

In the following table, the item **"Approach (Tool) Name"** refers to the name of the proposed approach or tool, ("\" if not specified)
The item **"Detection Source"** refers to the input of the proposed approach, ("\" for approaches that do not focus on a detection process)
The item **"Analysis Type"** refers to the information type utilized, i.e., static analysis or dynamic analysis. Typically, approaches based on static analysis do not execute the target system, while approaches based on dynamic analysis execute the target system and monitor its execution state. Especially, detecting pattern instances from UML sequence diagrams also consider as dynamic. Some approaches utilize a hybrid analysis type. ("\" for mapping studies and literature reviews)
The item **"Utilized Feature"** refers to the characteristic utilized to identify a pattern instance, including structure (e.g., inheritance and composition), behavior, semantics (e.g., naming conventions), linguistics (e.g., synonym of class names), and metrics (e.g., depth of inheritance hierarchy). Corresponding to the item **"Analysis Type"**, a behavior can be static (e.g., method invocations extracted by parsing the abstract syntax tree) or dynamic (e.g., object allocation at runtime). For some approaches, e.g., based on machine learning, structural or static behavior relationships are used indirectly to calculate a metric (e.g., number of child classes and method invocation coupling). Considering such metrics rely on structures or static behaviors, we list "structure" or "behavior" in this item in addition to "metrics". ("\" for approaches that do not focus on a detection process)
The item **"Detection Technique"** refers to the technique utilized to identify a pattern instance. While multiple techniques may be employed by an approach, the item refers to the direct technique of how an instance is searched, matched, queried, or classified. ("\" if no detection technique is presented)
The item **"Evaluation Systems"** refers to the systems evaluated. ("\" if no evaluated system)
The item **"Compared Approaches"** refers to the approaches (corresponding to the item **"Approach (Tool) Name"**) compared by the proposed approach. ("\" if not compared with other approaches)
The item **"Language"** refers to the programming language an approach focused on. ("\" if not clearly declared in the approach)
The item **"Focused Patterns"** refers to the pattern supported. In the cases that supported patterns are not clearly declared, the item refers to the patterns evaluated in the approach. If no pattern is evaluated, the item generally refers to "GoF patterns". In the cases that the approach is not limited to GoF patterns but does not clearly declare the variant, the item refers to "\".
The item **"Data Package"** refers to the website address that publishes detection results or tools. The item is shaded if the website is unable to access during the investigation. ("\" if no data package is provided)

#	Paper Title	Approach (Tool) Name	Detection Source	Analysis Type	Utilized Feature	Detection Technique	Evaluated Systems	Compared Approaches	Language	Focused Patterns	Data Package
1	A Customizable Approach to Design Patterns Recognition Based on Feature Types	RaM	source code	static	structure behavior semantics	SQL query	JUnit 3.7 JHotDraw 5.1 QuickUML 2.001 JRefactory 2.6.24 Apache Ant 1.6.2 GALL++ 2.4 LibG++ 2.7.2	\	Java C++	all 23 GoF patterns	http://research.cditshore.edu.p k/Group/SE/DesignP atterns.aspx
