

Lab: Introduction to Loop Transformations

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EJCP 2015
June 22, Nancy

Experimental Validation

- Essential to many scientific domain
 - 1. Build a hypothesis
 - 2. See if numbers support it
- In optimizing compiler research
 - prove optimality, or
 - do empirical validation
- Getting $X\%$ speedup by itself is **USELESS**
 - provide *why*

Computer Scientific Method

- Slides from David Patterson
 - Talk: How to Have a Bad Career In Research/ Academia
 - www.cs.berkeley.edu/~pattrsn/talks/nontech.html
 - Many nice tips for Ph.D. students and beyond

Bad Career Move #4: Use the Computer Scientific Method

- Obsolete Scientific Method
 - hypothesis
 - sequences of experiments
 - prove/disprove hypothesis
 - reproducible
- Computer Scientific Method
 - hunch!
 - an experiment with lots of parameters
 - forget if it doesn't support hunch

Plan for the Afternoon

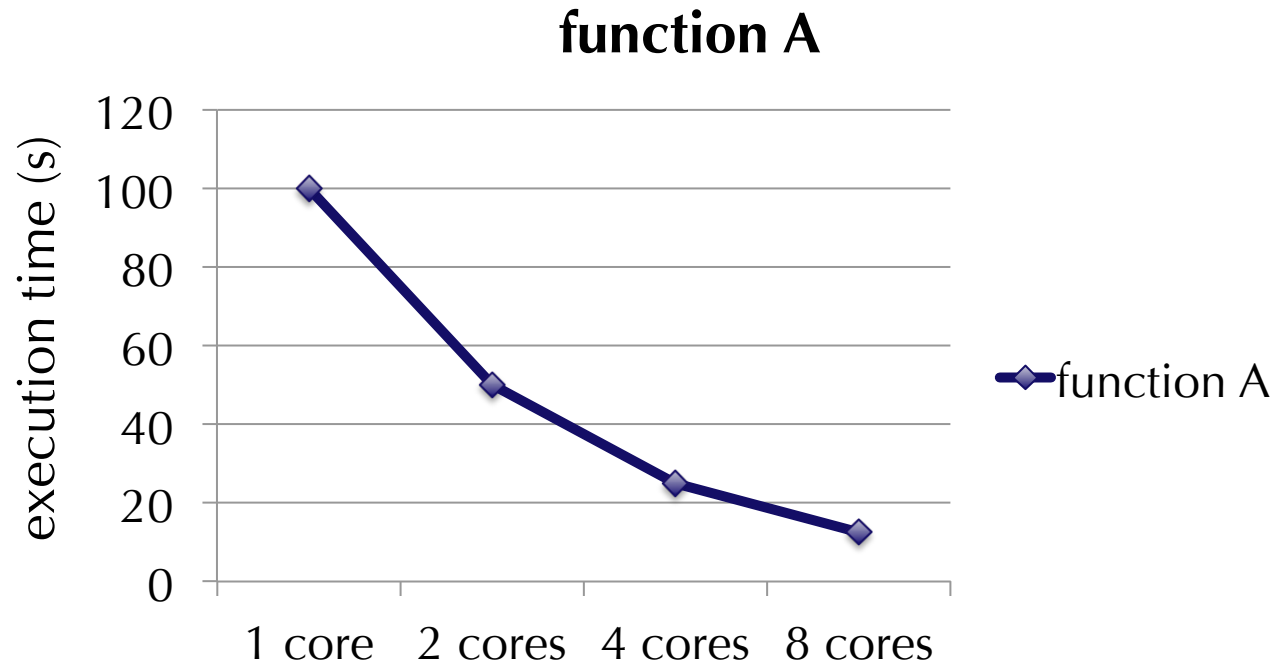
- Mixture of lecture + lab
- 1. Performance Measurement
- 2. Loop Transformations by Hand
- 3. How to Punch the Audience

Example 1: Parallel Performance

- Setup
 - parallelized a function of a program
 - measured exec. time of the function
 - up to 8 cores

