

# Caner Derici, PhD

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## Technical Skills

<b>Areas of Expertise:</b>	Compilers & Programming Languages · Machine Learning · Distributed Systems
<b>Languages:</b>	C++ · LLVM · MLIR · Go · Python · Racket/Scheme · Java · SQL · JavaScript
<b>Workflows &amp; Productivity:</b>	Linux · Neovim · tmux · VSCode · Copilot · Git · GH Actions · Obsidian · Toggl · Todoist
<b>API, DB &amp; Misc:</b>	REST · gRPC · OpenAPI · FastAPI · DQLite · MongoDB · PostgreSQL · CI/CD · Jenkins

## Education

Ph.D., <a href="#">Indiana University, Bloomington</a> , Computer Science, Compilers & Programming Languages	2015 – 2025
Dissertation: <a href="#">Self-Hosting Functional Programming Languages on Meta-Tracing JIT Compilers</a>	
M.Sc., <a href="#">Boğaziçi University</a> , Computer Science, Machine Learning & Natural Language Processing	2012 – 2014
B.Sc., <a href="#">Bilgi University</a> , Computer Science	2005 – 2010

## Selected Projects

### [Pycket: A tracing JIT compiler for full-scale bootstrapping functional language](#)

Built the first tracing JIT capable of running a self-hosting language on a meta-tracing JIT backend, and worked on it [for over five years](#) during PhD. Created a new IR and implemented [performance analysis tools](#), run-time optimizations, and [formalisms](#) to improve throughput. Added code-gen for the FFI layer, engines, and meta-continuations for user threads. Used Python, C++, and Racket.

### [Around the World in 26 Languages](#)

Building a personal collection of experimental compilers, one for each letter of the alphabet, named after a world city. Each explores different ideas in language design, IR construction, optimizations, and run-time. Targeted backends include LLVM IR, MLIR, NVPTX for CUDA. All in C++.

### [Racket IR: Linklets](#)

Contributed to Linklets, the intermediate representation and compilation unit format used in current Racket releases on Chez (see publications). Documented Linklets' design and developed its formal semantics in my [PhD dissertation](#).

### [Rax: A full-stack nanopass compiler from Racket to x86\\_64](#)

Implemented all the passes (closure conversion, register allocation, code-gen, etc.), along with garbage collection. Developed optimizations, such as inlining, loop-invariant code motion, and proper tail calls. In Racket, and C++.

### [FARS: Functional Automated Reasoning System](#)

A resolution/refutation theorem prover, for expressions in first-order predicate logic with equality. Used binary paramodulation, and forward and backward subsumption for equational deduction. In Racket.

### [HazirCevap \(Witty\): A closed-domain question answering system for high school students](#)

Government-funded large-scale question-answering system. M.Sc. thesis on NLP. Led the R&D team (3 faculties, 4 grad students). Developed a Hidden Markov Random Field model for question analysis, and relevance metrics for information retrieval and response generation (see publications). In Python, and JavaScript.

## Experience

Canonical USA	REMOTE, US
<b>SWE II (L4 - IC3) · Domain Specific Language Compiler &amp; Distributed Orchestration</b>	2021 – 2024
<ul style="list-style-type: none"><li>Designed and developed a custom scripting DSL for (CPU &amp; memory) restricted computations. Built compiler on top of a modified Lua interpreter in Go.</li><li>Developed and maintained <a href="#">Juju</a>, an eventually consistent distributed orchestration system used by ~200 companies globally, capable of handling 1000+-node workloads with 99.9% availability on any infrastructure (Kubernetes or otherwise) across various cloud providers (e.g., AWS, GCE). All in Go.</li><li>Improved reliability and fault tolerance by implementing edge machine services on relational DQLite back-end, migrating from NoSQL MongoDB (e.g., <a href="#">sample PR</a>).</li><li>Owned client libraries for three years—<a href="#">python-libjuju</a>, <a href="#">Terraform Juju Provider</a>; doubled active users and maintained a steady release cadence.</li><li>Took part in roadmap planning, coordinated cross-team work; mentored junior engineers, and improved hiring by creating a structured bootcamp process that cut down onboarding new engineers from 6 months to 1 month.</li></ul>	

Indiana University	IN, US
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<b>Research Assistant, Course Instructor</b>	2015 – 2021
<ul style="list-style-type: none"><li>Independently took an ambiguous, uncharted compiler problem to a working product; built the first-ever tracing JIT compiler that is a full-scale runtime for a self-hosting, production-grade language. Conducted a full performance investigation and designed new optimization algorithms (see <a href="#">PhD dissertation</a>).</li><li>Taught data structures &amp; algorithms, compilers, virtual machines, and domain specific languages.</li></ul>	

- International software company developing virtual payment systems for e-commerce platforms. I developed and delivered 3 virtual point-of-sale projects in 2 years. Used Java, Apache Tomcat, Spring, Mercurial, Jira.

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## Selected Publications

- Flatt M., Derici C. Dybvig R. K., Keep A. et. al. "Rebuilding racket on chez scheme (experience report)", ICFP'19
- Derici C. et. al. "A closed-domain question answering framework using reliable resources to assist students" Natural Language Engineering'18
- Derici C. et. al. "Question analysis for a closed domain question answering system", CICLING'15
- Derici C. et. al. "Rule-based focus extraction in Turkish question answering systems", SIU'14
- Başar R. E., Derici C., and Şenol Ç. "World With Web: A compiler from world applications to JavaScript". Technical Report, Scheme and Functional Programming Workshop'09

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## Awards & Scholarships

- Scholarship and award for a project on teaching natural languages to hearing impaired, 2014.
  - Full Scholarship for PhD, 2015-2025
  - Full Scholarship for MSc, 2012
  - Full Scholarship for BSc, 2005-2010
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