2	Design pattern recovery based on annotations	DRT	source code	static	structure semantics	SQL query	JHotDraw 5.1.2 Apache Ant 1.6.2	PINOT Fujaba	Java	Singleton Factory Method Adapter Composite Proxy Observer Visitor	\
3	Flexible Design Pattern Detection Based on Feature Types	nRP	source code	static	structure behavior	SQL query	JUnit 3.7, JHotDraw 5.1, JRefactory 2.6.24	\	Java	GoF patterns	\
4	Discovery of Design Patterns Variants for Quality Software Development	\	source code	static	\	\	JFreeChart 0.8.1, Java awt (Java Platform SE 7),jdk- lib-rt-7.3.1, JRefactory 2.6.24, jakarta- struts-1.1-1b	DPD ePAD Sparx EA nRP	Java	5 GoF variants	\
5	Evaluation of Design Pattern Recovery Tools	\	source code	\	\	\	\	DPRE DeMIMA DPD PTIDE PINOT DP-Miner	Java C++	23 GoF patterns	\
6	A Survey on Design Pattern Recovery Techniques	\	\	static dynamic	structure behavior semantics metrics	\	JHotDraw 5.1 JUnit 3.7 JRefactory 2.6.24 QuickUML 2001 Apache Ant 1.6.2	Pidsj DPR DeMIMA DECOR PINOT	Java	GoF patterns	\
7	A Comparative Study on Results of Design Patterns Recovery Tools	\	source code	\	\	\	JHotDraw 5.1 QuickUML 2001	DPD DPRE DeMIMA Prototyping tool MARPLE	Java	GoF patterns	\
8	Customizable Feature based Design Pattern Recognition Integrating Multiple Techniques	UDDPRt	source code	static	structure	SQL query	AJP JUnit 3.7 JHotDraw 5.1 JRefactory 2.6.24 QuickUML Apache Ant 1.6.2	(10 tools)	Java C / C++ C#	GoF patterns	<a href="http://research.cditshore.edu.p
k/Group/SE/DesignP
atterns.aspx">http://research.cditshore.edu.p k/Group/SE/DesignP atterns.aspx
9	Design Pattern Detection Using Similarity Scoring	DPD	source code bytecode	static	structure behavior semantics	graph matching	JHotDraw 5.1 JRefactory 2.6.24 JUnit 3.7	\	Java	GoF patterns	https://sees.ems.concor dia.ca/~nikolaos/pattern _detection.html
10	DPDX - Towards a Common Result Exchange Format for Design Pattern Detection Tools	DPDX	\	\	\	\	\	DP-Miner Maia SSA SPQR Columbus PINOT Pidsj Rumba DEEBE P-Mart	\	\	https://awiki.ai.uni- bonn.de/dpdx/
11	Design Patterns Detection Using a DSL-driven Graph Matching Approach	DPF	source code	static	structure behavior	graph matching	JUnit 3.7, Lexi 0.1, JHotDraw 5.1, QuickUML, 2.1, Nutch 0.4, PMD 1.8, JRefactory 2.6.24 Log4j 1.2.15, JHotDraw 7, Voldemort 1.3.x, Apache Avro 1.6, JOT 3.6.1	DPD	Java	GoF patterns except Facade Flyweight Chain of Responsibility Interpreter Mediator 56 GoF variants	http://research.cditshore.edu.pk/Group/ SE/DesignPatterns.asp x
12	A Model-Driven Graph-Matching Approach for Design Pattern Detection	DPF	source code	static	structure behavior	graph matching	JUnit 3.7 JHotDraw 5.1 QuickUML 2.1 Nutch 0.4 PMD 1.8 JHotDraw 7.0 Apache Avro 1.6	DPD	Java	Factory Method Prototype Singleton Adapter State Strategy Composite Decorator Observer Template Method Memento Bridge Command Proxy Visitor	http://www.roost.unisinn io/t/ingoft/dpt
13	Design Pattern Finder: A Model-driven Graph-Matching Approach to Design Pattern Mining	DPF	source code	static	structure behavior	graph matching	JUnit 3, JHotDraw 6/7, Apache Avro 1.6, JOT, Log4j, Voldemort,	DPD	Java	GoF patterns except Facade Flyweight Chain of Responsibility Interpreter Mediator 56 GoF variants	\