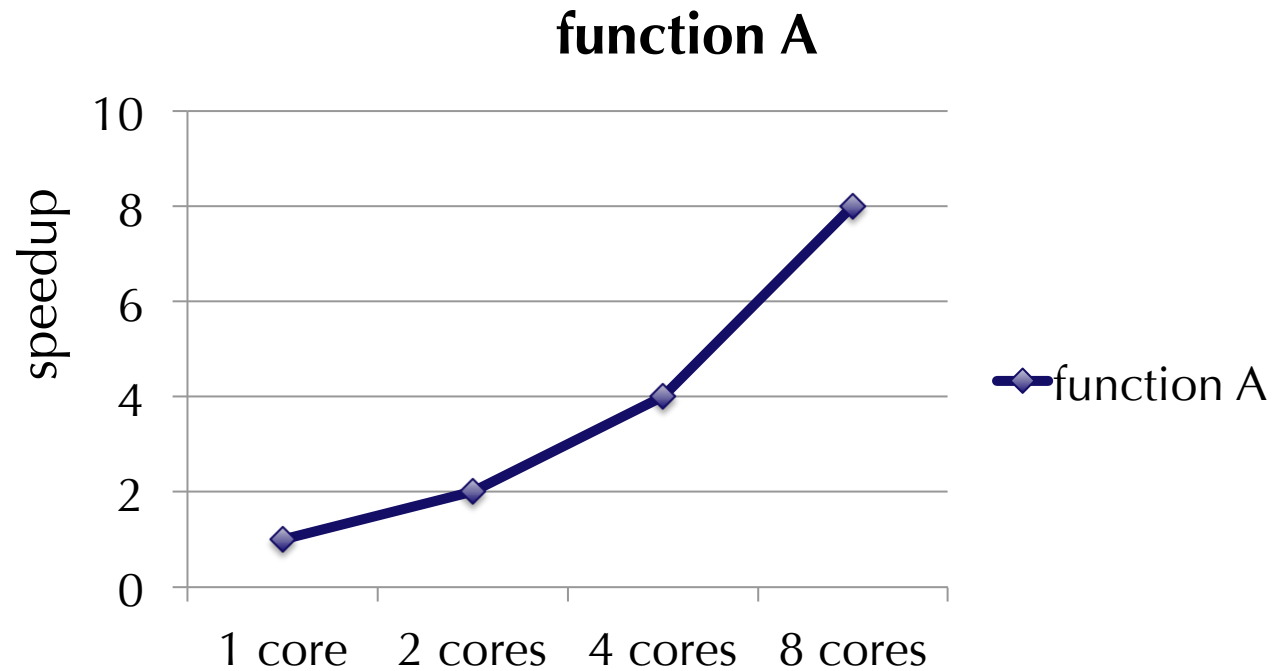
Example 1: Parallel Performance

- What can you say?



