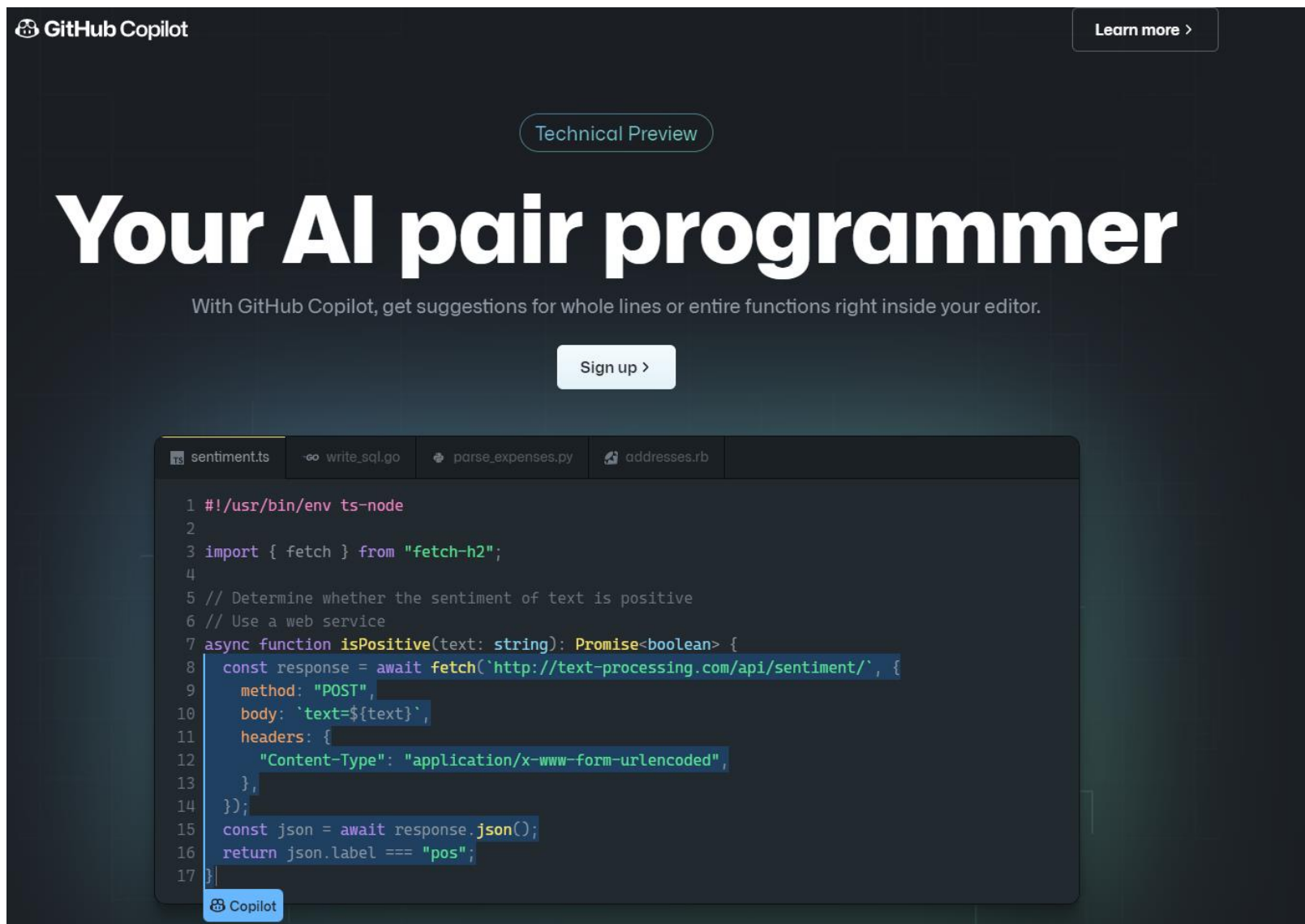
Carlos Eduardo Dantas

carlooseduardodantas@iftm.edu.br



**INSTITUTO FEDERAL DE
EDUCAÇÃO, CIÊNCIA E TECNOLOGIA**
TRIÂNGULO MINEIRO
Campus Uberlândia Centro

MOTIVAÇÃO



The image shows the GitHub Copilot website and a code editor. The website has a dark background with the GitHub Copilot logo in the top left, a "Learn more >" button in the top right, and a "Technical Preview" badge in the center. The main heading is "Your AI pair programmer" in large white text, followed by the subtext "With GitHub Copilot, get suggestions for whole lines or entire functions right inside your editor." and a "Sign up >" button. Below this is a screenshot of a code editor with four tabs: "sentiment.ts", "write_sql.go", "parse_expenses.py", and "addresses.rb". The "sentiment.ts" tab is active, showing a TypeScript function `isPositive` that uses `fetch` to call a sentiment analysis API. The code is color-coded, and a blue Copilot icon is visible in the bottom left corner of the editor.

GitHub Copilot

Learn more >

Technical Preview

Your AI pair programmer

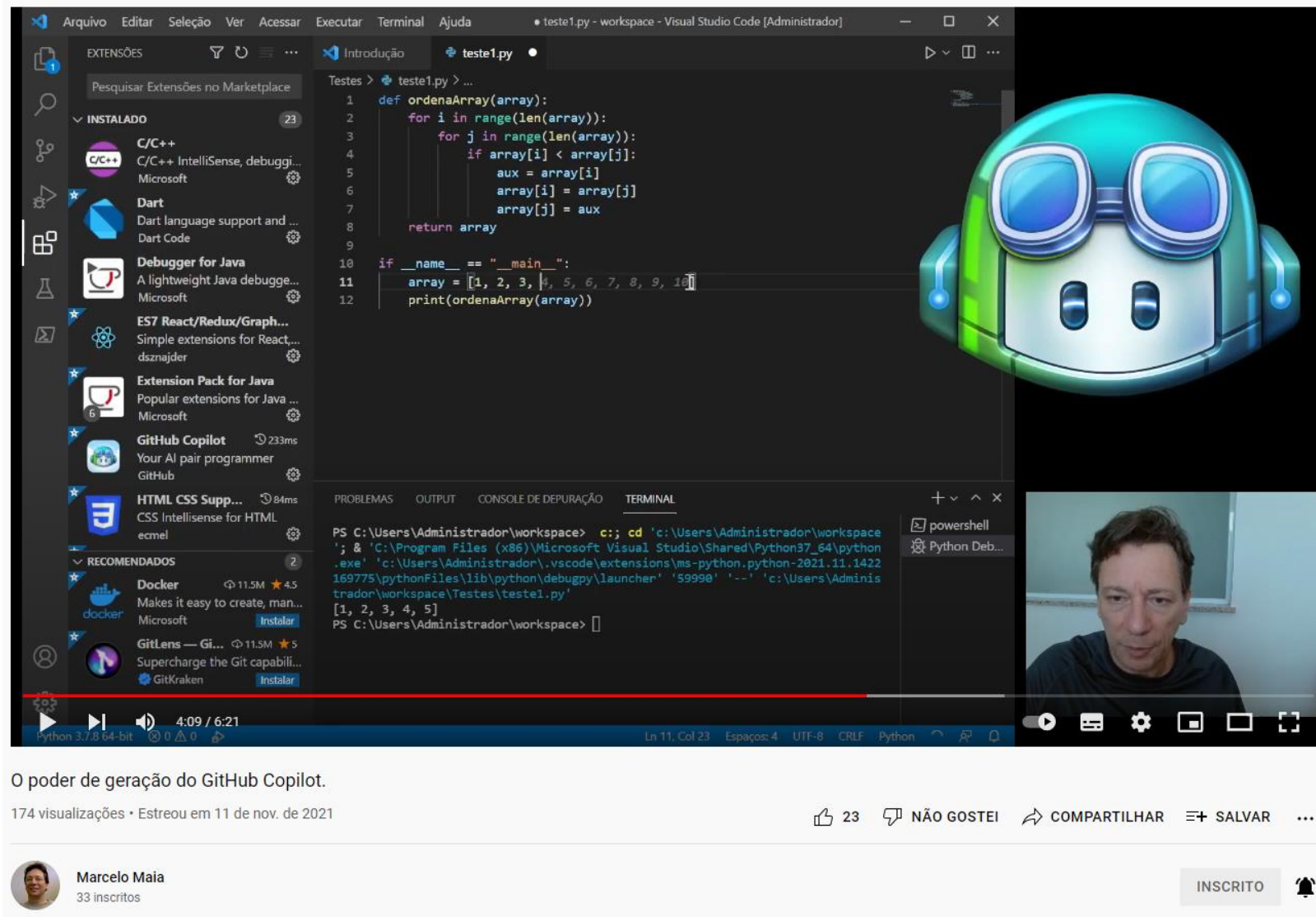
With GitHub Copilot, get suggestions for whole lines or entire functions right inside your editor.