14	Detecting the behavior of design patterns through model checking and dynamic analysis	ePAD	source code bytecode	static dynamic	structure behavior	model checking	JHDS.1, JUnit 3.7 JHotDraw 5.1, JRefactory 2.6.24, QuickUML 2001, MaproXML 1.9.7	DPD RAM DPF	Java	Abstract Factory Builder Factory Method Prototype Command Iterator Memento Observer State Strategy Template Method Visitor	http://docenti.unisa.it/00 4744nonsi?pagina=335&nonsa=1126
15	An Eclipse plug-in for the detection of design pattern instances through static and dynamic analysis	ePAD	source code bytecode	static dynamic	structure behavior	model checking	JHotDraw 5.1	\	Java	GoF patterns	http://www.sesa.dmi.unis a.it/ePAD/
16	ePADEVo: A Tool for the Detection of Behavioral Design Patterns	ePADEVo	source code bytecode	static dynamic	structure behavior	visual language parsing	JHotDraw 5.1	\	Java	Observer State Strategy	https://id.dropboxuserco nrent.com/u/20291568/e PADEVo/index.html
17	Towards Automating Dynamic Analysis for Behavioral Design Pattern Detection	ePADEVo	source code bytecode	static dynamic	structure behavior	visual language parsing	JHotDraw 5.1 QuickUML 2001 MaproXML 1.9.7	DPRE DPD ePAD	Java	State Strategy Observer	<a href="http://www.unisa.it/uploa
ds/8207/webappendix.pdf">http://www.unisa.it/uplo ads/8207/webappendix. pdf
18	Design pattern recovery through visual language parsing and source code analysis	DPRE	source code	static	structure behavior	visual language parsing	JHotDraw 5.1/6.0b1 QuickUML Apache Ant Java 5 Eclipse JDT (CORE + UI)	PINOT	Java	Adapter Bridge Composite Facade Proxy Decorator	http://www.sesa.dmi.unis a.it/dp/
19	Improving Behavioral Design Pattern Detection through Model Checking	DPRE	source code bytecode	static dynamic	structure behavior	model checking	JHotDraw 5.1 JRefactory 2.6.24	Pidsj DPD DeMIMA	Java	Observer Strategy State Command Visitor Template Method	\
20	A Benchmark Platform for Design Pattern Detection	MARPLE	\	\	\	\	\	\	\	\	http://www.esens.disco. unimib.it/DPWeb/v/
21	Enhancing Software Evolution through Design Pattern Detection	MARPLE	source code	static	structure	machine learning	\	\	Java	GoF behavioral patterns	\
22	DPB: A benchmark for design pattern detection tools	MARPLE	\	\	\	\	\	\	\	\	http://www.esens.disco. unimib.it/DPWeb/v/
23	A tool for design pattern detection and software architecture reconstruction	MARPLE	source code	static	structure behavior metrics	(clustering algorithm)	(30 systems)	WoP	Java	Abstract Factory Composite Visitor	http://www.esens.disco.unimib .it/wiki/marple/
24	A Design Pattern Detection Plugin for Eclipse	MARPLE	source code	static	structure	(clustering algorithm)	\	\	Java	GoF patterns	\
25	The MARPLE Project - A Tool for Design Pattern Detection and Software Architecture Reconstruction	MARPLE	source code	static	structure	(clustering algorithm)	(30 systems)	\	Java	Abstract Factory	http://www.esens.disco.unimib .it/reverse/Marple.html
26	On applying machine learning techniques for design pattern detection	MARPLE-DPD	source code	static	structure behavior semantics metrics	machine learning	DPExemple QuickUML 2001 JUnit 3.8 JRefactory 2.6.24 Netbeans 10.x JUnit 3.7 JHotDraw 5.1 MaproXML 1.9.7 Nutch 0.4 PMD 1.8	Pidsj DPD WoP DPJF	Java	Singleton Adapter Composite Decorator Factory method	http://www.esens.disco.unimib .it/reverse/Marple.html