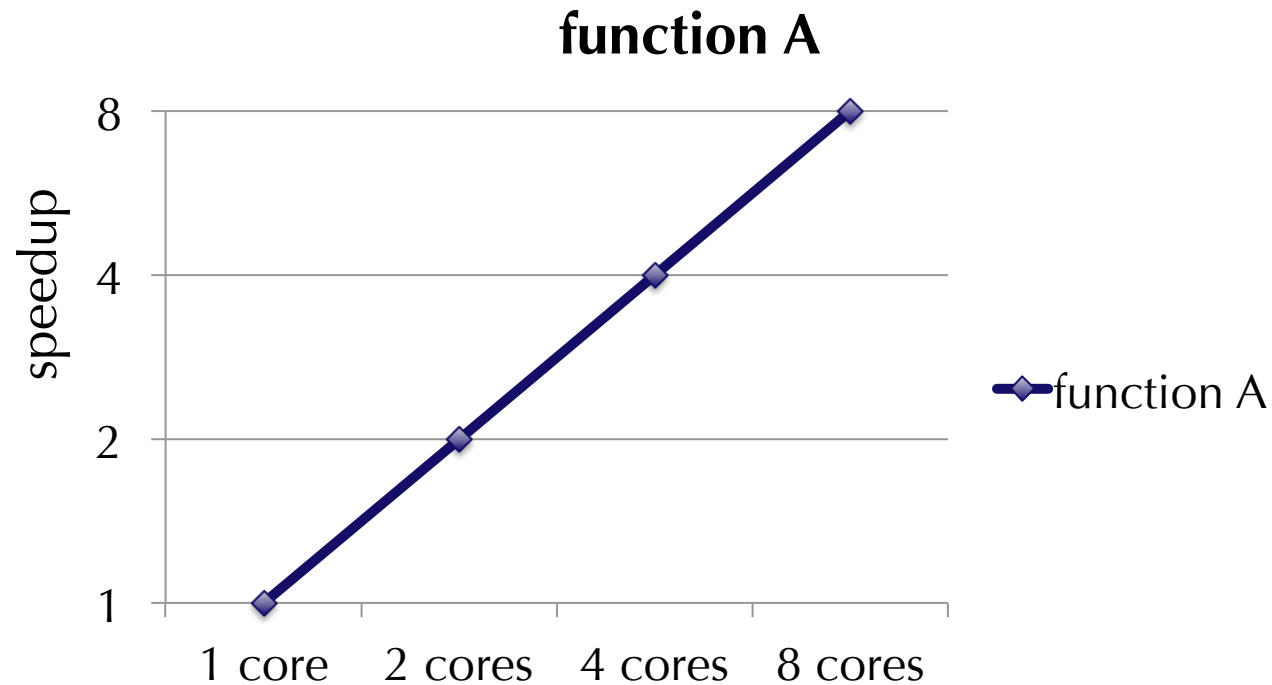
Example 1: Parallel Performance

- Is it better?




Example 1: Parallel Performance

- How about this?

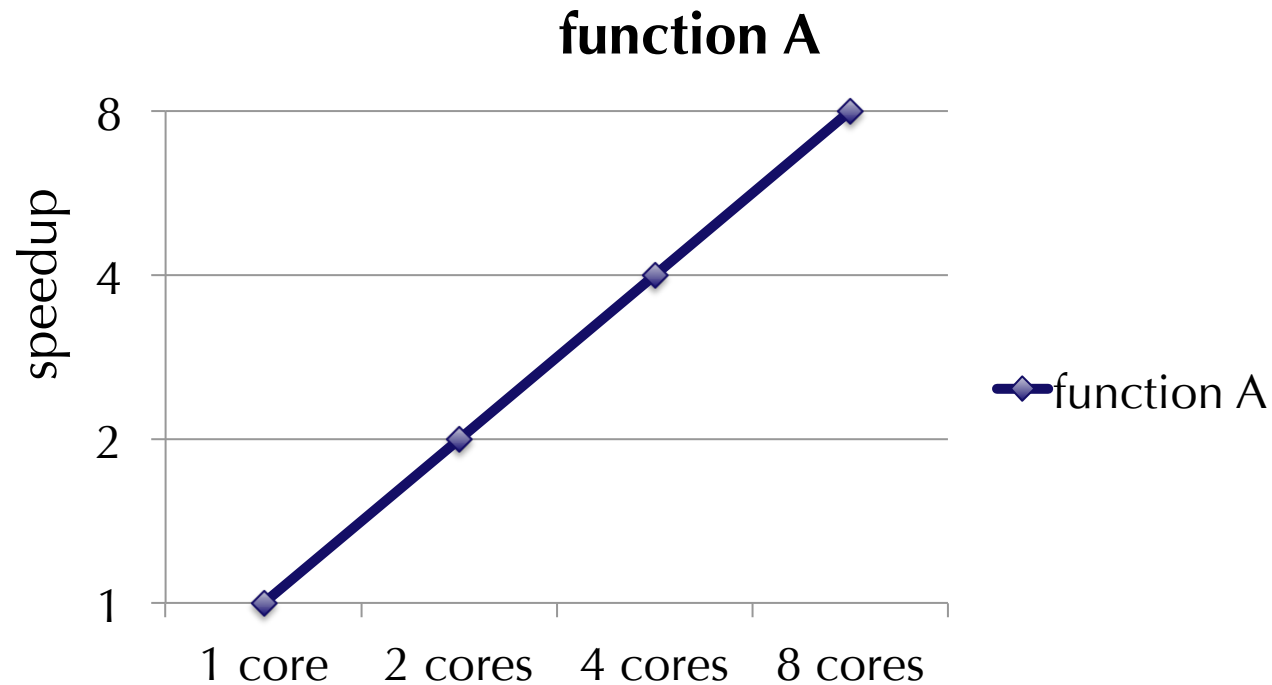


Key Principle in Plotting Data

- Make it a straight line
 - preferably 45 degree angle
 - Reason: much easier to make claims
 - claiming a curve is quadratic
- 
- showing it becomes a straight line after sqrt

