

# Preface

Like most doctoral students, I started my studies by reviewing the existing, most prominent approaches in the field. A couple of months later I thought I had acquired a sufficient understanding of instruction selection and felt confident enough to begin developing new methods.

That confidence was short-lived.

When exploring my new ideas, I would soon face a number of problems about instruction selection that I didn't fully understand, prompting me to read more papers until I did. Empowered with new knowledge, I would resume my research, only to shortly after be confronted with yet another set of problems. After doing this for another few months, the pile of related work had grown so large that I started to wonder how many more papers the collection would need before it contained everything ever published on instruction selection. So I set out to find those missing papers. Several months later, my findings had been compiled into a 109-page technical report—which grew to 139 pages in a second revision—and although it was written primarily to be shared with others, I wrote it equally as much for myself to be used later as a manual of reference. At this point my supervisors and I believed the material to be of sufficient quality for publication, but it was simply too long to be accepted by any journal in its current form. Fortunately, Springer agreed to publish my work as a book, which is the one you are currently reading.

The ambition of this book is to (i) introduce instruction selection as an interesting problem—what it is, and why it matters—and (ii) present an exhaustive, coherent, and accessible survey on the existing methods for solving this problem. In most cases, the goal is to convey the main intuition behind a particular technique or approach. But for methods that have had a significant impact on instruction selection, the discussions are more in-depth and detailed. The prerequisites are kept to a minimum to target as wide an audience as possible: it is assumed that the reader has a basic background in computer science, is familiar with complexity theory, and has some basic skills in logic and maths. However, no expectations are made regarding prior knowledge on instruction selection, and very little on compilers in general. Hence the material presented herein should be useful to anyone interested in instruction selection, including:

- novice programmers, who have used a compiler but know nothing about its internals;
- intermediate and advanced students, who may already have taken a course on compilers; and
- expert practitioners, who have decades of experience in compiler development.

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