Sign up >

```
1 #!/usr/bin/env ts-node
2
3 import { fetch } from "fetch-h2";
4
5 // Determine whether the sentiment of text is positive
6 // Use a web service
7 async function isPositive(text: string): Promise<boolean> {
8   const response = await fetch('http://text-processing.com/api/sentiment/', {
9     method: "POST",
10    body: `text=${text}`,
11    headers: {
12      "Content-Type": "application/x-www-form-urlencoded",
13    },
14  });
15  const json = await response.json();
16  return json.label === "pos";
17 }
```

Copilot

MOTIVAÇÃO



The screenshot displays a YouTube video player with a video titled "O poder de geração do GitHub Copilot." The video content shows a Visual Studio Code interface. On the left, the Extensions sidebar is open, showing installed and recommended extensions like C/C++, Dart, and GitHub Copilot. The main editor displays a Python file named "teste1.py" with a bubble sort algorithm. A large, stylized blue robot head with goggles is overlaid on the right side of the code editor. At the bottom right, a small video inset shows a man, presumably the presenter, looking at the camera. The video player interface includes a progress bar at 4:09 / 6:21, view counts (174 visualizações), and interaction buttons like "23", "NÃO GOSTEI", "COMPARTILHAR", "SALVAR", and "INSCRITO". The video was posted on November 11, 2021, by Marcelo Maia, who has 33 subscribers.

O poder de geração do GitHub Copilot.

174 visualizações · Estreou em 11 de nov. de 2021

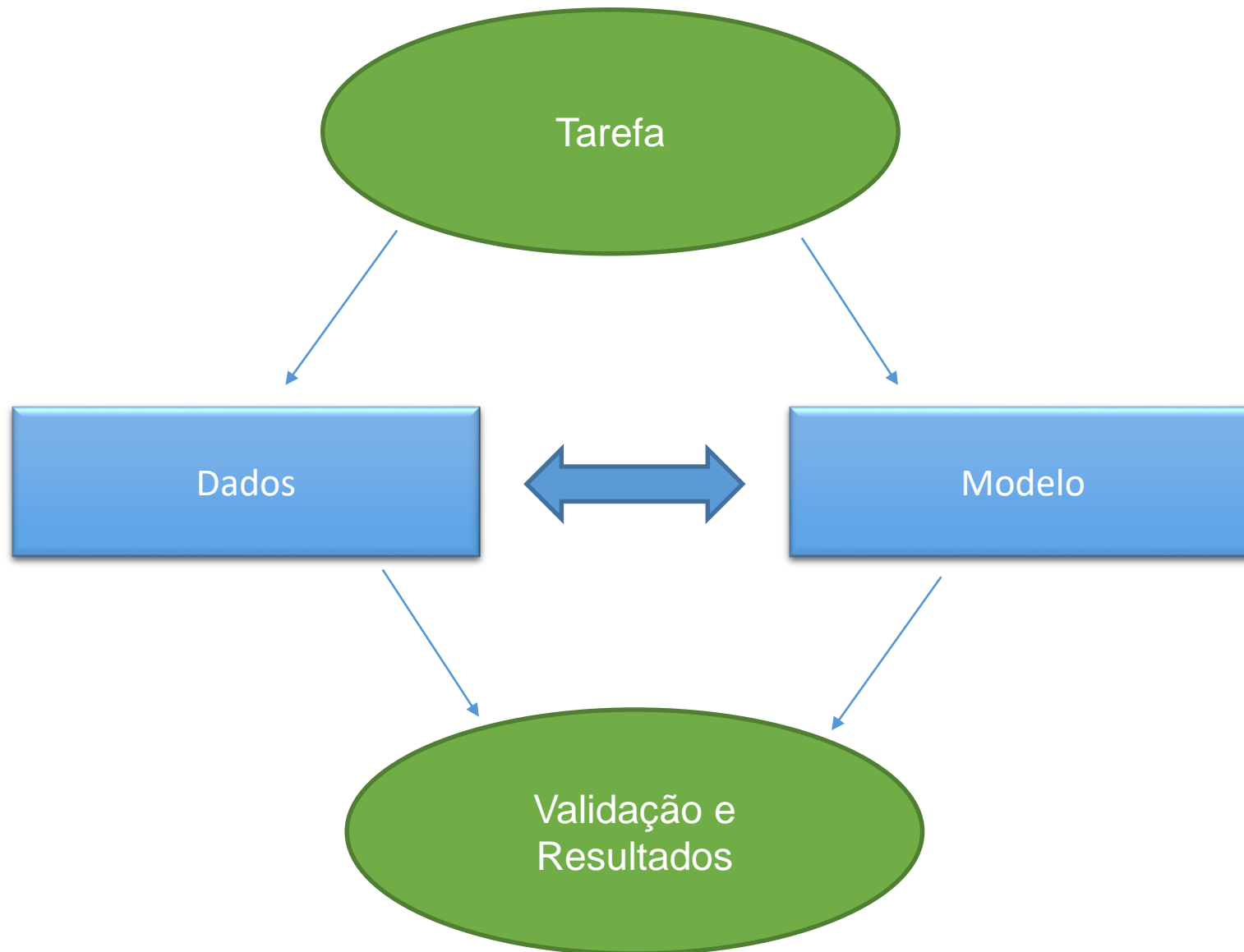
23 NÃO GOSTEI COMPARTILHAR SALVAR ...

Marcelo Maia
33 inscritos

INSCRITO

<https://youtu.be/a5ViPnDKfNg>

DESIGN



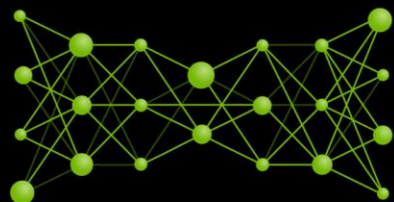
EXEMPLO

DEEP LEARNING SUPER SAMPLING

1080p Aliased,
Jittered Pixels



Convolutional
Autoencoder



4K Anti-aliased Output



16K Anti-aliased Ground Truth



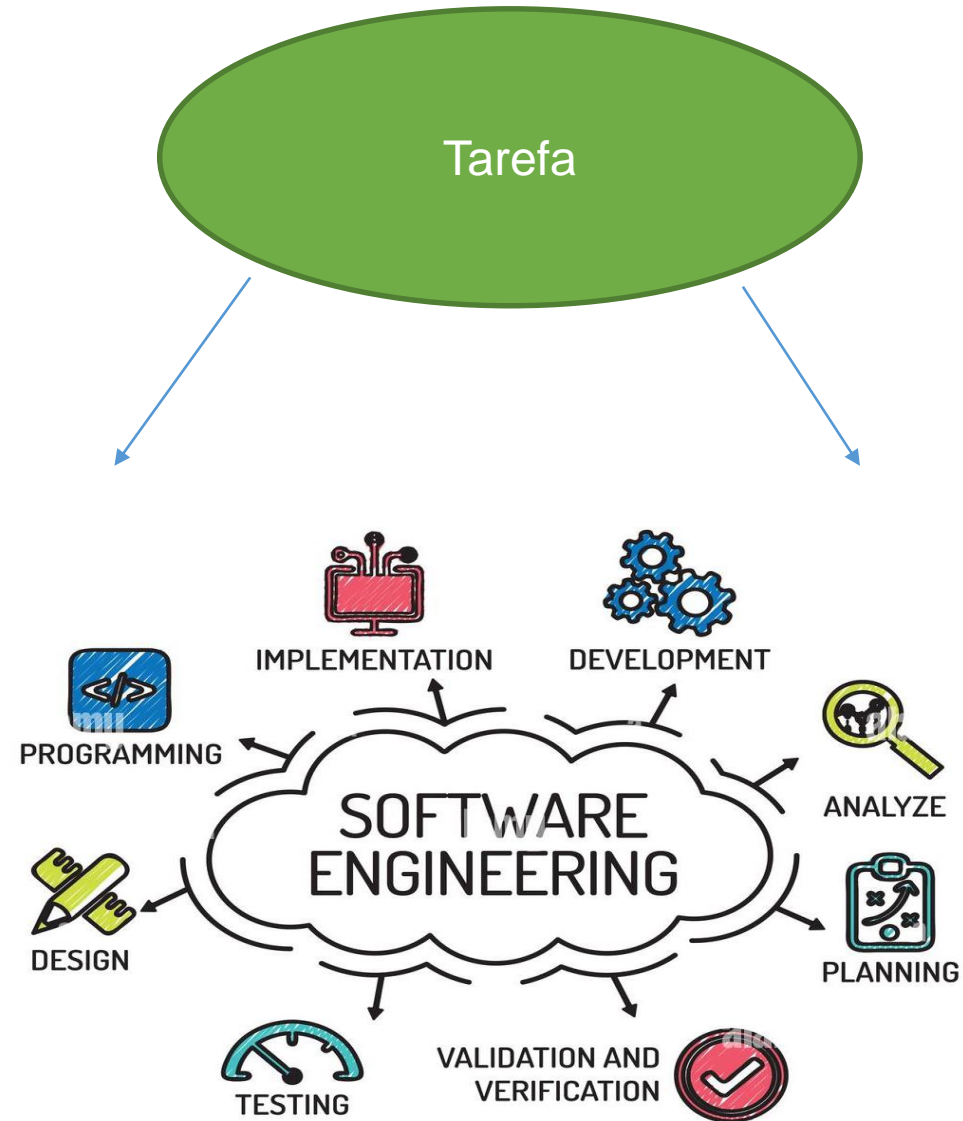
vs.