27	A comprehensive approach to the recovery of design pattern instances based on sub-patterns and method signatures	DPIDT	source code	static	structure	graph matching	JavaAWT 5.0 JHotDraw 5.1 JUnit 3.8 Dom4j 1.6.1 Jaxy 1.1.1 Hodoku 2.1.1 Barozda4 2.1.0 ResFlow 5.0 Teamcenter 6.02.199 (an example)	DeMIMA DPD Sempatrac	Java	all 23 GoF patterns	http://dbs.hdu.edu.cn/d p/dp/index.jsp
28	A Design Pattern Detection Approach Based on Semantics	\	source code UML diagrams	static dynamic	structure behavior linguistics	XML query	\	\	\	all 23 GoF patterns	\
29	A New Approach for Pattern Problem Detection	\	source code	static	structure linguistics	XML query	(a case study of Bridge pattern)	\	\	GoF patterns	\
30	A fuzzy matching approach for design pattern mining	\	source code UML diagrams	static dynamic	structure behavior metrics	matrix computation	JUnit 3.7/5.6/4.7 JHotDraw 5.1/6.0 Jefactory 2.6.24/2.9.18	\	Java	State Strategy Template Method Observer Visitor	\
31	A New Approach for Detecting Design Patterns by Graph Decomposition and Graph Isomorphism	\	UML diagrams	static	structure	matrix computation	\	\	\	all 23 GoF patterns	\

32	A practical pattern recovery approach based on both structural and behavioral analysis	PRAssistant	source code bytecode	static dynamic	structure behavior semantics	Prolog programming	JHotDraw 5.2 Junit 3.8.1	\	Java	GoF patterns except Prototype Facade Command Memento Template Method	\
33	A Review of Design Pattern Mining Techniques	\	\	static dynamic	structure behavior semantics metrics	\	Galib, LEDA, Lisp++, Java AWT, Java Swing, JDK, JES, JHotDraw, JRefactory, JUnit, Mac, QuickUML, JHotDraw 5.1	\	\	GoF patterns except Memento Iterator	\
34	A rule-based procedure for automatic recognition of design patterns in UML diagrams	\	UML diagrams	static dynamic	structure behavior	Prolog programming	\	\	Java	GoF patterns	\
35	Automatic Design Pattern Detection	VizAnalyzer	source code bytecode	static dynamic	structure behavior semantics	(dedicated algorithm)	Recorder VizAnalyzer SwingSet2	\	Java	Observer Composite Mediator Chain of Responsibility Visitor	\
36	Compound Record Clustering Algorithm for Design Pattern Detection by Decision Tree Learning	\	source code	static	structure behavior	machine learning	AWT Junit JHotDraw	\	Java	Strategy	\
37	Design Pattern Detection by Using Meta Patterns	\	source code bytecode	static dynamic	structure behavior	Prolog programming	textbook sample) (the tool itself)	\	Java	Abstract Factory Builder Chain of Responsibility Composite Factory Method Observer Proxy State Strategy Template Method Visitor Singleton	\
38	JADEPT: Dynamic Analysis for Behavioral Design Pattern Detection	JADEPT	source code bytecode	static dynamic	structure behavior	database query	(10 implementation samples)	\	Java	Chain of Responsibility Observer Visitor	\
39	Design Pattern Detection in Java Systems: A Dynamic Analysis Based Approach	JADEPT	source code bytecode	static dynamic	structure behavior semantics	database query	(10 samples)	\	Java	GoF behavioral patterns	\
40	Design Pattern Detection using FINDER	FINDER	source code bytecode	static	structure	rule matching	GTK- Free 0.6	PINOT DPD	Java	22 GoF patterns	https://www.secs.yorku.ca/~proiect/dpd/
41	Design Pattern Detection using Software Metrics and Machine Learning	\	source code	static	structure metrics	machine learning	Java library 1.6.0.13 Junit 4.5 Spring Framework 2.5 RC2	DPD DIET	Java	Singleton Template Method Adapter State Strategy	http://www.washi.cs.was.edu.ac/papers/paper1schy/ana/ds.htm (no dataset?)
