

# Sacha-Elie Ayoun

PHD STUDENT · SUPERVISED BY PROF. PHILIPPA GARDNER · IMPERIAL COLLEGE LONDON

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## Education

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### Imperial College London

PHD IN COMPUTER SCIENCE - UNDER THE SUPERVISION OF PROF. PHILIPPA GARDNER

Part of the Verified Trustworthy Software Specification Group. Working on Gillian, a parametric symbolic analysis framework, and instantiating it on JavaScript, C and Rust.

*London, United Kingdom*

*Oct. 2018 - present*

### Marktoberdorf Summer School on Safety and Security of Software Systems

ATTENDING THE SUMMER SCHOOL

Link to the summer school program : <https://www2.in.tum.de/mod19/lectures.html>

*Marktoberdorf, Germany*

*Aug. 2019*

### Imperial College London

MSC IN ADVANCED COMPUTING - WITH DISTINCTIONS

- Thinking about programs: Complexity (A\*), Separation logic (A\*), Probabilistic model checking and program analysis(A\*\*), System Verification(A\*)
- Security: Advanced classes (A), Privacy Enhancing Techniques (A\*), Network and Web(A).
- Software engineering(A)
- Machine Learning: Deep learning (A), Reinforcement Learning (A\*)

*London, United Kingdom*

*Oct. 2017 - Sept. 2018*

### CentraleSupélec, Supélec Curriculum

MSC IN ELECTRICAL AND COMPUTER ENGINEERING

CentraleSupélec is a top-tier French professional school of science and engineering, with partner programs with prestigious universities around the world, such as MIT, Columbia, Oxford, and Imperial College.

- Broad curriculum with over 30 different subjects, ranging from Corporate Law to Electrical Engineering, Networks, and Operating systems. Average 3.7/4.
- Excellent computer science-related results. Algorithms and Data Structures (4), Numerical Methods of Optimisation (4), Operating Systems and Networks (4), Big Data (4), Software Engineering (4)
- One of the top engineering school in France

*Gif-Sur-Yvette, France*

*Sep. 2015 - present*

### Classes Préparatoires Charlemagne

FRENCH CLASSES PRÉPARATOIRES: 2-YEAR ELITE, INTENSIVE PROGRAM IN ADVANCED MATHEMATICS, PHYSICS AND COMPUTER SCIENCE

- Ranked 43rd out of 1600 contestants on the French national ENS contest in Mathematics and Computer Science
- Accepted at both CentraleSupélec and ENS Lyon (an elite French public educational institution)

*Paris, France*

*Sep. 2013 - Jun. 2015*

## Experience

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### French Alternative Energies and Atomic Energy Commission (CEA)

RESEARCH INTERN ON FRAMA-C, A STATIC ANALYSER FOR THE C PROGRAMMING LANGUAGE

Frama-C is a modular static analysis tool based on abstract interpretation. In particular, its EVA (Evolved Value Analysis) module automatically computes sets of possible values for the variables of an analysed program. My role was to develop a new abstract domain that would keep track of the state of every file descriptor. During the internship, I extended this abstract domain to keep track of the states of variables that do not depend only on the value they have. This involved handling variable aliases, and working with the POSIX file system and understanding the way in which it interacts with the C language. For my work, I have received excellent feedback from my supervisor.

*Saclay, France*

*Jul. 2017 - Sept. 2017*

### CentraleSupélec - Exams Organisation Committee

TREASURER OF THE WELCOME COMMITTEE FOR COMPETING STUDENTS

A summer internship, during which my team had to welcome competing students for the exams to enter the French Grandes Ecoles for one week that they would spend on our campus. Each week, between 200 and 300 students would come and live on our campus to take their exams. My role involved managing the budget and treasury for the four weeks, during which I handled over 16K€, the planning of events, and communication with the students.

*Paris-Saclay, France*

*Jun. 2016 - Jul. 2016*

### Vitalliance (Home Care Assistance Company) - Digital Division

DESIGN INTEGRATION ON A MOBILE APPLICATION

As a study for CentraleSupélec's Junior Enterprise, I integrated a new graphical user interface (GUI) to an existing mobile application using hybrid technologies (Apache Cordova). I used the payment to finance my Student Union Campaign.

