TITLE OF YOUR THESIS

Author's Name

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Doctoral Committee

Name, Post-Nominal Initials

Name, Post-Nominal Initials

Name, Post-Nominal Initials

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Date of Defense: 05/04/2018

A great dedication goes here.

ACKNOWLEDGEMENTS

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Abstract

Meta-tracing JITs promise "compiler construction kits" for dynamic languages, yet their behaviour on *self-hosting language runtimes* is still poorly understood. This dissertation shows that a complete Racket implementation can run correctly on Pycket's RPython-based meta-tracing VM, validating the feasibility of efficient, self-hosting execution on a meta-tracer.

The work begins by formalising *linklets*—Racket's fine-grained compilation units—with a new operational semantics and an executable Redex model. These semantics give the first rigorous account of linklet evaluation and underpin the remainder of the system.

Using linklets, I re-engineer Pycket's front-end: the reader, macro expander, module system, and large portions of the standard library are imported as pre-compiled linklets. The resulting *bootstrapped Pycket* loads, expands, and runs unmodified Racket programs while passing the full regression suite, demonstrating a practical path to portability for the entire Racket stack on a meta-tracing runtime.

Although functionally complete, this architecture exposes a *fundamental challenge*: data-driven, branch-heavy phases (e.g. macro expansion, regexp engine) scatter hot loops, inflate traces, and magnify garbage-collection cost. Micro- and macro-benchmarks, combined with targeted ablation studies, isolate these effects and quantify their impact.

The dissertation then stakes out two research avenues—supported by prototype evidence—as the most promising ways forward:

1. **Stackful execution for memory locality**: selectively running deeply nested interpreter frames on the native stack collapses heap-allocated continuation chains and cuts GC time by up to 30%.

2. **Hot-branch steering for trace quality**: lightweight runtime feedback diverts the tracer away from unpredictable branches, curbing trace explosion without relying on partial evaluation, which fares poorly on large, branchy workloads.

Taken together, the prototypes, formal models, and empirical results presented here provide the first definitive proof that a full-featured functional programming language can *indeed self-host* atop a meta-tracing JIT while remaining semantically sound—establishing a solid foundation on which future optimisation research can confidently build.

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INTRODUCTION AND BACKGROUND

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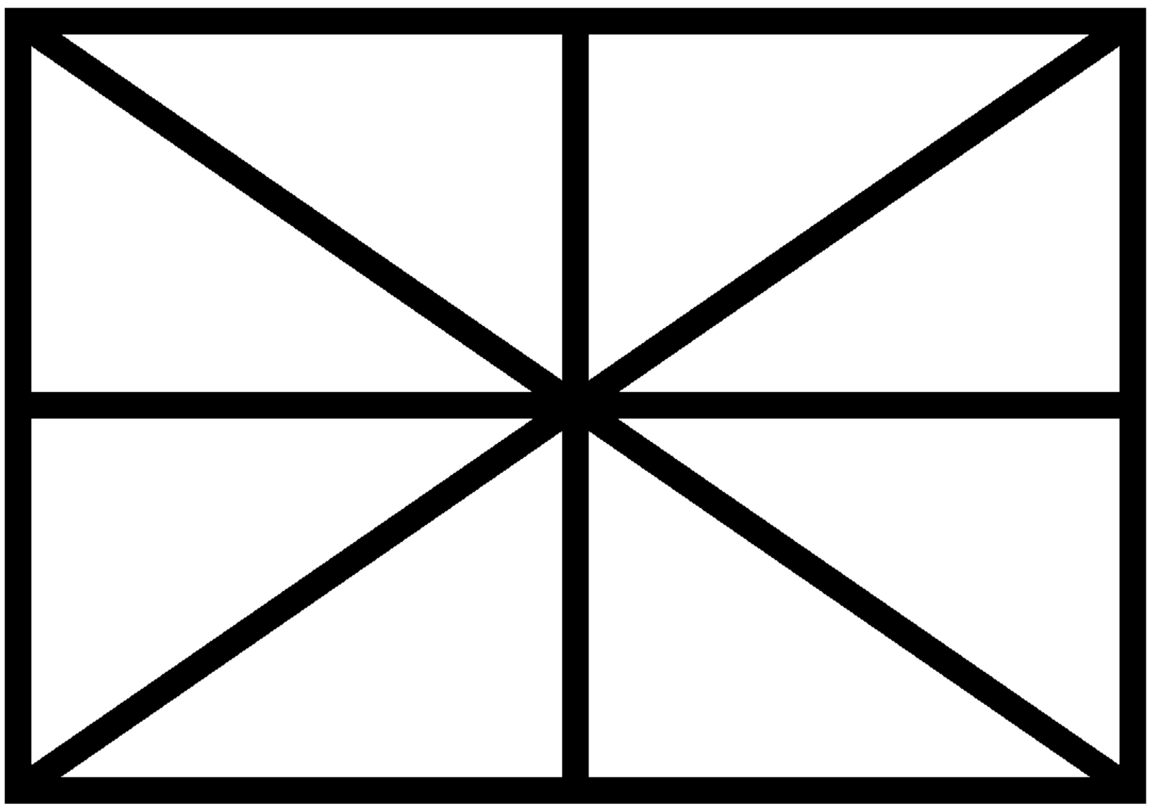

Figure 1.1: This is an example Figure.

