

Iván Arcuschin Moreno

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About

I'm a close-to-be-graduated **PhD candidate in Computer Science at the University of Buenos Aires**, Argentina. I'm passionate about **Machine Learning** and **Software Engineering**, two topics which I've studied in-depth during my PhD. Right now, I'm fascinated by the way AI models are becoming incredibly common and making a big impact in society, even though *we still don't fully understand how they work*. This has motivated me to dive deep into the field of **Mechanistic Interpretability**, both by reading research papers and by working on self-learning projects.

My PhD experience, along with my extensive teaching experience, has taught me how to **break down complex problems** into smaller parts, **analyze them thoroughly**, and communicate the results in a **clear and concise way**. It has also given me the skills to conduct **empirical studies** using proper statistical analysis. I'm a **fast learner** and **proficient programmer**, skills that I further honed during my AWS Applied Scientist internship, allowing me to effectively solve a wide range of challenging problems.

Education

- Jan-Mar 2024 **Research Scholar, ML Alignment & Theory Scholars, (MATS)**
(in progress) Mentorship: *Dr. Adrià Garriga-Alonso*. The current project aims to build a benchmark of artificially compressed transformers with known circuits for evaluating circuit discovery techniques.
- Nov-Dec 2023 **Auditor participation of Neel Nanda's training program, ML Alignment & Theory Scholars**
I've completed the following ARENA tutorials on Mechanistic Interpretability:
 - [Intro to Mechanistic Interpretability: TransformerLens & induction circuits](#)
 - [Indirect Object Identification](#)I've also participated in reading groups for the following papers:
 - ["A Mathematical Framework for Transformer Circuits"](#)
 - ["Towards Monosemanticity: Decomposing Language Models With Dictionary Learning"](#)
 - ["Interpretability in the Wild: a Circuit for Indirect Object Identification in GPT-2 small"](#)
- 2018 - present **PhD candidate in Computer Science, University of Buenos Aires (UBA), Argentina**
Thesis title: "Random Espresso Test Case Generation for Android". Supervisor: Dr. Juan P. Galeotti.
Expected graduation date: March 2024.
- 2013 - 2018 **Licenciante (BSc + MSc) in Computer Science, UBA, Argentina**
Thesis title: "An Empirical Evaluation of Sapienz Approach for Automatically Generating Test Cases for Android Applications"

Research

My PhD's research focuses on improving the techniques for **automatic test case generation on Android apps**, specifically using Espresso, a popular UI testing framework for Android. I've also studied the effectiveness of **search-based algorithms**, such as genetic and evolutionary, for test generation in this context. My work has been published at international conferences: **ICSE** and **AST**. Additionally, I served as a mentor to several undergraduate students working on their Master's theses, helping me develop my leadership capabilities.

— Published papers

- 2024 **Arcuschin I.**, Di Meo L., Auer M., Galeotti J., Fraser G., *Brewing Up Reliability: Espresso Test Generation for Android Apps*. To appear in *International Conference on Software Testing, Verification and Validation (ICST)*
- 2022 **Arcuschin I.**, Ciccaroni C., Galeotti J., Rojas J.M., *On the feasibility and challenges of synthesizing executable Espresso tests*. *International Conference on Automation of Software Test (AST)*
- 2021 **Arcuschin I.**, Galeotti J., Garbervetsky D., *An Empirical Study on How Sapienz Achieves Coverage and Crash Detection*. *Journal of Software: Evolution and Process (JSEP)*
- 2020 **Arcuschin I.**, Galeotti J., Garbervetsky D., *Algorithm or Representation? An empirical study on how SAPIENZ achieves coverage*. *International Conference on Automation of Software Test (AST)*

2020 **Arcuschin I.**, *Search-Based Test Generation for Android Apps*. Doctoral Symposium at International Conference on Software Engineering (ICSE)

— Research visits

2019 **Visiting researcher**, *ERATO Metamathematics for Systems Design*, Tokyo, Japan
Visited **Prof. Dr. Fuyuki Ishikawa**. Duration: 3 months. I worked on the problem of **generating realistic test scenarios**, aiming to assess the quality of **self-driving vehicle's control software** in the presence of **unreliable ML components**.