Temporal Feedback

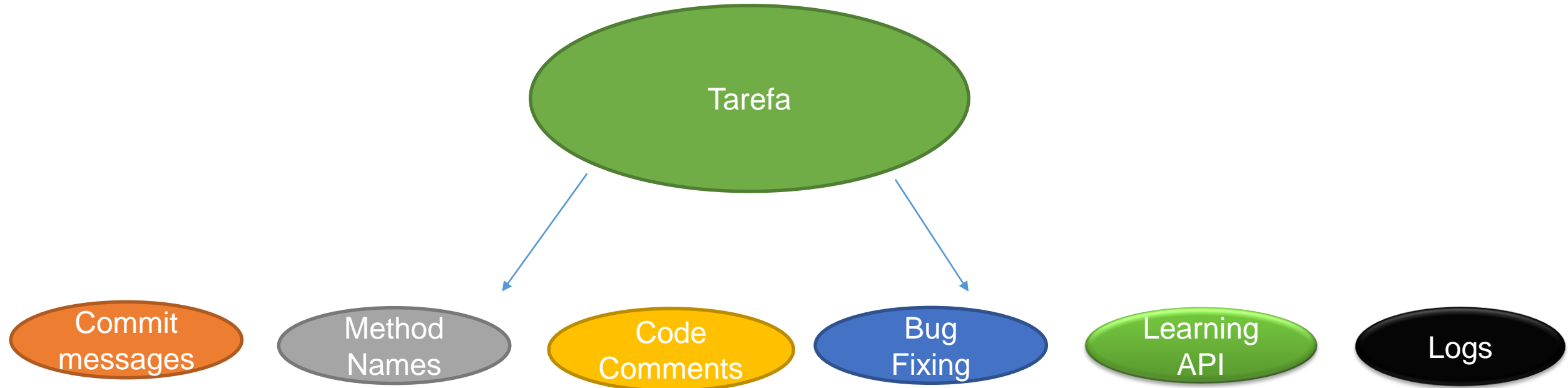
1080p Motion Vectors



TAREFA

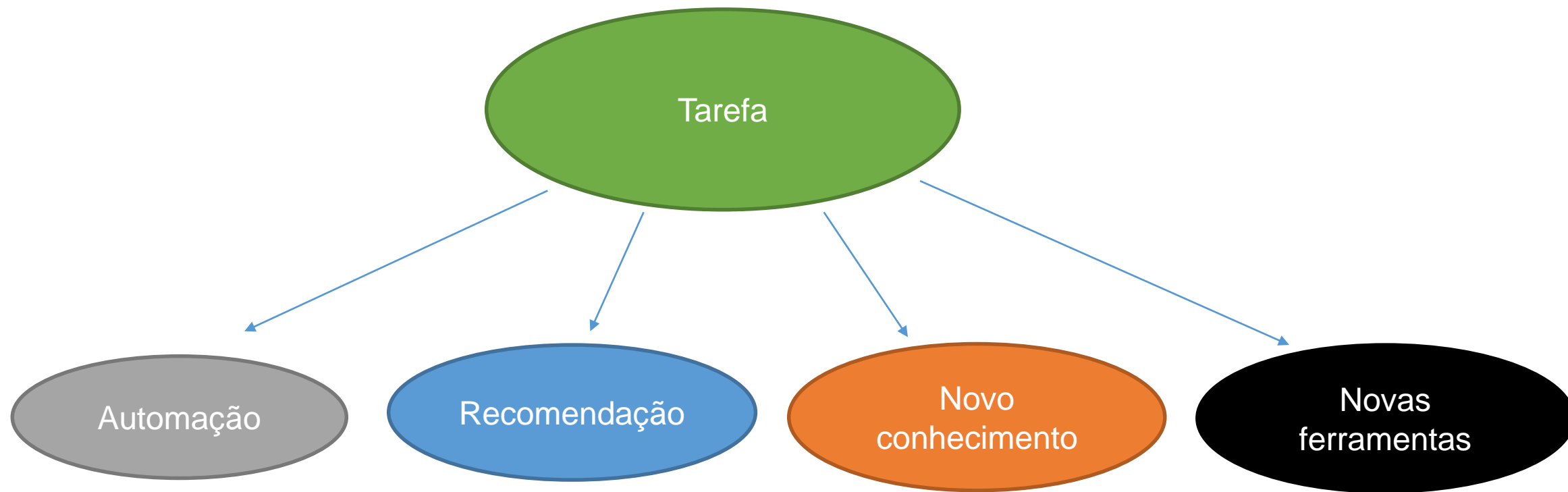


TAREFA



AND MANY OTHERS

TAREFA



TAREFA

Recomendação

Detecting Architecturally Relevant Classes Using Dynamic Analysis

Liliane do Nascimento Vale^{1,2} and Marcelo de Almeida Maia¹

¹Faculty of Computing - Federal University of Uberlândia, Uberlândia – MG – Brazil

²Computer Science Department - Federal University of Goiás, Catalão – GO – Brazil

Email: liliane.ufg@gmail.com, marcelo.maia@ufu.br

AutoComment: Mining Question and Answer Sites for Automatic Comment Generation

Edmund Wong, Jinqiu Yang, and Lin Tan
University of Waterloo, Waterloo, Ontario, Canada
{e32wong, j223yang, lintan}@uwaterloo.ca

Suggesting Accurate Method and Class Names

Miltiadis Allamanis[†]

[†]School of Informatics
University of Edinburgh
Edinburgh, EH8 9AB, UK

{m.allamanis, csutton}@ed.ac.uk

Earl T. Barr[‡]

[‡]Dept. of Computer Science
University College London
London, UK

e.barr@ucl.ac.uk

Christian Bird^{*}

^{*}Microsoft Research
Microsoft
Redmond, WA, USA

cbird@microsoft.com

Charles Sutton[†]

Commit Message Generation for Source Code Changes

Shengbin Xu¹, Yuan Yao¹, Feng Xu¹, Tianxiao Gu², Hanghang Tong³ and Jian Lu¹

¹State Key Laboratory for Novel Software Technology, Nanjing University, China








²Alibaba Group, USA

³Arizona State University, USA

kingxu@mail.nju.edu.cn, {y.yao, xf, lj}@nju.edu.cn, tianxiao.gu@gmail.com, hanghang.tong@asu.edu

TAREFA

Automação

	ICSE-2019-AUTOFIX Merge pull request #4 from martinezmatias/patchesinfo ...	37e0447 on 30 Oct 2020	 5 commits
	csc	Fixes	2 years ago
	results	info about the patches	13 months ago
	tl	Fixes	2 years ago
	README.md	upload readme	17 months ago
	main.py	Fixes	2 years ago

☰ README.md

DLFix: Context-based Code Transformation Learning for Automated Program Repair

TAREFA

Novo
conhecimento

When and Why Your Code Starts to Smell Bad

Michele Tufano*, Fabio Palomba[†], Gabriele Bavota[‡], Rocco Oliveto[§],
Massimiliano Di Penta[¶], Andrea De Lucia[†], Denys Poshyvanyk*

*The College of William and Mary, Williamsburg, VA, USA - [†]University of Salerno, Fisciano (SA), Italy

[‡]Free University of Bozen-Bolzano, Italy - [§]University of Molise, Pesche (IS), Italy

[¶]University of Sannio, Benevento, Italy

Why We Refactor? Confessions of GitHub Contributors

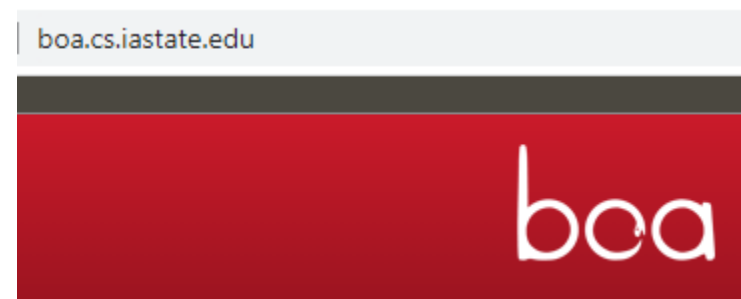
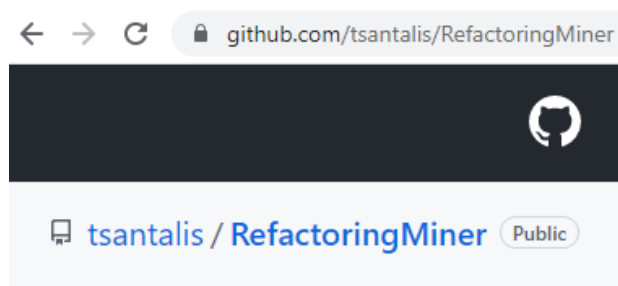
Danilo Silva
Universidade Federal de
Minas Gerais, Brazil
danilofs@dcc.ufmg.br

Nikolaos Tsantalis
Concordia University
Montreal, Canada
tsantalis@cse.concordia.ca

Marco Tulio Valente
Universidade Federal de
Minas Gerais, Brazil
mtov@dcc.ufmg.br

TAREFA

Novas
ferramentas



TAREFA

Crokage

Describe the Java programming task

Task:

Java Program to display first 100 prime nun

Search

Clean

Num. of Answers:

☐ 10

☒ 5

☐ 1

How do you like the overall result?

