

A digital illustration of a unicorn standing in a misty, blue-toned forest. The unicorn is dark brown with a white mane and a single horn. The forest has tall, thin trees and a large, gnarled tree trunk on the left. The lighting is ethereal, with light rays filtering through the trees.

UNICORNS AND MOBILE SOFTWARE DESIGN ANALYTICS

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REVEAL | FACULTY OF INFORMATICS
UNIVERSITY OF LUGANO, SWITZERLAND





Absurdistan

Bankistan



REVEAL



STANDING

ON THE

SHOULD BE

OF GIANT

Roberto Minelli

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Roberto Minelli

Ph.D. Student @ University of Lugano

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Me

I am a Ph.D. student at the University of Lugano (USI) in the [Faculty of Informatics](#). I am working under the supervision of [Prof. Dr. Michele Lanza](#), in the [REVEAL](#) research group, along with [Dr. Andrea Mocci](#), [Tommaso Dal Sasso](#), [Luca Ponzanelli](#) and [Yuriy Tymchuk](#).

Previously, I obtained my Bachelor and Master Degrees in Informatics in the same Faculty.

For more information you can download my [Curriculum Vitae](#).


Interests

My focus is on Reverse Engineering, Software Evolution, Mining Software Repositories, and Software Visualization. Currently I am developing the concept of [Self-Adaptive IDEs](#), IDEs that collect, process, and leverage the interactions of developers with different information sources to better support the workflow of developers.

In my Master Thesis Project I analyzed mobile applications and developed *SAMOA*, a software analytic tool for apps. In my Bachelor Project I developed *Commit 2.0 for Eclipse*, a tool that enriches commit comments with software visualizations.


I am an enthusiast Apple user: *once you get a Mac you'll never go back*. I like visual arts, design, photography and music. I have attention to detail and an eye for aesthetic design.

Contact



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(Mobile) Software Analytics enables software practitioners to explore and analyze data to obtain insightful and actionable information for data-driven tasks around (mobile) software applications.



**Mobile
Software Analytics**

Huge Marketplace





Huge Marketplace

Technologically Interesting



Huge Marketplace

Technologically Interesting

Novel

Goal

**Study Mobile
Applications
from a Software
Design Point of
View**



References

- ▶ Roberto Minelli; *Software Analytics for Mobile Applications*, MSc Thesis, University of Lugano 2012
- ▶ Roberto Minelli, Michele Lanza; *Software Analytics for Mobile Applications - Insights & Lessons Learned*. In Proceedings of CSMR 2013 (17th IEEE European Conference on Software Maintenance and Reengineering), pp. 144-153, IEEE CS Press, 2013
- ▶ Roberto Minelli, Michele Lanza; *SAMOA - A Visual Software Analytics Platform for Mobile Applications*. In Proceedings of ICSM 2013 (29th IEEE International Conference on Software Maintenance), pp. 476-479, IEEE CS Press, 2013

Software Analytics for Mobile Applications

Master's Thesis submitted to the Faculty of Informatics of the Università della Svizzera Italiana in partial fulfillment of the requirements for the degree of Master of Science in Informatics Software Design

presented by
Roberto Minelli

under the supervision of
Prof. Dr. Michele Lanza
co-supervised by
Dr. Marco D'Ambrosio

June 2012

SAMOA — A Visual Software Analytics Platform for Mobile Applications

Roberto Minelli and Michele Lanza
REVEAL @ Faculty of Informatics — University of Lugano, Switzerland

Abstract. Mobile applications, also known as apps, are software systems running on handheld devices such as smartphones and tablet PCs. The market of apps has rapidly expanded in the past few years into a multi-billion dollar business. From a new perspective, this market sector approaches to maintain and comprehend traditional software systems can be applied to the context of apps. We present a novel approach to comprehend apps from a structural and historical perspective, leveraging three factors: software analytics platform based on third-party APIs, and a number of business-oriented metrics. We implemented this approach in a web-based application, SAMOA. Our findings reveal that apps differ significantly from traditional software systems in a number of ways, which calls for the development of novel approaches to maintain and comprehend them.

Keywords. mobile applications, software evolution, maintenance, analytics, making software resilient.