2019 **Visiting researcher**, *University of Leicester*, Leicester, UK
Visited **Prof. Dr. José Miguel Rojas**. Duration: 2 months. This visit laid the foundations for the paper "*On the feasibility and challenges of synthesizing executable Espresso tests*", in which we analyze the feasibility of leveraging state-of-the-art **Android generation tools** for producing Espresso tests by **translating their output to the Espresso API**.

— Scientific Experiences & Awards

2020 Student Volunteer participation, *International Conference of Software Engineering (ICSE)*

2017 Google Latin America Research Award, **Google**

& 2018 Awarded for the research project "*EVOLUTIZ: Multi-objective Test Generation for Testing Evolving Android Applications*". This project was accepted for an extension in 2018.

2017 Student Volunteer participation, *International Conference of Software Engineering (ICSE)*

Industry

2022 **Applied Scientist Intern**, *Amazon Web Services (AWS)*, New York, U.S
Member of the **Automated Reasoning Group**. Developed a methodology to minimize **confidential software artifacts**, discarding sensitive information while preserving **security defects** for automated analysis on tools such as **CodeGuru Reviewer**. The methodology was implemented as a tool and deployed in production.

2017 - 2022 **Backend developer (Freelance)**, *Dubbing Digital*, Buenos Aires, Argentina
Designed and implemented RESTful APIs and DB models. Development of extensive test suite for backend. Technologies: **JavaScript**, **TypeScript**, **Node.js** and **PostgreSQL**.

Coursework in PhD curriculum

— Artificial Intelligence and Machine Learning

- **Data Science with R: Statistical Foundations**, Lecturers: *Dr. Ana Bianco and Dr. Mariela Sued*
Final project: Design, prepare and record a **short lesson** on how to implement a **Naive Bayes** classifier for **sentiment analysis** using **R**.
- **Ethics on AI**, Lecturers: *Dr. Vanina Martinez and Dr. Ricardo Rodriguez*
Final project: **Written essay** analyzing the **ethical implications** of using **AI agents** for finding missing children in the context of **warfare**, based on the **G20's OECD framework for the classification of AI systems**.
- **Introduction to Machine Learning**, Lecturers: *Dr. Pablo Brusco and Dr. Matías Lopez-Rosenfeld*
Final project: **Oral presentation** of the paper "*Competition-Level Code Generation with AlphaCode*", and an **evaluation of different ML algorithms** (e.g., Decision Trees, SVM, etc.) on a simple classification problem.
- **Introduction to Natural Language Processing**, Lecturer: *Dr. Luciano del Corro*
Topics: Word embeddings (word2vec), N-grams, LSTM models (ELMo), Transformer models (BERT, GPT).

— Automated Software Engineering

- **Meta-heuristics**, Lecturer: *Dr. Irene Loisseau*
- **Development and Automated Testing of RESTful APIs**, Lecturer: *Dr. Andrea Arcuri*
- **Advanced Analysis and Automatic Synthesis of Programs**, Lecturer: *Dr. Diego Garverbetsky*
- **Models and Algorithms for Systems Analysis**, Lecturer: *Dr. Víctor Braberman*

Self-learning projects

- **Mechanistic Interpretability walkthroughs**
Completed Neel Nanda's **walkthrough** for the paper "*Progress measures for grokking via mechanistic interpretability*" and **tutorial** for implementing a GPT-2 style transformer from scratch in PyTorch.

- **Software Engineering for AI (SE4AI) study group**
Participated in a weekly reading group about SOTA techniques for **Automated testing and verification of ML-enabled systems**, organized by the Software Engineering & Formal Methods laboratory at UBA.
- **Presentation of Mechanistic Interpretability paper at SE4AI study group**
[Oral presentation](#) of the paper "*Progress measures for grokking via mechanistic interpretability*", with a focus on the **mechanistic interpretability** research framework.

Teaching

- current year **Head Teaching Assistant**, *University of Buenos Aires, Argentina*
- & 2018 - 2019 Courses: *Software Engineering II, Computer Architecture II, and Operating Systems.*
- 2016 - 2018 **Teaching Assistant**, *University of Buenos Aires, Argentina*
Courses: *Introduction to Programming, Programming Paradigms, and Algorithms and Data Structures II.*