42	Design Pattern Mining Using Distributed Learning Automata and DNA Sequence Alignment	DLA-DNA	source code	static	structure	machine learning	JHotDraw 6.0e1, Apache Ant 1.6.2, Java Swing 1.4, Argo4JML, Eclipse 3.6	PINOT Pidsy DPJF	Java	GoF structural patterns	\
43	Design Pattern Mining Using State Space Representation of Graph Matching	\	UML diagrams	static	structure	graph matching	\	\	\	Strategy Command Singleton	\
44	Design Pattern Recognition	Pistone	UML diagrams	static	structure behavior semantics	fuzzy matching	\	\	Java	GoF patterns	\
45	Detecting Design Patterns in Object-Oriented Design Models by Using a Graph Mining Approach	DesPaD	source code	static	structure	graph matching	Junit 3.8 Junit 4.1 Java AWT 1.3	PINOT HEDGEHOG Fujaba	Java	23 GoF patterns	https://github.com/mura-toru/CODEDesPaD-gt
46	Detection of Diverse Design Pattern Variants	D3	source code	static	structure behavior	SQL query	(Applied Java Patterns), JHotDraw 6.0e1	PINOT Fujaba	Java	Singleton Factory Method Builder	\
47	DPJF - Design Pattern Detection with High Accuracy	DPJF	source code	static	structure behavior	Prolog programming	JHotDraw 5.1/6.0, Java IO 1.4, Java AWT 1.3, Argo4JML 0.18b1, Eclipse 3.6, TeamCore	Fujaba PINOT Pidsy DPD	Java	Abstract Factory Decorator Chain of Responsibility Proxy Observer Composite	http://sewiki.lia.uni-bonn.de/research/dpd/dp/
48	DP-Miner: Design Pattern Discovery Using Matrix	DP-Miner	UML diagrams	static	structure behavior	matrix computation	AWT JDK1.4	\	Java	GoF patterns	\
49	From Sub-patterns to Patterns: an Approach to the Detection of Structural Design Pattern Instances by Subgraph Mining and Merging	\	source code	static	structure	graph matching	JHotDraw 6.0, JRefactory 2.9.19, JEdt 4.2, Dom4j 1.6.1	\	Java	Adapter Composite Decorator Bridge Proxy	\
50	Generating Design Pattern Detectors from Pattern Specifications	SanD	source code bytecode	static dynamic	structure behavior	Prolog programming	(their own analysis tool)	MetaD	Java	Observer Composite Decorator	\
51	Implementation Variants of the Singleton Design Pattern	D3	source code	static	structure behavior	SQL query	JHotDraw	PINOT	Java	8 variants of Singleton	http://www.doubled.pl/
52	Measuring the Quality of Design Pattern Detection Results	Molle	\	\	\	\	JHotDraw 6.0e1, Apache Log4j 1.2.16, Apache Ant 1.6.2	FINDER DPD PINOT	Java	GoF patterns	\
53	Micro Patterns in Java Code	\	URL	\	\	\	7 JRE implementations	\	Java	micro patterns	\
54	Mining Domain-Specific Design Patterns: A Case Study	\	URL	\	\	\	(case study)	\	\	(website patterns)	\
55	Model Level Design Pattern Instance Detection using Answer Set Programming	\	UML diagrams	static	structure behavior	answer set programming	\	\	\	\	\
56	Modeling Design Patterns for Semi-Automatic Reuse in System Design	\	\	static dynamic	\	\	ExampEl	\	\	Factory Method Builder Decorator Composite Observer Command Chain of Responsibility Template Method	\
57	Predicting the Existence of Design Patterns based on Semantics and Metrics	Sniffer	UML diagrams	static	structure semantics metrics	metrics assessment	Junit 3.7 JRefactory 1.0 JHotDraw 5.1	\	Java	Mediator Command Strategy State Factory Method Visitor Abstract Factory	\
58	Reverse engineering of design patterns from Java source code	PINOT	source code	static	structure behavior	\	Java AWT 1.3, JHotDraw 6.0e1, Java Swing 1.4, java.io 1.4.2, Java.net 1.4.2, javax 1.4.2, Apache Ant 1.6.2, Argo4JML 0.18.1	HEDGEHOG Fujaba	Java	23 GoF patterns	https://www.cs.ucdavis.edu/~shini/research/pinot/
59	SPQR: Flexible Automated Design Pattern Extraction From Source Code	SPQR	source code	static	structure	XML query	Killer Widget	\	C++	GoF patterns	\