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Software Analytics for Mobile Applications – In

Roberto Minelli and Michele Lanza
REVEAL @ Faculty of Informatics — University of Lugano

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2. Related Work. Due to the recent boom of apps, there is little work, and its nature is quite heterogeneous. They divided apps in categories (i.e., cards, navigation, photography, social and weather) and another app in each category appear in the App Store. We want to study the source code of apps, and their changes of distribution, to understand if and the possible implications for the maintenance of apps.

I
**Source Code Design &
Implementation**

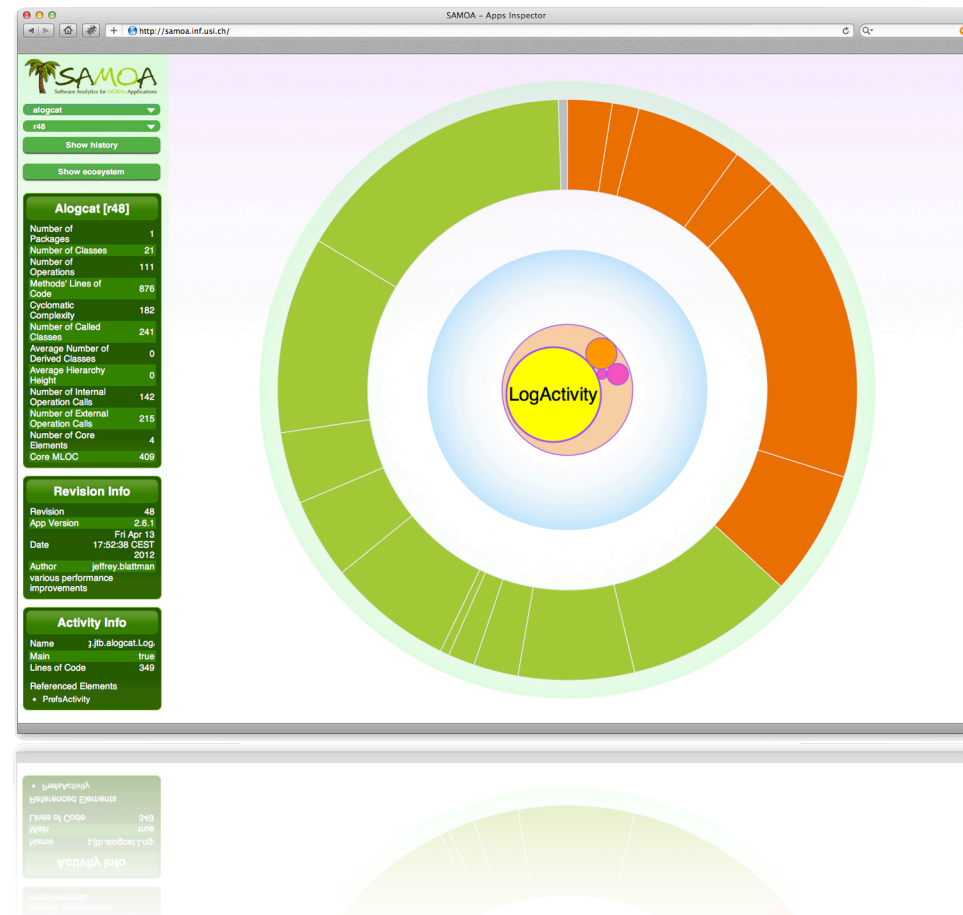
II
Evolution

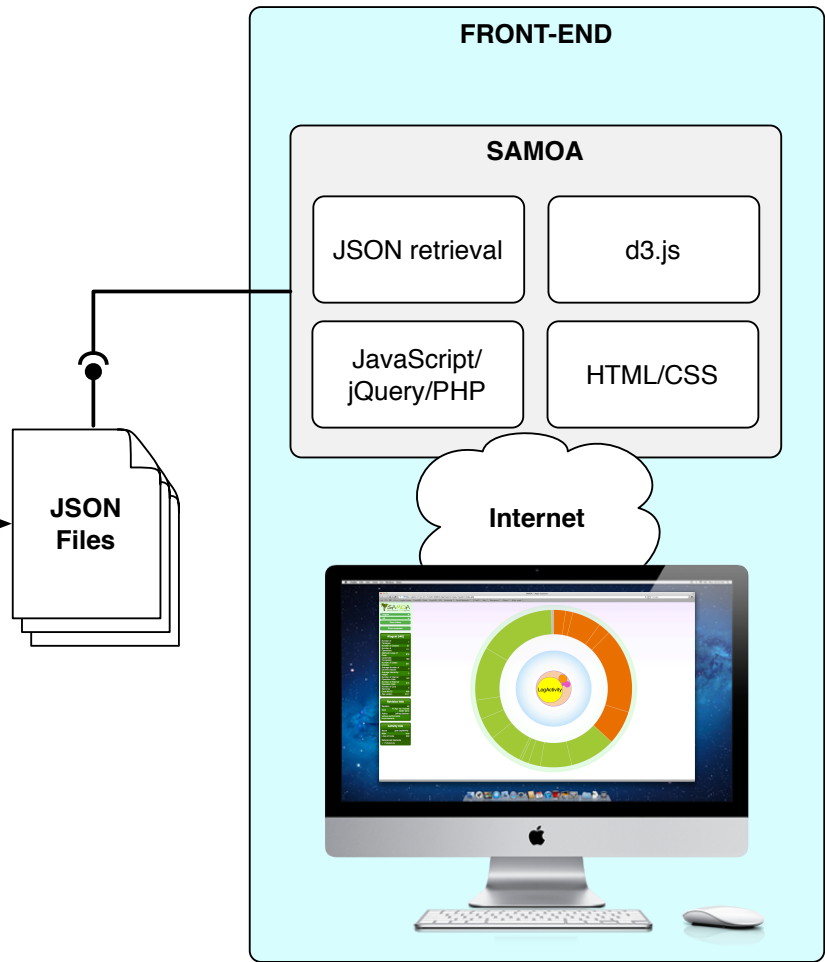
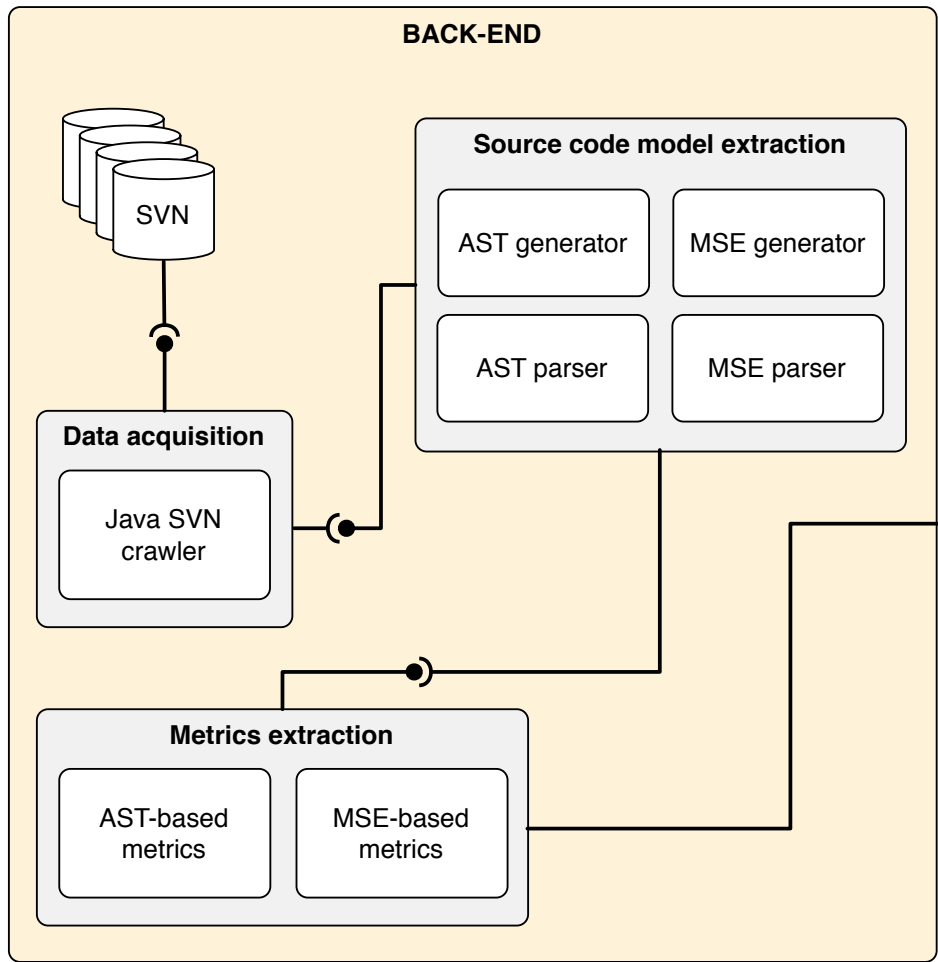
III
Use of 3rd Party Libraries