★★★★★

Post id: 34080304

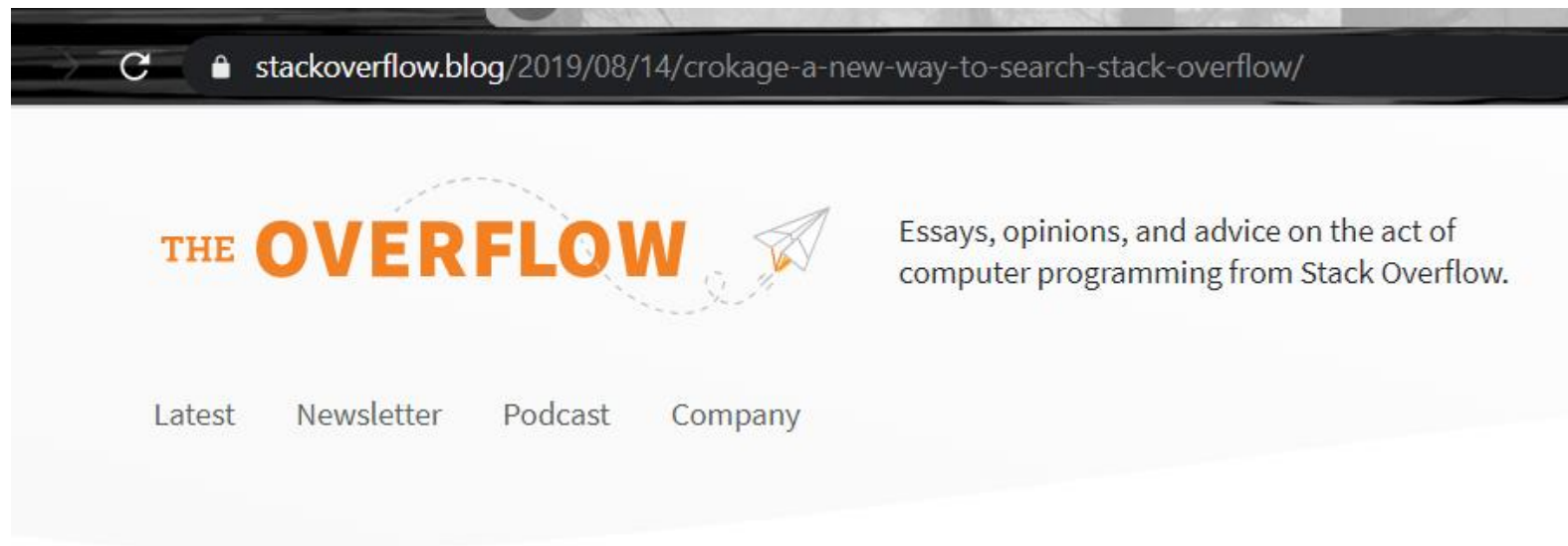
java

A Method for Testing Primality

I would *start* by extracting the method for testing primality, specifically only test for even and then you can test odd numbers less than or equal to the square root of the value. Something like,

```
private static boolean isPrime(int n) {  
    if (n == 1 || n == 2) {  
        return true;  
    } else if (n % 2 == 0) {  
        return false;  
    }  
}
```

TAREFA



Benjamin Popper · 3°

Director of Content at Stack Overflow

Brooklyn, Nova York, Estados Unidos · 346 conexões ·

[Informações de contato](#)

code-for-a-living

AUGUST 14, 2019


CROKAGE: A New Way to Search Stack Overflow

One of the most powerful attributes of Stack Overflow (SO) is the accumulation of developers' knowledge over time. Community members have contributed more than 18 million questions and 27 million answers. When a developer is stuck on a coding problem, they search through this vast trove of information to see if a solution to their...



Ben Popper

Director of Content

Andre Hora 

Department of Computer Science, Federal
University of Minas Gerais, Belo
Horizonte, Brazil

Correspondence

Andre Hora, Department of Computer
Science, Federal University of Minas
Gerais, Belo Horizonte, Brazil.
Email: andrehora@dcc.ufmg.br

Abstract

Developers spend a significant part of their time searching for code examples on the web. Often, they look for Application Programming Interface (API) usage examples, that is, how to use APIs provided by libraries and frameworks. For this purpose, several programming websites are available. Some programming websites provide manually created examples: unfortunately, as millions of APIs are available nowadays, they do not cover the majority of the APIs. To alleviate this limitation, other programming websites focus on automatically mining API usage examples from code repositories. To the best of our knowledge, however, these solutions are still very limited: they often present poor, duplicated, and similar API usage examples. In this article, we propose an approach, APISonar, to automatically mine API usage examples from code repositories. Our approach aims to overcome the limitations of current solutions: we focus on presenting readable and reusable API usage examples. We analyze millions of source files provided by 4486 software projects hosted on GitHub. Based on this data, we extract 11 million API usage examples about 1.5 million distinct APIs. We evaluate APISonar by assessing its quality and usage. We show that APISonar is a competitive solution, providing the best API examples in terms of readability and reusability, as compared with popular programming websites. Moreover, despite being a novel website, APISonar attracted a significant amount of users in a short period (3.7K users from 119 countries during 5 months). APISonar is available at www.apisonar.com.

apisonar.com

APISonar

Search API examples

try: java, android, Log, math, json...

Learning to Spot and Refactor Inconsistent Method Names

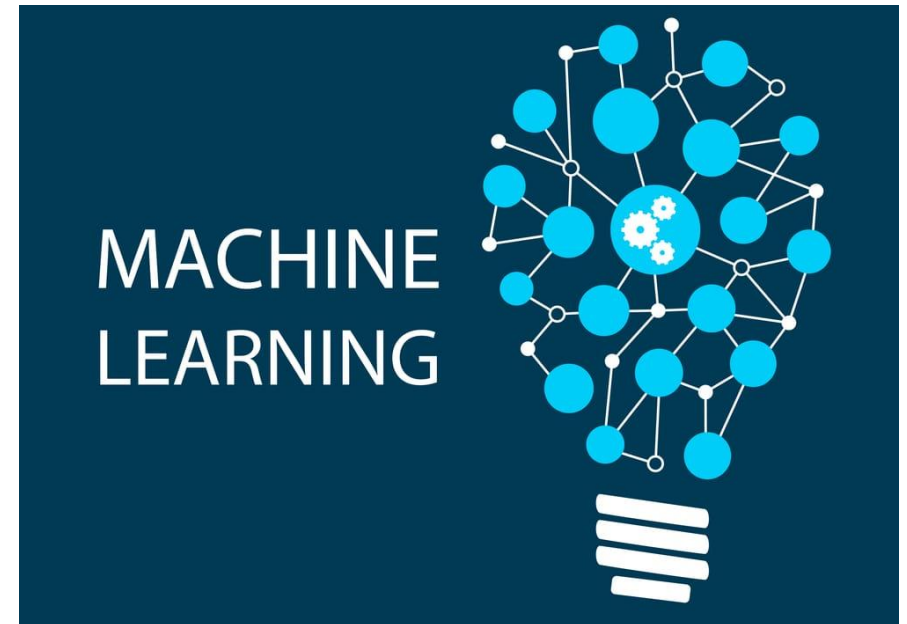
Kui Liu[†], Dongsun Kim[†], Tegawendé F. Bissyandé[†], Taeyoung Kim[‡], Kisub Kim[†], Anil Koyuncu[†],
Suntae Kim[‡], Yves Le Traon[†]

[†]Interdisciplinary Centre for Security, Reliability and Trust (SnT), University of Luxembourg, Luxembourg
{kui.liu, dongsun.kim, tegawende.bissyande, kisub.kim, koyuncu.anil, yves.lettraon}@uni.lu