60	Towards Machine Learning Based Design Pattern Recognition	\	source code	static	structure metrics	machine learning	JHotDraw 5.1	PMARt DPD MARLE FINDER	Java	Adapter Decorator Observer Proxy Composite Command	\
61	Using metric-based filtering to improve design pattern detection approaches	Sniffer	source code	static	structure behavior semantics	metrics assessment	QuickUML 2001 Jaw 0.1 JRefactory 1.0 JHotDraw 5.1	\	Java	GoF patterns	\
62	A Matrix-Based Approach to Recovering Design Patterns	DP-Miner	source code	static	structure behavior	matrix computation	JavaAWT 1.4.2 Junit 3.8.2 JEdt 4.2 JHotDraw 6.0 beta1 CCK 1.0.1 GFP 0.1.0	\	Java	Adapter Bridge Strategy Composite	\
63	Efficiently Detecting Structural Design Pattern Instances Based on Ordered Sequences	DePATOS	source code	static	structure behavior	graph matching	Junit 3.7 JHotDraw 5.1 Dom4j 1.6.1 JRefactory 2.6.24 JUL-core 3.6.1 Spring Framework 4.0	DPF DeMIMA DPD Sempatrec	Java	Adapter Decorator Composite Bridge Facade Proxy Flyweight	http://dcs.hku.edu.cn/dspatos/index.html
64	Implications of Deep Learning for the Automation of Design Patterns Organization	\	document	static	semantics	machine learning	(3 pattern collections)	\	\	\	\
65	Towards Pattern-Based Design Recovery	\	source code	static	structure behavior	(dedicated algorithm)	AWT JOL	\	Java	GoF patterns	\
66	Rule-based detection of design patterns in program code	Sempatrec	source code	static	structure behavior semantics	rule matching	Junit 3.7 JHotDraw 5.1 JRefactory 2.6.24	DeMIMA DPD	Java	Singleton Factory Method Abstract Factory Composite Adapter Decorator Visitor Observer Mediator State / Strategy Template Method	http://www.indiana.edu/~jenny/index.php/research/ontologies
67	Feature Maps: A Comprehensive Software Representation for Design Pattern Detection	FRN	source code	static	structure behavior semantics	machine learning	JHotDraw JRefactory Junit Lui MapperXML NetBeans Nutch PAD QuickUML	\	Java	Singleton Template Method Composite Decorator	http://resolver.obvsg.at/urn:nbn:at:at-1-11857
68	Fingerprinting design patterns	Pidej	source code	static	structure metrics	machine learning	JHotDraw 5.1	\	Java C++ Smalltalk Java	Composite	http://www.pidej.net/toob/designpatterns/
69	Efficient Identification of Design Patterns with Bit-vector Algorithm	\	source code	static	structure behavior	approximate string matching	JHotDraw 5.1 Juzzle 0.5 QuickUML 2001	Pidej	Java	Abstract Factory Composite	\
70	DeMIMA: A Multilayered Approach for Design Pattern Identification	DeMIMA	source code bytecode	static dynamic	structure behavior	Prolog programming	JHotDraw 5.1 JRefactory 2.6.24 Junit 3.7 MapperXML 1.9.7 QuickUML 2001	\	Java	Abstract Factory Adapter Command Composite Decorator Factory Method Observer Prototype Singleton State / Strategy Template Method Visitor	http://www.irc.unimore.it/ca/pidej/Publications/Documents/
71	Tool Support for Design Pattern Recognition at Model Level	LAMBDES-DP	UML diagrams	static dynamic	structure behavior	automated theorem proving	(2 samples)	\	\	GoF patterns	\
72	Automatic Design Patterns Identification of C++ Programs	DEPAIC++	source code	static	structure behavior	(dedicated algorithm)	\	\	C++	Abstract Factory Composite Iterator	\

73	Automating design-pattern identification	DP++	source	static	structure	database query	DTK	\	C++	(most structural and a few behavioral patterns)	http://induscsuah.edu
74	Mining Design Patterns from C++ Source Code	\	source code	static	structure	(dedicated algorithm)	Jakes, Leda, StarOffice Calc, StarOffice Writer	\	C++	GoF patterns GoF variants	\
75	Reverse Engineering State and Strategy Design Patterns Using Static Code Analysis	\	source code	static	structure	database query	\	\	C++	State Strategy	\