SAMOA

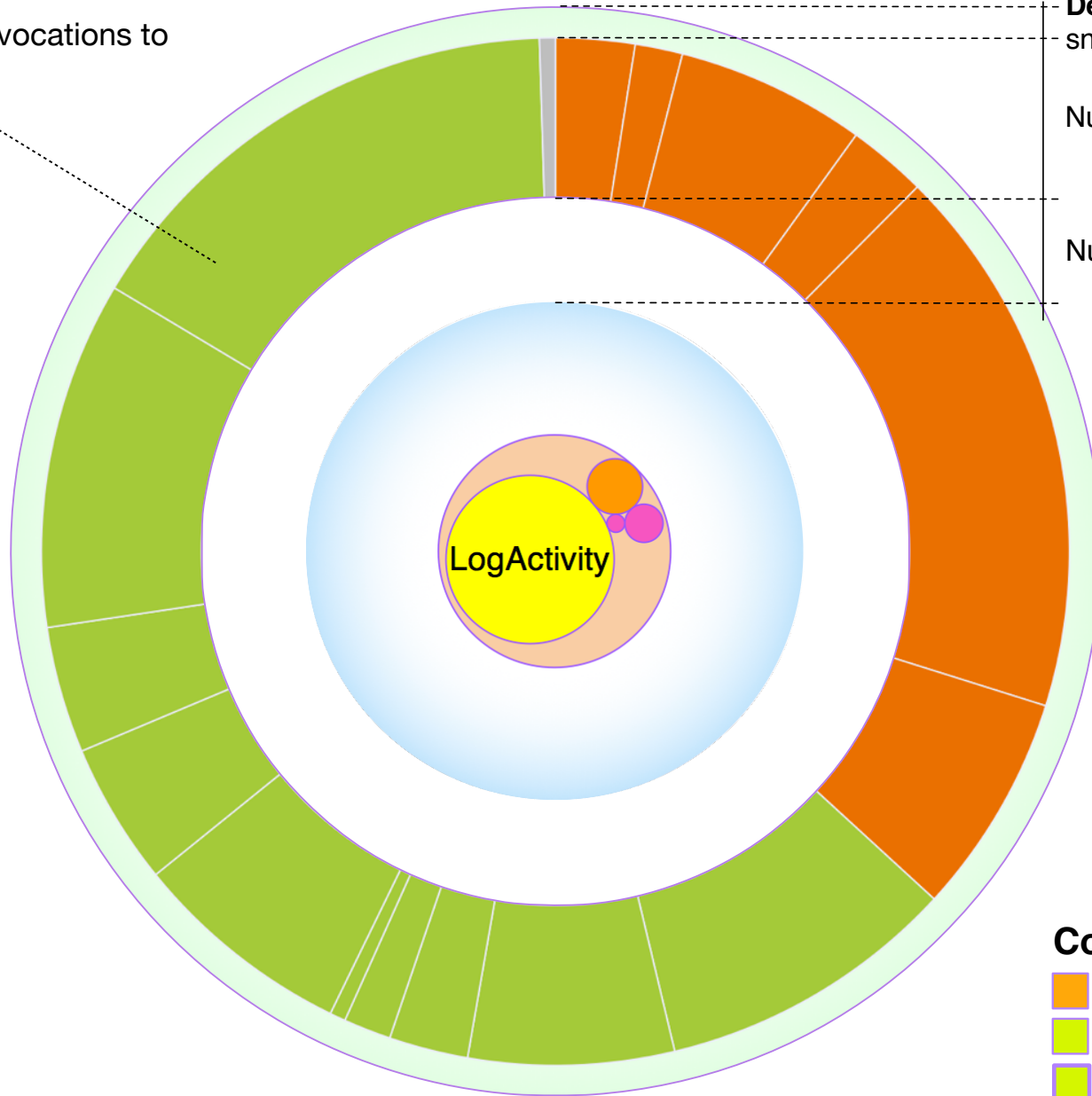
Software Analytics for MOBILE Applications