Table 1.1: This is an example Table.

x	f(x)	g(x)
1	6	4
2	6	3
3	6	2
4	6	2

laborum.

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CHAPTER 2
TECHNICAL APPROACH

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2.1 Section

This is a section in Chapter 2.

2.1.1 Example Subsection

This is a subsection in Chapter 2.

Example Subsubsection

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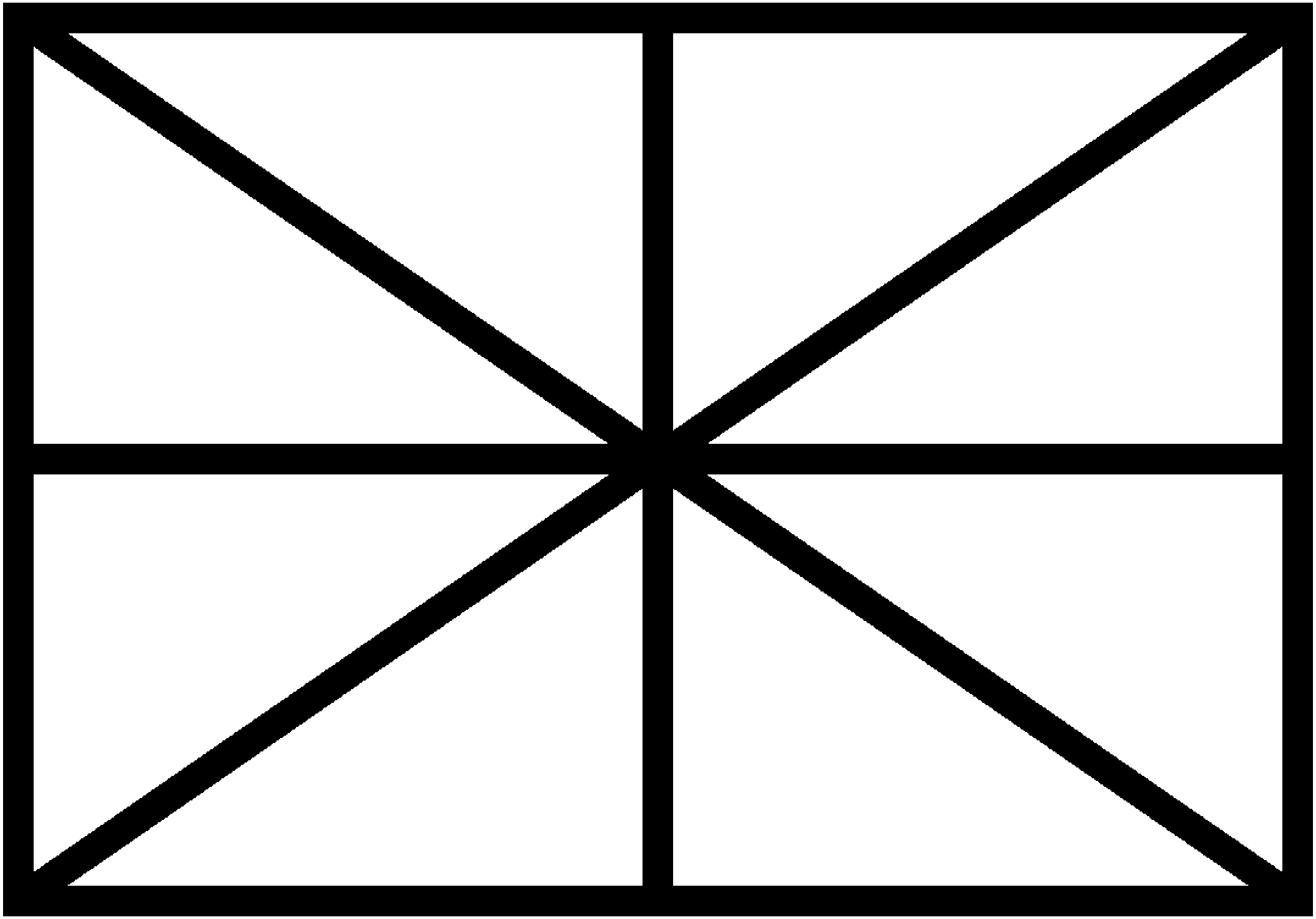

Figure 2.1: This is another example Figure, rotated to landscape orientation.

CHAPTER 3

RESULTS

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CHAPTER 4
DISCUSSION

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CHAPTER 5
CONCLUSION

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Appendices

APPENDIX A
EXPERIMENTAL EQUIPMENT

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APPENDIX B
DATA PROCESSING

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[2] George P. Burdell. *Myths and Their Origins*. Real Books, Inc., 2016.

[3] A. Einstein, B. Podolsky, and N. Rosen. "Can Quantum-Mechanical Description of Physical Reality Be Considered Complete?" In: *Phys. Rev.* 47 (10 1935), pp. 777–780.

VITA

Vita may be provided by doctoral students only. The length of the vita is preferably one page. It may include the place of birth and should be written in third person. This vita is similar to the author biography found on book jackets.