76	Design pattern detection based on the graph theory	\	source code	static	structure	graph matching	JHotDraw 5.1 JRefactory 2.6.24 JUnit 3.7	np Simpstrac DeMMA DPD	Java	GoF patterns	http://relab.um.ac.ir/index.php/eng-ran
77	The State of the Art on Design Patterns: A Systematic Mapping of the Research state of the art on GoF design patterns: a mapping study	\	\	(mapping study)	\	\	\	\	\	23 GoF patterns	\
78	Research state of the art on GoF design patterns: a mapping study	\	\	(mapping study)	\	\	\	\	\	GoF patterns	\
79	Standing on the Shoulders of Giants - A Data Fusion Approach to Design Pattern Detection	\	source code	static	structure	(dedicated algorithm)	\	DPD DP-Miner PIDS FUJABA	Java	Observer Visitor Decorator Chain of Responsibility Proxy Bridge Mediator Facade	\
80	Elemental Design Patterns - A Link Between Architecture and Object Semantics	\	\	\	\	\	\	\	\	\	\
81	A Design Pattern Detection Technique that Aids Reverse Engineering	\	source code bytecode	static dynamic	structure behavior	(dedicated algorithm)	PURE Toolkit, JINI-based Home Appliance System, Project Management Supporting Tool, MP3 Player StarWriter	PINOT Fujaba	Java	23 GoF patterns	http://relab.sku.ac.kr/832003/undergraduate/tem_project_2005/results/
82	Design Pattern Mining Enhanced by Machine Learning	Columbus	source code	static	structure	machine learning	\	\	C++	Object Adapter Strategy	\
83	Columbus - Reverse engineering tool and schema for C++	Columbus	source code	static	\	\	Jakes Leda Writer	\	C++	\	\
84	Object-oriented design patterns recovery	\	source code	static	structure	metrics assessment	Galib 2.4, LEDA 3.4, Libg++ 2.7.2, Mic 0.3, Socker 1.10, ET++ 3.0 (8 industrial software)	\	C++	Adapter Bridge Composite Facade Proxy Decorator	\
85	Design Pattern Recovery in Object-Oriented Software	\	source code	static	structure	(dedicated algorithm)	galib, grofl, LEDA, libg++, msc, socket	\	C++	Adapter Composite Decorator Bridge Proxy	\
86	Detection of Design Patterns from Class Diagram and Sequence Diagrams Using Ontology	\	UML diagrams	static dynamic	structure behavior	rule matching	(case study)	\	\	GoF patterns	\
87	Dynamic Analysis and Design Pattern Detection in Java Programs	\	source code bytecode	static dynamic	structure behavior	(dedicated algorithm)	JHotDraw 5.1/6.0/7.0.7	\	Java	Adapter Proxy Observer Decorator Bridge Strategy / State	\
88	Measuring Precision for Static and Dynamic Design Pattern Recognition as a Function of Coverage	\	source code bytecode	static dynamic	structure behavior	database query	Java Swing, SwingSet2	\	Java	Observer	\
89	Structural and Behavioral Detection of Design Patterns	\	UML diagrams	static dynamic	structure behavior semantics	XML query	JHotDraw	\	Java	Observer	\
90	Design Pattern Detection in Eiffel Systems	DPVK	source code binary code	static	structure	SQL query	(Sample implementations), EiffelStudio 5.4 (Student implementations)	\	Eiffel	GoF patterns except Prototype Singleton Facade Chain of Responsibility Memento Template Method	\
91	Ontology-Based Design Pattern Recognition	\	source code	static	structure	XML query	\	\	C#	GoF patterns	\
92	Programming language neutral design pattern detection	\	source code	static	structure	(dedicated algorithm)	NUnit	\	C#	Singleton Decorator Composite Chain of Responsibility Factory Method Mediator	\
93	Graph Transformation Rules with weight and Fuzzy Logic for Better Design Pattern Recognition	\	UML diagrams	static dynamic	structure behavior	(dedicated algorithm)	\	\	\	GoF patterns	\
94	A Semantic Web Based Approach for Design Pattern Detection from Source Code	\	source code	static	structure	XML query	JHotDraw 5.1 JRefactory 2.6.24 JUnit3.7	DPD	Java	Singleton Composite Observer Decorator Factory Method Prototype State / Strategy Template Method	\