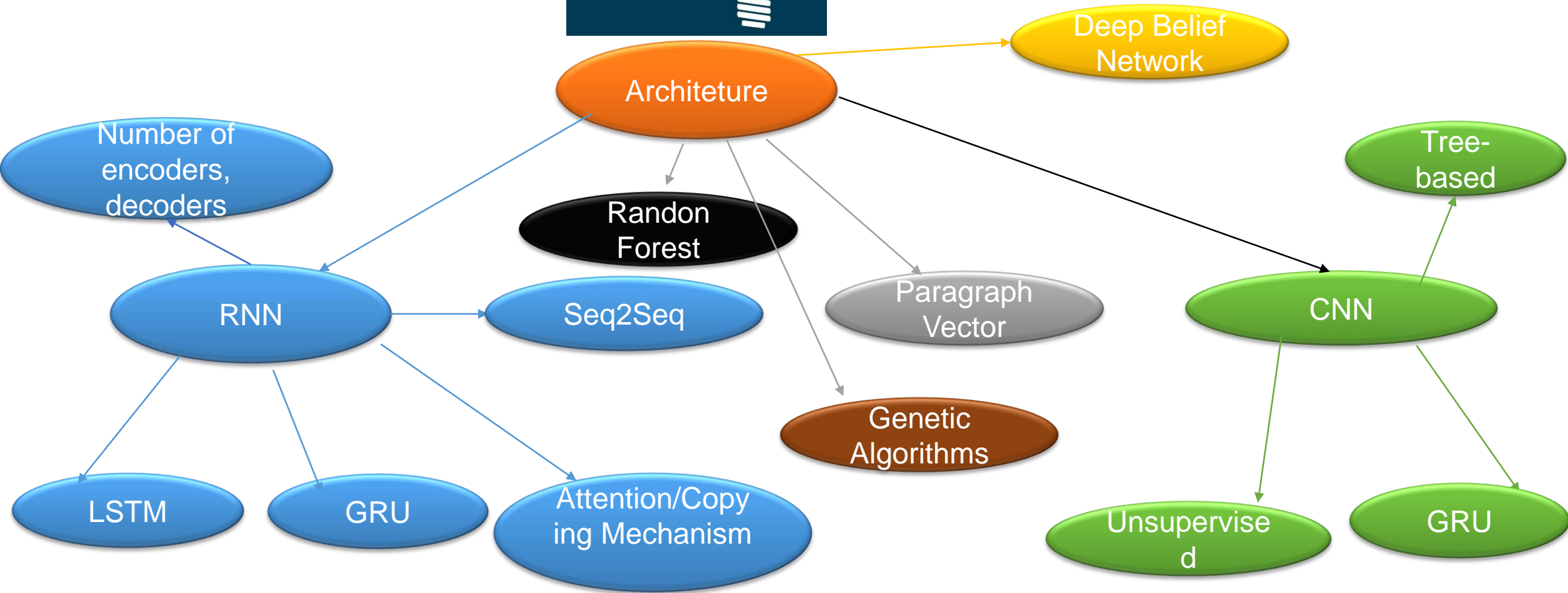
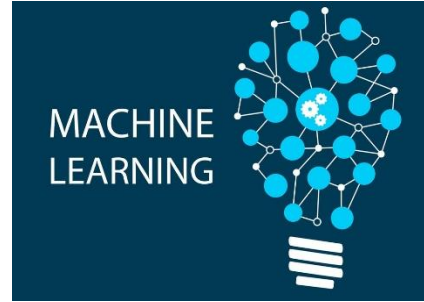
[‡]Department of Software Engineering, Chonbuk National University, South Korea
{rlaxodud1200, jipsin08}@gmail.com

```
Commit 70106770ea61a5fe845653a0b793f4934cc00144  
-public double inverseCumulativeProbability(final double p){  
+public double inverseCumulativeProbability(final double p){
```

MODELO



MODELO



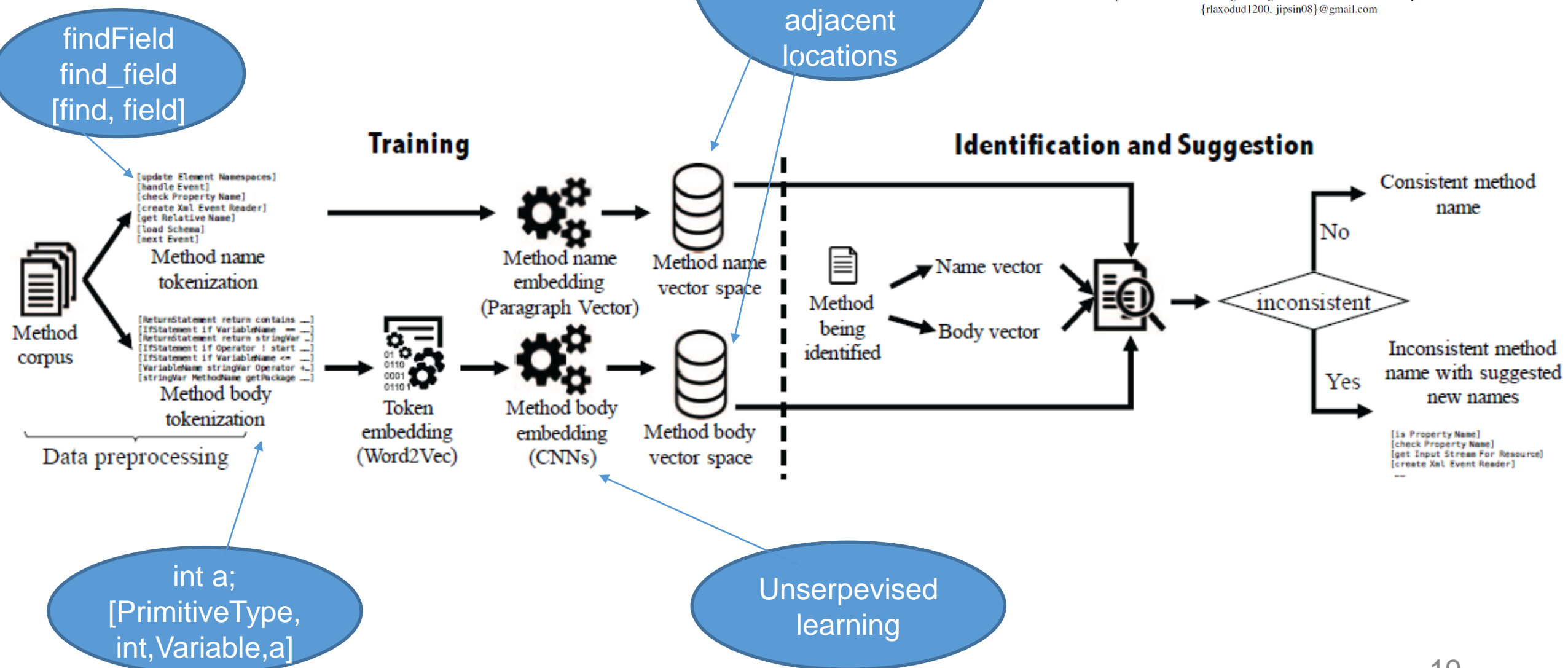
MODELO

Learning to Spot and Refactor Inconsistent Method Names

Kui Liu[†], Dongsun Kim[†], Tegawendé F. Bissyandé[‡], Taeyoung Kim[‡], Kisub Kim[†], Anil Koyuncu[†],
Suntae Kim[‡], Yves Le Traon[†]

[†]Interdisciplinary Centre for Security, Reliability and Trust (SnT), University of Luxembourg, Luxembourg
{kui.liu, dongsun.kim, tegawende.bissyande, kisub.kim, koyuncu.anil, yves.lettraon}@uni.lu

[‡]Department of Software Engineering, Chonbuk National University, South Korea
{rlaxodud1200, jipsin08}@gmail.com



MODELO

Papers from <https://ml4code.github.io/papers.html>

Search across all paper titles, abstracts, authors by using the search field. Please consider [contributing](#) by updating the information of existing papers or adding new work.

Search:

Year ▾	Title ▲	Authors ⚙
2019	A case study on machine learning for synthesizing benchmarks	A. Goens, A. Brauckmann, S. Ertl, C. Cummins, H. Leather, J. Castrillon
2019	A Grammar-Based Structural CNN Decoder for Code Generation	Z. Sun, Q. Zhu, L. Mou, Y. Xiong, G. Li, L. Zhang
2019	A Literature Study of Embeddings on Source Code	Z. Chen, M. Monperrus
2019	A Neural Model for Generating Natural Language Summaries of Program Subroutines	A. LeClair, S. Jiang, C. McMillan
2019	A Neural Model for Method Name Generation from Functional Description	S. Gao, C. Chen, Z. Xing, Y. Ma, W. Song, S.W. Lin

Machine Learning for Big Code and Naturalness

Research on machine learning for source code.