Name	Rating	Installs	Start rev.	End rev.	LOC
Alogcat	4.6	>100k	2	48	876
Andless	4.2	>100k	2	93	2372
Android VNC	4.3	>1m	2	203	4949
Anstop	N/A	N/A	2	61	1142
AppSoundmanager	4.5	>50k	1	157	1605
AppsOrganizer	4.6	>1m	3	191	8321
CSIPSimple	4.4	>100k	2	1'415	20777
Diskusage	4.7	>50k	2	69	4749
Mythdroid	N/A	N/A	76	640	6114
Mythmote	4.6	>10k	2	281	1593
Open GPS Tracker	4.2	>100k	2	1'255	9754
Opensudoku	4.6	>1m	15	415	3813
Replicaisland	4.2	>1m	2	7	14192
Ringdroid	4.6	>10m	2	66	3516
Search Light	4.7	>100k	2	4	272
Share My Position	4.6	>10k	2	76	468
SIPDroid	4	>500k	50	620	14019
Solitaire for Android	4.3	>10m	2	30	3343
Zirco Browser	3.8	>10k	65	457	6429
Zxing	4.3	>50m	569	2'257	3407

Slices represent invocations to **third-party APIs**



Delta with largest snapshot in history

Number of **External** Calls

Number of **Internal** Calls

Call ring colors

- Green: Android calls
- Orange: Java calls
- Light Blue: Javax calls
- Pink: Apache calls
- Grey: Not classified calls
- Light Grey: All other calls

Core colors

- Orange: Activity
- Yellow: Main Activity
- Light Yellow: Default Main Activity
- Pink: Service
- Dashed Purple: Phantom element

Part I

Snapshot based

- Dominance of external calls
- Dominance of internal calls
- God-core classes
- High core ratio
- Low core ratio
- Multiple main activities

Part II

History based

- Core drop
- Delayed use of versioning systems
- Flat intervals in history
- Gradual increase of core elements
- High correlation between LOC and third-party calls
- Out-of-sync manifest file
- Snap decrease of core elements
- Snap increase of core elements
- Stepwise growth in history
- Stepwise increase of core elements



Much adoe about
Nothing.

As it hath been sundrie times publikely
acted by the right honourable, the Lord
Chamberlaine his seruants.

Written by William Shakspeare.



LONDON
Printed by V.S. for Andrew Wise, and
William Aspley.
1600.

“Findings”

- ▶ There were no substantial findings
- ▶ Design principles are essentially absent: Everything is hacked together
- ▶ Even basic guidelines are being ignored
- ▶ Code Quality is not a concern
- ▶ Warning: Our dataset was not small, but by no means large (enough)

Conclusions?



Conclusions



Reflections

- ▶ Time-to-market is paramount for apps, who cares about the code, as long as it does what it's supposed to do
- ▶ Most apps have such a small core domain model that there's not really much to "design"
- ▶ The extensive usage of APIs creates some interesting problems, also regarding intellectual property
- ▶ In a way the dream of component-based software engineering is being realized here, but it's not a dream, it's a nightmare

DEFAULT

SNAPSHOTS

TAKE SNAPSHOT

Reflections Too

- ▶ As long as “apps” run on mobile phones I doubt they will become much more complex: Too many UX concerns
- ▶ Things might change radically when tablets start departing from phones in terms of apps
- ▶ Our work is 3 years old
 - ▶ Maybe things changed, but I am not interested
 - ▶ Maybe we looked in the wrong place, at the wrong things



Fin