95	Clustering and lexical information support for the recovery of design pattern in source code	\	source code	static	structure	(clustering algorithm)	JHotDraw 5.1 JUnit 3.7 QuickUML 2001 MapperUML 1.9.7	\	Java	Decorator State / Strategy Adapter Command Composite Observer Prototype Singleton Template Method Factory Method	\
96	ACDPR: A Recommendation System for the Creation of Design Patterns Using Anti-patterns	ACDPR	UML diagrams	static	structure	(dedicated algorithm)	(21 systems)	\	Java	creational patterns	https://github.com/Naclal/ACDPR-clasest
97	Automatic Detection of Design Pattern for Reverse Engineering	\	source code	static dynamic	structure behavior	(dedicated algorithm)	PURE Toolkit, JINI-based Home Appliance System, MP3 Player, JADE core package, Project Management Supporting Tool	PINOT Fujaba	Java	Iterator Singleton Builder Command Memento Prototype Chain of Responsibility Adapter State	http://relab.sku.ac.kr/832003/undergraduate/tem_project_2005/result/
98	Detecting Design Patterns Using Source Code of Before Acquiring Design Patterns	\	source code	static	structure	(dedicated algorithm)	(8 systems from NetStock)	\	Java	State Strategy	\
99	Design Pattern Recognition by Using Adaptive Neuro Fuzzy Inference System	\	source code	static	structure	machine learning	JHotDraw 5.1	PIdel DPD MARPLE FINDER	Java	Adapter Decorator Observer Proxy Composite Command	\
100	Design Pattern Recovery Based on Source Code Analysis with Fuzzy Logic	\	source code UML diagrams	static	structure	fuzzy matching	\	\	Java	GoF patterns	\
101	Dynamic Design Pattern Recognition	\	source code binary code	static dynamic	structure behavior	fuzzy matching	\	\	\	\	\
102	Design Patterns Mining using Subgraph Isomorphism: Relational View	\	source code	static	structure	graph matching	\	\	\	GoF patterns	\
103	Structural variants detection for design pattern instantiation	\	UML diagrams	static	structure	(dedicated algorithm)	\	\	\	structural patterns	\
104	A Decision Tree Approach for Design Patterns Detection by Subgraph Isomorphism	\	UML diagrams	static	structure	graph matching	\	\	\	all 23 GoF patterns	\
105	A Survey: Design pattern detection approaches with metrics	\	source code	static	structure	metrics	\	\	\	GoF patterns	\
106	Design Pattern Detection by Sub Graph Isomorphism Technique	\	source code	static	structure	graph matching	\	\	\	GoF patterns	\
107	Model-Driven Design Pattern Detection Using Difference Calculation	\	UML diagrams	static	structure	(difference algorithm)	\	\	\	GoF patterns	\
108	Detecting Behavioral Design Patterns from Software Execution Data	DePaD	bytecode	dynamic	behavior	(difference algorithm)	Levi 0.1.1 JHotDraw 5.1 JUnit 3.7 MaccorML (Xcode) 1.8.7 JDBC API (JDK1.4.2) MySQL Connected 3.0	\	Java	Observer Strategy State	\
109	Towards a web of patterns	UwC	source code bytecode	static dynamic	structure behavior semantics	XML query	\	\	Java	GoF patterns	http://wwwist.massey.ac.nz/wcp/2005/0204/wcp-dr.xml
110	Source code and design conformance, design pattern detection from source code by classification approach	(AaS)	source code	static	structure	machine learning	JHotDraw 5.1 JUnit 3.7 JRefactory 2.6.24	DPD PINOT FUJABA JaC	Java	Adapter Builder Composite Factory method Iterator Observer	\
111	Applying learning-based methods for recognizing design patterns	\	source code	static	structure	metrics	JRefactory JUnit Quaque	DPD DP-Miner DPIDT AaS	Java	Adapter Bridge Proxy Abstract Factory Singleton Template Method	\
112	Software design pattern mining using classification-based techniques	\	source code	static	structure	machine learning	JHotDraw JUnit QuickUML	DPD MARPLE-DPD AaS DPIDT DP-Miner	Java	Abstract Factory Adapter Bridge Composite Template Method	\