Search related work

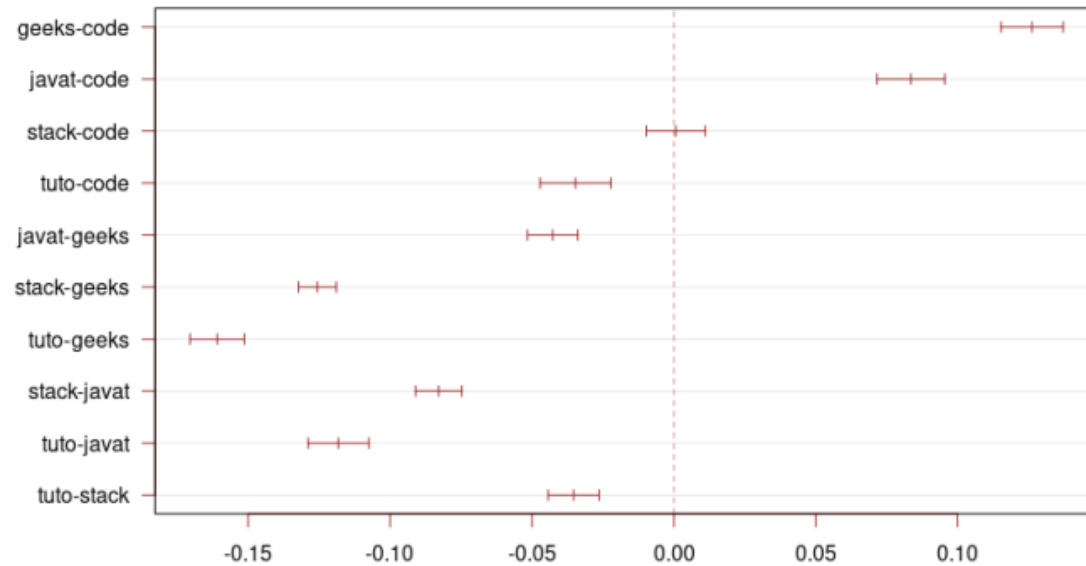
Go

MODELO

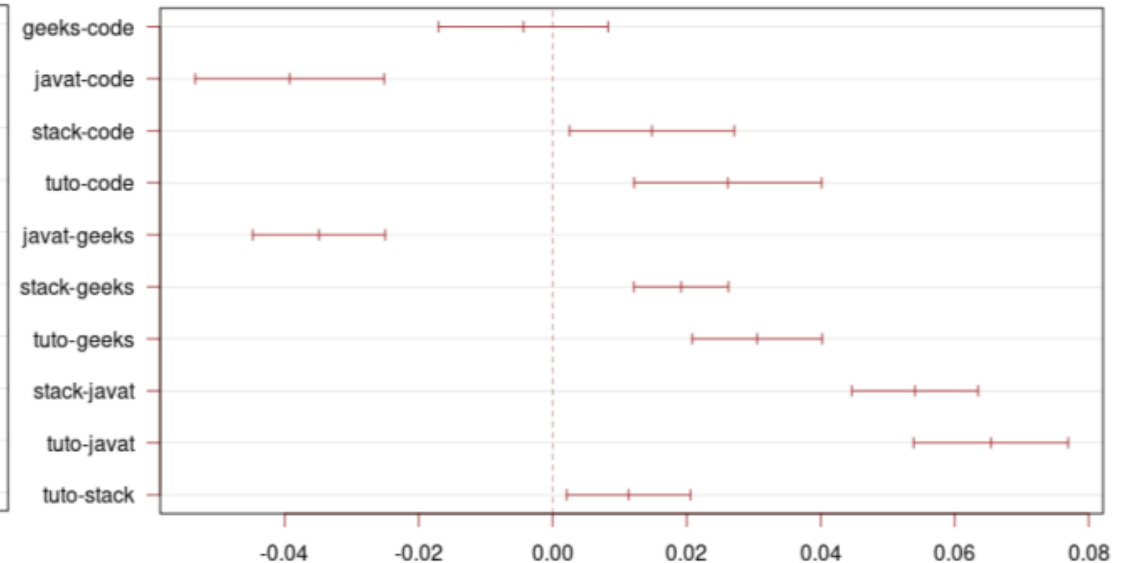
Readability and Understandability of Snippets Recommended by General-purpose Web Search Engines: a Comparative Study

Carlos Eduardo C. Dantas
carloseduardodantas@iftm.edu.br
Federal University of Uberlândia
Brazil

Marcelo A. Maia
marcelo.maia@ufu.br
Federal University of Uberlândia
Brazil



(a) Readability

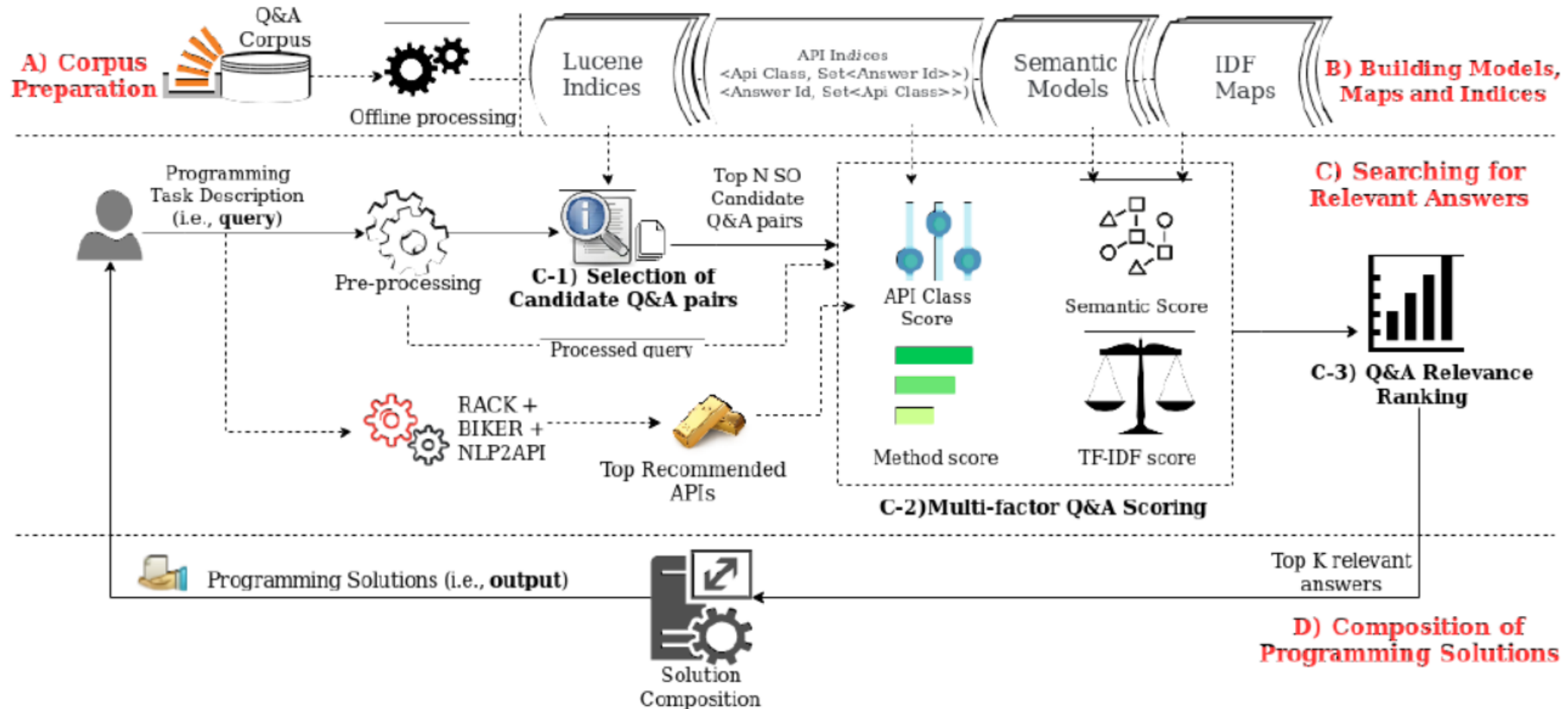


(b) Understandability

DADOS



stackoverflow




DADOS

<https://archive.org/details/stackexchange>



Stack Exchange Data Dump

by [Stack Exchange, Inc.](#)

Publication date	2021-09-07
Usage	Attribution-ShareAlike 4.0 International   
Topics	Stack Exchange Data Dump
Contributor	Stack Exchange Community

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stackoverflow.com-Badges.7z	296.4M
stackoverflow.com-Comments.7z	4.8G
stackoverflow.com-PostHistory.7z	29.7G
stackoverflow.com-PostLinks.7z	103.3M
stackoverflow.com-Posts.7z	16.9G
stackoverflow.com-Tags.7z	867.3K
stackoverflow.com-Users.7z	777.9M
stackoverflow.com-Votes.7z	1.3G

DADOS

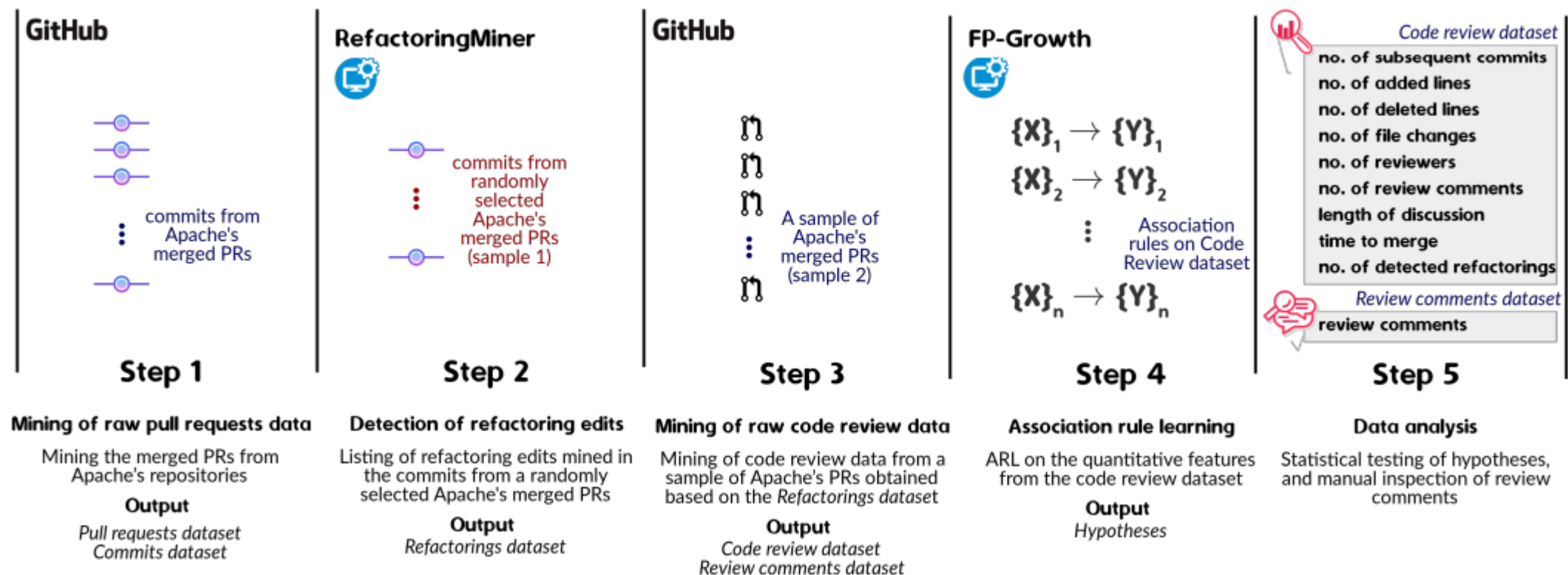
An Empirical Study on Refactoring-Inducing Pull Requests