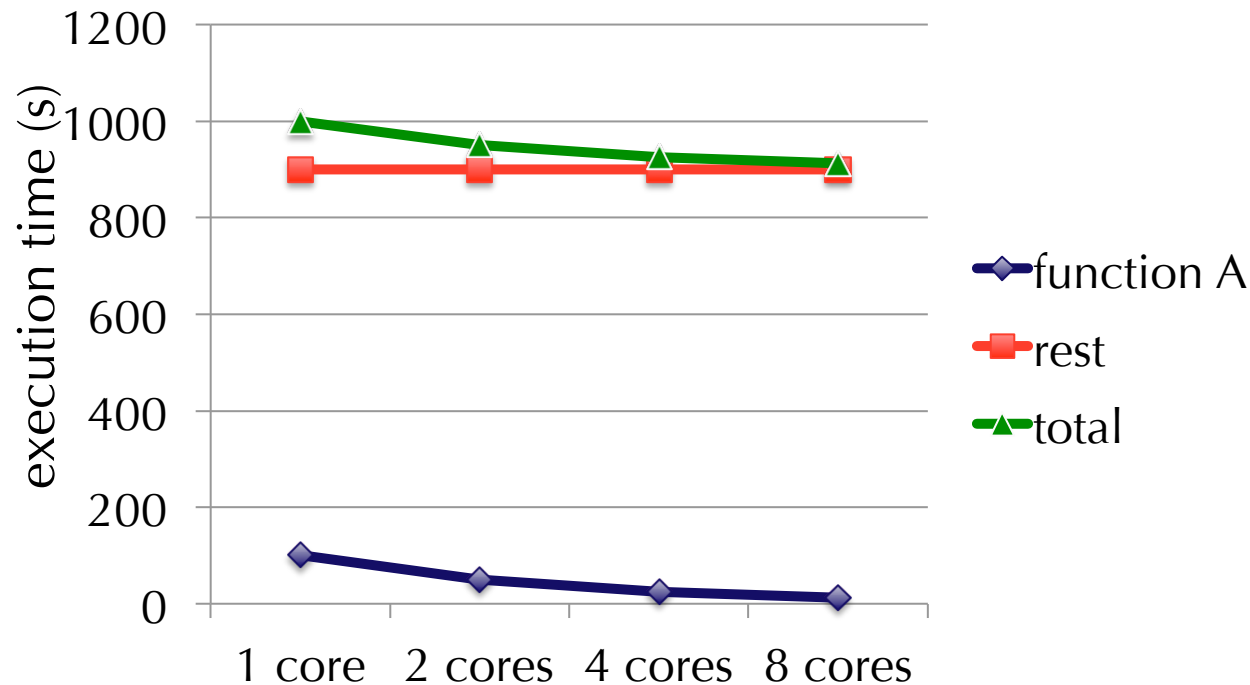
Example 1: Parallel Performance

- What can still be missing?



Example 1: Parallel Performance

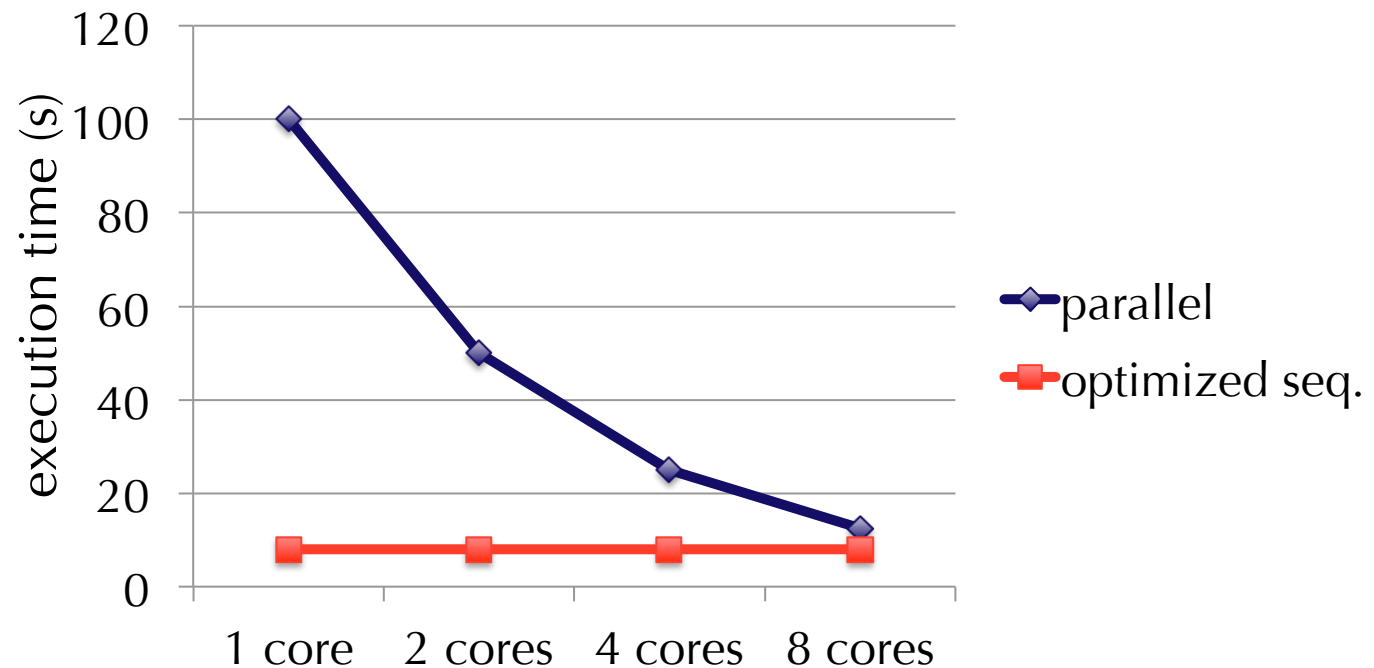
- What can be wrong?
- How relevant is Function A?