*Paris, France*

*Jan. 2016 - Feb. 2016*

# Projects

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## Imperial College - Verified Trustworthy Software Specification Group

London, United Kingdom

GILLAN AND GILLIAN-C

Oct. 2018 - Present

Gillian is a language-independent framework for the development of compositional symbolic analysis tools. It supports three flavours of analysis: whole-program symbolic testing, full verification, and bi-abduction. For a given language, Gillian requires as input a compiler from the language to our intermediate language GIL and an implementation of the memory model and basic actions for the model. Gillian then provides a complete toolchain for the symbolic analysis of that language. For now, Gillian has been instantiated to:

- Gillian-JS, an analysis tool for JavaScript whose performance is as good as the previous work on JaVert 2.0.
- Gillian-C, an analysis tool for C leveraging CompCert, a Coq-certified C compiler developed at Inria with promising initial results for performance.
- Gillian-while, an analysis language for a toy while language which we will use for experimentation into error reporting, concurrency,...

My main contribution is the instantiation and evaluation of Gillian to while and C. Gillian has recently been submitted for publication.

## Imperial College - Verified Trustworthy Software Specification Group

London, United Kingdom

INDEPENDENT STUDY OPTION AND MSc PROJECT - A VERIFICATION TOOL FOR THE IMPERIAL SEPARATION LOGIC COURSE

Jan. 2018 - Sept. 2018

JaVerT is a verification toolchain for Javascript developed by the Verified Trustworthy Software Specification group at Imperial College. JaVerT includes JS-2-JSIL, a logic-preserving compiler from an intermediate goto language called JSIL, as well as JSIL Verify, a verification tool based on a sound separation logic for JSIL. My project was to develop a verification tool for a small record-based While language that is used in the Imperial Separation Logic course, by implementing a logic-preserving compiler from this While language to JSIL and leveraging on JSIL Verify for verification. I also added a Language Server Protocol layer in front of the verification tool in order to make it transparent for the users. This will allow the students taking the course to mechanically verify the algorithms used in the course and gain further experience in using verification tools, improving the overall quality of the course.

## CentraleSupélec - ViaRezo

Paris-Saclay, France

"LINKCS" PROJECT MANAGER: DEVELOPMENT OF A WEB AND MOBILE APPLICATION FOR CAMPUS LIFE

Sep. 2016 - Sep. 2017

CentraleSupélec was recently created by a merger between the Ecole Centrale Paris and Supélec. This merger, coupled with the very active student and societal life in the school, gave rise to the need for an application that would help the students manage their everyday lives inside the campus societies. As project manager, I led the development of this application, with its very ambitious micro-services architecture and use of cutting-edge web technologies, such as NodeJS, ReactJS, and GraphQL. I designed the application in a modular way; currently, it includes a directory of all students and societies, as well as an accompanying calendar, but can be easily extended with other services in the future. This is a multi-year long ongoing project, for which I serve as a consultant on a regular basis.

# Extracurricular Activity

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## HackCS - Hackathon CentraleSupélec

Gif-sur-Yvette, France

PRESIDENT AND FOUNDER

Dec. 2016 - July 2017

Founded HackCS, CentraleSupélec's student-organised hackathon. 80 students participated in the first edition, in partnership with Schlumberger.

## Skylight - Student Union list for elections

Gif-sur-Yvette, France

MEDIA AND IT MANAGER

Nov. 2016 - January 2017

Our list of 23 students ran for the student union campaign. After raising over 15000€, we organised a week full of events for the whole school. It was the best team work exercise I have ever been through.

## Hyris - Video making society

Gif-Sur-Yvette, France

IT RESOURCE MANAGER

May 2016 - May 2017

Hyris is the video making society of CentraleSupélec. As IT Resource Manager, I was in charge of maintaining and updating the IT infrastructure of the society. During this time, I also acquired skills in video filming and editing.

## MagiCS - Magic Society

Gif-Sur-Yvette, France

TREASURER

May 2016 - May 2017

I was treasurer of MagiCS, the Magic Society of CentraleSupélec. This involved managing the budget for the societies, and also served as an excellent opportunity for me to develop presentation and communication skills needed for performing in magic shows.

# Skills

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### TECHNICAL SKILLS

- Programming languages: OCaml, Javascript, Python, Java
- Web technologies: Django, NodeJS, GraphQL, SQL, MongoDB, Neo4J, HTML/CSS

### LANGUAGES

- French: Native
- English: Fluent
- Spanish: Notional