

# Daniil Tiganov

✉ tiganov@ualberta.ca | 🏠 tiganov.ca | 📱 tiganov

## Summary

I'm interested in security analysis tools and frameworks that can be widely adopted by developers and integrated into their workflows. I put high priority on making my work usable, well documented, and maintainable. I'm also interested in incorporating the latest and most advanced static analysis research into my work to maximize precision and scalability. My current focus is enabling iOS Swift developers to analyze their apps for security vulnerabilities: <https://github.com/themaplelab/swan>.

## Education

### University of Alberta

Edmonton, Alberta, Canada

BSC SPECIALIZATION IN COMPUTING SCIENCE

Sept. 2016 - Exp. Dec. 2021

Accepted to M.Sc. in Computing Science (thesis-based) at University of Alberta, starting January 2022.

## Research

### The Maple Lab, University of Alberta

Edmonton, Alberta, Canada

RESEARCH ASSISTANT

May 2021 - PRESENT

- Supervisor: Dr. Karim Ali
- Working on SWAN, a static program analysis framework for Swift.
- Wrote an efficient call graph construction algorithm.
- Enabled taint analysis for detecting security vulnerabilities.
- Enabled tpestate analysis for detecting API misuses.
- Wrote analyses for detecting inefficient configurations of Swift location APIs (based on our ICSME '21 paper).

PART-TIME RESEARCH ASSISTANT (UNOFFICIAL)

Jan 2020 - Apr 2021

- Published a tool paper about SWAN to ESEC/FSE 2020.
- Rebuilt SWAN to parse plain-text Swift Intermediate Language (SIL).
- Developed a new intermediate representation for SWAN, called SWIRL.
- Integrated SWAN into Synchronized Pushdown Systems points-to analysis.

RESEARCH ASSISTANT

May 2019 - Dec 2019

- Developed SWAN in cooperation with IBM.
- Documented and overhauled framework to be more modular and maintainable.
- Rewrote SIL to WALA CAST translator.
- Wrote a custom SWAN-specific IR with parser.
- Developed a VSCode and CLI tool frontend.

## Work Experience

### Synopsys

Calgary, Alberta, Canada

SECURITY ANALYSIS INTERN

Jan. 2020 - Dec. 2020

- Worked on Coverity, mostly in C++.
- Improved Spring framework view resolution configuration and annotation support.
- Increased the OWASP benchmark score of the new analysis engine by 24%.
- Increased analysis precision by resolving numerous false negatives and false positives.
- Ported several security checkers to Kotlin.

### Greentree Engineering

Tisdale, Saskatchewan, Canada

SURVEYOR/GENERAL LABOURER

May 2018 - Aug. 2018

- Wrote a GUI tool in Python that addressed a bottleneck in topological surveying. The tool was used on multiple job sites.
- Gained practical GIS experience by surveying and laser scanning agricultural sites, and staking construction entities, such as roads, concrete foundations, and excavations.

### Greentree Engineering

Tisdale, Saskatchewan, Canada

GENERAL LABOURER

Jun. 2017 - Aug. 2017

## Publications

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**Daniil Tiganov**, Lisa Nguyen Quang Do, and Karim Ali. "Designing UIs for Static Analysis Tools: Evaluating tool design guidelines with SWAN." *Queue*, 2021.

ACM Queue

Abdul Ali Bangash, **Daniil Tiganov**, Karim Ali, and Abram Hindle. "Energy Efficient Guidelines for iOS Core Location Framework." *International Conference on Software Maintenance and Evolution*, 2021

ICSME

**Daniil Tiganov**, Jeff Cho, Karim Ali, and Julian Dolby. "SWAN: A Static Analysis Framework for Swift." *ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering*, 2020

ESEC/FSE

Tool Paper

## Projects

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### SWASAR

CMPUT 497, UNIVERSITY OF ALBERTA

Jan. 2019 - Apr., 2019

- **Keywords:** C++, LLVM, Phasar, Static program analysis
- This project was an attempt at implementing taint analysis on Swift applications using Phasar, an LLVM static analysis framework.
- LLVM IR generated from the Swift compiler is fed to a modified Phasar analysis to find the presence of taints in the Swift source code. The taint analysis was successful, but using an LLVM analysis framework is not ideal for analyzing Swift applications.

### QuickTopo

PRAIRIUM

Jul. 2018 - Sept. 2020

- **Keywords:** JavaScript, Go, Mapbox GL JS, GeoJSON, Leadership, Web, GIS
- I lead a team of 3 other developers under the name Prairium. We worked on developing an independent commercial solution, Quick-Topo, to address a bottleneck in the topological surveying process, especially in the area of agriculture.
- I have developed and used a prototype for this software when I was working as a surveyor for Greentree Engineering.

### CloudCity

HACKED 2019

Jan. 2019

- **Keywords:** C++, openFrameworks, Game design
- My team and I developed a simple city building game about population management using openFrameworks for HACKED 2019.

### Cluedo Assistant Tool (CAT)

PERSONAL PROJECT

Oct. 2018 - Dec. 2018

- **Keywords:** C#, WPF, Desktop application design
- I made a simple desktop application using WPF to assist in keeping track of moves and cards in the game of Cluedo.

### DoctorPlzSaveMe

CMPUT 301, UNIVERSITY OF ALBERTA

Sep. 2018 - Dec. 2018

- **Keywords:** Android, Leadership, Mobile application development
- I took on the role of project lead and backend developer for this course project.
- We developed an app that allows users to track/record their medical issues and receive feedback from a care provider.

### Other Projects

- **Starcraft 2 bot** - CMPUT 350 project: I helped develop a bot based on CommandCenter and pitted it against other teams' bots. I worked on siege tank and resource gathering AI.
- **Black Hole Visualizer** - I attempted to visualize a spinning black hole using openFrameworks for an ASTRO creative assignment. The result is good enough to roughly represent how particles are affected by a black hole. This work was later presented at a teaching conference by one of the course coordinators.
- **Laser Tag Pistol** - I 3D-printed, built, and programmed a custom laser tag pistol. It uses a Teensy for a micro-controller, produces various sounds, has LED animations, and can receive/send unique IR signals (to be able to differentiate between teams, for instance).
- **Automatic deadbolt opener** - I 3D printed, built, and programmed a remote-based automatic deadbolt opener for my dorm.

## Skills

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**Languages** Java, Scala, C/C++, JavaScript, Go, Kotlin, Swift, C#, Python, MIPS Assembly

**Frameworks** WALA, openFrameworks, AngularJS, WPF, JavaFX, Mapbox GL JS, Arduino

**Other** Land surveying and laser scanning (Trimble TSC3, SurveyPro, RTK GNSS, Trimble TX5), Skid-Steer, SolidWorks

**Languages** English, Russian