Flávia Coelho
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Tiago Massoni
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Everton L. G. Alves
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everton@computacao.ufcg.edu.br



DADOS

Why We Refactor? Confessions of GitHub Contributor



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Concordia University
Montreal, Canada
tsantalis@cse.concordia.ca

Marco Tulio Valente
Universidade Federal de
Minas Gerais, Brazil
mtov@dcc.ufmg.br

```
public static List<CourseInfo> getCourses() {  
    try {  
        List<CourseInfo> result = new ArrayList<CourseInfo>();  
        final List<CourseInfo> courseInfos =  
            getFromStepic("courses", CoursesContainer.class).courses;  
        for (CourseInfo info : courseInfos) {  
            final String courseType = info.getType();  
            if (StringUtil.isEmptyOrSpaces(courseType)) continue;  
            final List<String> typeLanguage = StringUtil.split(courseType, " ");  
            if (typeLanguage.size() == 2 && PYCHARM_PREFIX.equals(typeLanguage.get(0))) {  
                result.add(info);  
            }  
        }  
        return result;  
    }  
    catch (IOException e) {  
        LOG.error("Cannot load course list " + e.getMessage());  
    }  
    return Collections.emptyList();  
}
```

Extracted Code
Added Code
Call to the Extracted Method

```
public static List<CourseInfo> getCourses() {  
    try {  
        List<CourseInfo> result = new ArrayList<CourseInfo>();  
        int pageNumber = 0;  
        boolean hasNext = addCoursesFromStepic(result, pageNumber);  
        while (hasNext) {  
            pageNumber += 1;  
            hasNext = addCoursesFromStepic(result, pageNumber);  
        }  
        return result;  
    }  
    catch (IOException e) {  
        LOG.error("Cannot load course list " + e.getMessage());  
    }  
    return Collections.emptyList();  
}  
  
private static boolean addCoursesFromStepic(List<CourseInfo> result, int pageNumber)  
    throws IOException {  
    final String url = pageNumber == 0 ? "courses" : "courses?pages=" +  
        String.valueOf(pageNumber);  
    final CoursesContainer coursesContainer = getFromStepic(url, CoursesContainer.class);  
    final List<CourseInfo> courseInfos = coursesContainer.courses;  
    for (CourseInfo info : courseInfos) {  
        final String courseType = info.getType();  
        if (StringUtil.isEmptyOrSpaces(courseType)) continue;  
        final List<String> typeLanguage = StringUtil.split(courseType, " ");  
        if (typeLanguage.size() == 2 && PYCHARM_PREFIX.equals(typeLanguage.get(0))) {  
            result.add(info);  
        }  
    }  
    return coursesContainer.meta.containsKey("has_next") &&  
        coursesContainer.meta.get("has_next") == Boolean.TRUE;  
}
```

DADOS

An Exploratory Study of Log Placement Recommendation in an Enterprise System

Jeanderson Cândido^{*†}, Jan Haesen[†], Maurício Aniche^{*}, and Arie van Deursen^{*}

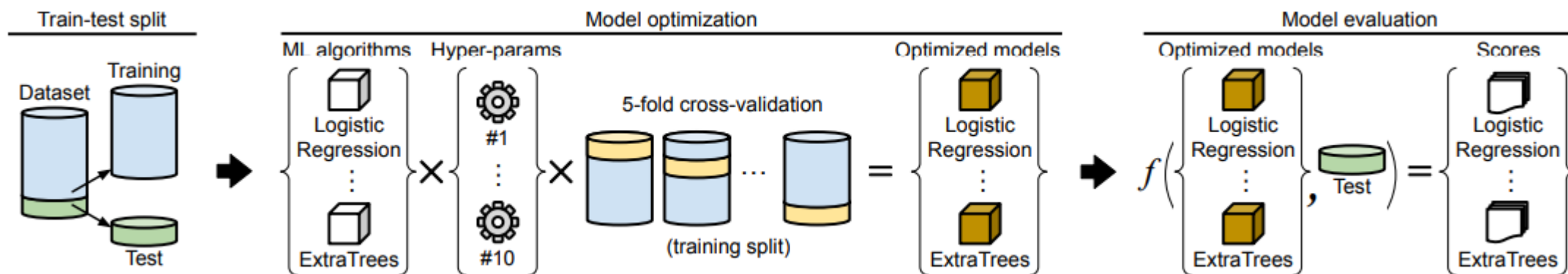
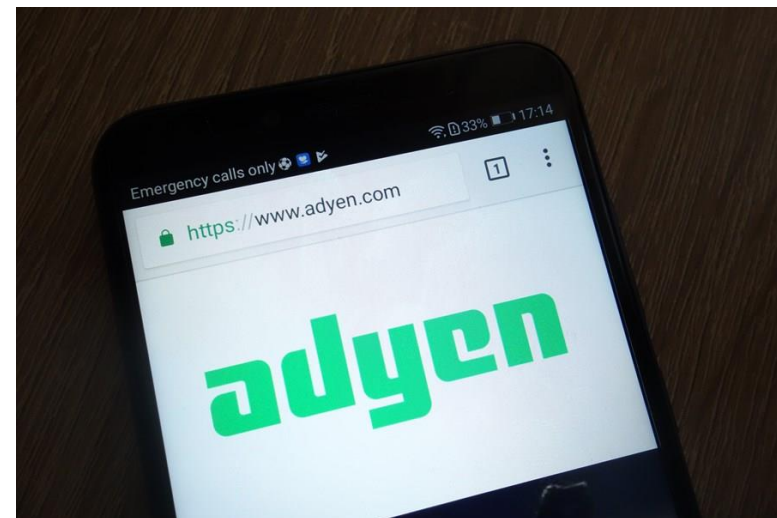
^{*}Department of Software Technology

Delft University of Technology, The Netherlands

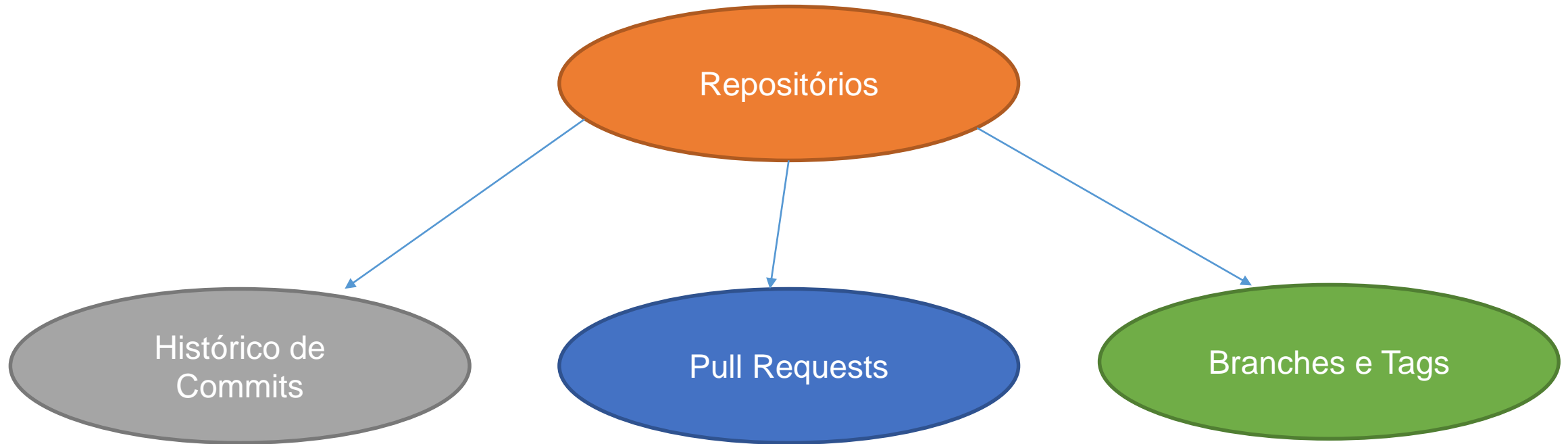
{j.candido, m.f.aniche, arie.vandeursen}@tudelft.nl

[†]Adyen N.V., The Netherlands

{jeanderson.candido, jan.haesen}@adyen.com



DADOS



DADOS

Quais repositórios
selecionar?