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Example 1: Parallel Performance

- What can be wrong?
- How good is the sequential code?



Don't Forget the Big Picture

- Always show overall performance
 - + detailed results as necessary

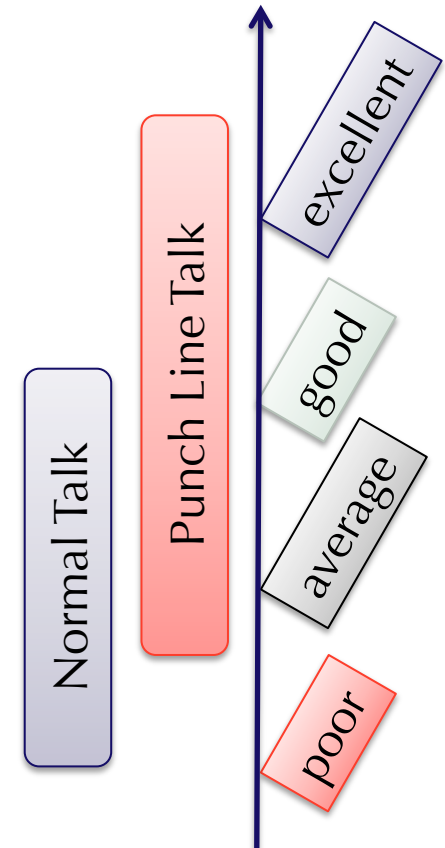
- Common examples
 - exec. time only for fragments
 - energy consumed by the CPU
 - dynamic energy only

Intro to Loop Transformations

- Tiling: a very very simplistic case
- Follow the instruction at
 - <http://perso.ens-lyon.fr/tomofumi.yuki/ejcp2015/>
- Resume at 16h00 for last few slides

The Punch Line Method

- How to Punch your audience
 - how to attract your audience
- Make your talk more effective
 - learned from Michelle Strout
 - Colorado State University
 - applicable to any talk



The Punch Line

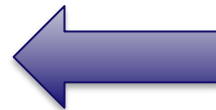
- The key cool idea in your paper
 - the key insight
- It is not the key contribution!
 - X% better than Y
 - do well on all benchmarks
- Examples:
 - ... because of HW prefetching
 - ... further improve locality after reaching compute-bound

Typical Conference Audience

- Many things to do
 - check emails
 - browse websites
 - finish their own slides

- Attention Level (made up numbers)

- ~3 minutes 90%



punch here!

- ~5 minutes 60%

- 5+ minutes 30%

push these numbers up!

- conclusion 70%

Typical (Boring) Talk

- 1. Introduction
- 2. Motivation
- 3. Background
- 4. Approach
- 5. Results
- 6. Discussion
- 7. Conclusion

Punch Line Talk

- Two Talks in One

- 5 minute talk

- introduction/motivation ← shortest path to the punch

- key idea ← the punch

- X-5 minute talk

- add some background

- elaborate on approach

- ...

Pitfalls of Beamer

- Beamer != bad slides
 - but it is a easy path to one
- Checklist for good slides
 - no full sentences
 - LARGE font size
 - few equations
 - many figures
 - !paper structure

beamer is not the best tool to encourage these

That's It!

- General guides
 - <http://matt.might.net/articles/>
 - <http://www.cs.ucla.edu/~palsberg/azuma.html>
- How to do bib right
 - <http://web.ece.ucdavis.edu/~jowens/biberrors.html>
- Feedback
 - tomofumi.yuki@inria.fr
 - or from my website (anonymous)