GitHub

Ecosistemas

Estrelas

Linguagens de
Programação

Quantidade de
commits

Tempo



The Apache Software Foundation

<https://www.apache.org/> Verified

[Overview](#) [Repositories](#) 2.3k [Packages](#) [People](#) 1.1k [Projects](#) 10

github.com/search/advanced



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Advanced search

stars:100 language:Java

VALIDAÇÃO

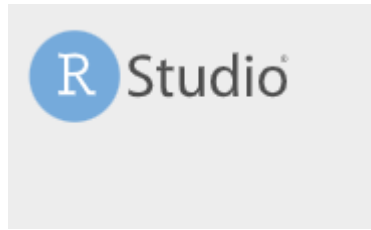
K = 10

	Java			
	Hit	MRR	MAP	MR
BIKER	0.16	0.11	0.11	0.01
BM25 + API Class	0.58	0.18	0.17	0.10
BM25 + Sent2Vec	0.49	0.22	0.20	0.08
BM25	0.56	0.22	0.22	0.13
BM25 + Method	0.72	0.40	0.36	0.16
BM25 + fastText	0.67	0.39	0.34	0.13
BM25 + TF-IDF	0.63	0.34	0.32	0.16
CROKAGE	0.81	0.55	0.49	0.22

K = 1

	Java			
	Hit	MRR	MAP	MR
BIKER	0.07	0.07	0.07	0.01
BM25 + API Class	0.00	0.00	0.00	0.00
BM25 + Sent2Vec	0.12	0.12	0.12	0.01
BM25	0.09	0.09	0.09	0.01
BM25 + Method	0.25	0.25	0.25	0.02
BM25 + fastText	0.28	0.28	0.28	0.03
BM25 + TF-IDF	0.21	0.21	0.21	0.03
CROKAGE	0.46	0.46	0.46	0.06

EXEMPLO PRÁTICO



<https://www.rstudio.com/>



Spring Tools | 4

Spring Tools 4 is the next generation of Spring tooling for your favorite coding environment. Largely rebuilt from scratch, it provides world-class support for developing Spring-based enterprise applications, whether you prefer Eclipse, Visual Studio Code, or Theia IDE.

<https://spring.io/tools>

EXEMPLO PRÁTICO



Tarefa

The diagram consists of two vertically aligned ovals. The top oval is orange and contains the word 'Tarefa'. The bottom oval is green and contains a question about refactoring operations that improve code readability.

Quais operações de refactoring
tendem a melhorar a
legibilidade do código-fonte?

EXEMPLO PRÁTICO

Quais operações de refactoring
tendem a melhorar a
legibilidade do código-fonte?

Repositórios do
Github

Ferramenta que
detecta operações
de refactoring

Ferramenta que
captura a
legibilidade das
classes

Análise estatística

EXEMPLO PRÁTICO

Quais operações de refactoring tendem a melhorar a legibilidade do código-fonte?

tomcat Public

Apache Tomcat

java

http

tomcat

javaee

network-server

Java

Apache-2.0

3,882

5,714

0

14

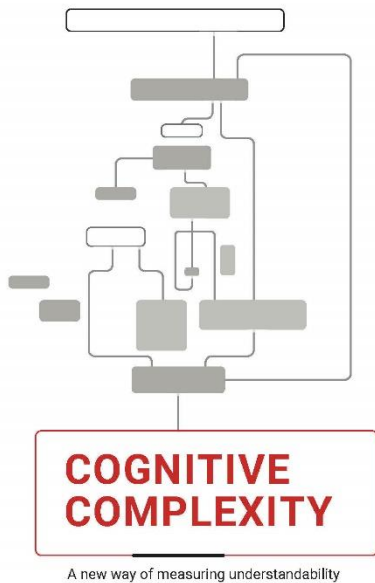
Updated 3 hours ago



EXEMPLO PRÁTICO

Quais operações de refactoring tendem a melhorar a legibilidade do código-fonte?

sonarsource



A comprehensive model for code readability

Simone Scalabrino ✉, Mario Linares-Vásquez, Rocco Oliveto, Denys Poshyvanyk

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EXEMPLO PRÁTICO

Quais operações de refactoring tendem a melhorar a legibilidade do código-fonte?

```
Refactoring-readability - RefactoringReadabilityApplication [Spring Boot App] C:\Program Files\Java\jdk1.8.0_151\bin\javaw.exe (23 de nov de 2021 19:19:31)
2021-11-23 19:26:56.102 INFO 7260 --- [va AST analyzer] o.s.analyzer.commons.ProgressReport : 1 source file to be analyzed
2021-11-23 19:26:56.143 INFO 7260 --- [va AST analyzer] o.s.analyzer.commons.ProgressReport : 1/1 source file has been analyzed
2021-11-23 19:26:56.143 WARN 7260 --- [main] org.sonar.java.SonarComponents : Unresolved imports/types have been detected during analysis. Enable DEBUG mode to see them.
2021-11-23 19:26:56.144 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing tomcat [Commits: 10, Errors: 0, Refactorings: 42]
2021-11-23 19:26:56.165 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat 5a55179a049ec39246c8ba76073ab4485542b98c ...
2021-11-23 19:26:56.181 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat 808e0cb47bc428404e58775606bbe933193340f4 ...
Refactorings at 808e0cb47bc428404e58775606bbe933193340f4
Change Variable Type e : GSSException to e : GSSException|IllegalStateException in method public getUserPrincipal() : Principal from class org.apache.catalina.connector.Request
2021-11-23 19:27:12.299 INFO 7260 --- [va AST analyzer] o.s.analyzer.commons.ProgressReport : 1 source file to be analyzed
2021-11-23 19:27:12.414 INFO 7260 --- [va AST analyzer] o.s.analyzer.commons.ProgressReport : 1/1 source file has been analyzed
2021-11-23 19:27:12.415 WARN 7260 --- [main] org.sonar.java.SonarComponents : Unresolved imports/types have been detected during analysis. Enable DEBUG mode to see them.
2021-11-23 19:27:30.195 INFO 7260 --- [va AST analyzer] o.s.analyzer.commons.ProgressReport : 1 source file to be analyzed
2021-11-23 19:27:30.296 INFO 7260 --- [va AST analyzer] o.s.analyzer.commons.ProgressReport : 1/1 source file has been analyzed
2021-11-23 19:27:30.296 WARN 7260 --- [main] org.sonar.java.SonarComponents : Unresolved imports/types have been detected during analysis. Enable DEBUG mode to see them.
2021-11-23 19:27:30.297 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing tomcat [Commits: 11, Errors: 0, Refactorings: 43]
2021-11-23 19:27:30.309 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat f9e8d2b09f9e9a6c02c674c1464fb5abf68fb000 ...
2021-11-23 19:27:30.317 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat 5a55179a049ec39246c8ba76073ab4485542b98c ...
Refactorings at 5a55179a049ec39246c8ba76073ab4485542b98c
2021-11-23 19:27:30.401 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat a791804b0951da1a67c026926345d6b7191273fd ...
2021-11-23 19:27:30.412 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat f9e8d2b09f9e9a6c02c674c1464fb5abf68fb000 ...
Refactorings at f9e8d2b09f9e9a6c02c674c1464fb5abf68fb000
2021-11-23 19:27:30.502 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat d83479efe35e15125a3be781c9670269abe74bfe ...
2021-11-23 19:27:30.509 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat a791804b0951da1a67c026926345d6b7191273fd ...
Refactorings at a791804b0951da1a67c026926345d6b7191273fd
2021-11-23 19:27:30.607 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat c3412ad28f72cbaf024967978c1c1690d3c5a27d ...
2021-11-23 19:27:30.614 INFO 7260 --- [main] o.r.rm1.GitHistoryRefactoringMinerImpl : Processing F:\repositories\tomcat 248e9b74c9ccb8fb7b5072acd932f9deb3e979fb ...
Refactorings at 248e9b74c9ccb8fb7b5072acd932f9deb3e979fb
Move Class org.apache.tomcat.util.net.openssl.panama.OpenSSLContext.DHParam moved to org.apache.tomcat.util.net.openssl.panama.OpenSSLLifecycleListener.DHParam
```

EXEMPLO PRÁTICO

Quais operações de refactoring tendem a melhorar a legibilidade do código-fonte?

A	B	C	D	E	F
repository	refactoring_type	className	operation	readability	understandability
https://github.com/apache/tomcat.git	Add Parameter	org.apache.tomcat.util.net.openssl.panama.OpenSSLContext.ContextState	BEFORE	0.5000286049318571	345.0
https://github.com/apache/tomcat.git	Add Parameter	org.apache.tomcat.util.net.openssl.panama.OpenSSLContext.ContextState	AFTER	0.4972928118180621	345.0
https://github.com/apache/tomcat.git	Move Attribute	org.apache.tomcat.util.net.openssl.panama.OpenSSLContext	BEFORE	0.5000286049318571	345.0
https://github.com/apache/tomcat.git	Move Attribute	org.apache.tomcat.util.net.openssl.panama.OpenSSLContext.ContextState	AFTER	0.4972928118180621	345.0
https://github.com/apache/tomcat.git	Change Attribute Access Modifier	org.apache.tomcat.util.net.openssl.panama.OpenSSLContext	BEFORE	0.5000286049318571	345.0
https://github.com/apache/tomcat.git	Change Attribute Access Modifier	org.apache.tomcat.util.net.openssl.panama.OpenSSLContext.ContextState	AFTER	0.4972928118180621	345.0

EXEMPLO PRÁTICO

Quais operações de refactoring
tendem a melhorar a
legibilidade do código-fonte?

```
data: readability by operation
W = 20, p-value = 0.2188
alternative hypothesis: true location shift is not equal to 0
95 percent confidence interval:
 -0.10255220  0.09605526
sample estimates:
difference in location
 -0.001863713
```

