The Case for Compulsory Approximation

Adrian Sampson

A novelty, but not really research.

Computing, Approximately

Ravi Nair and Dan Prener IBM Thomas J. Watson Research Center Nair & Prener WACI @ ASPLOS '08



Hey, this could work!

Approximate computing's adolescence

A session at most conferences.

"But when will it *really* take off?"









Embracing compulsory approximation

- O Let's go where approximation is already successful!
- Generalize and build abstractions for the techniques people already use!
- O No "selling" necessary– there's nothing to buy!



Generalize ideas that currently *locked away* in application domains

Systems & PL tools to help *cope* with compulsory approx

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Machine learning



Abstract

Machine learning offers a fantastically powerful toolkit for building complex systems quickly. This paper argues that it is dangerous to think of these quick wins as coming for free. Using the framework of *technical debt*, we note that it is remarkably easy to incur massive ongoing maintenance costs at the system level when applying machine learning. The goal of this paper is highlight several machine learning specific risk factors and design patterns to be avoided or refactored to the learning specific risk factors and design, entanglement, hidden feedback

Machine learning

Processes & marketing for efficiency-accuracy trade-offs

Checking, enforcement, and composition

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Scientific & numerical computing



http://herbie.uwplse.org

[Panchekha, Sanchez-Stern, Wilcox, Tatlock; PLDI 2015]

Scientific & numerical computing

Manual, formal, worst-case analysis for when accuracy *really* counts



Automation and dynamic tools

Real-time graphics

= You Tube



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Add to

343 Industries promised us a 60 fps experience for Halo 5: Guardians, and the developer has delivered. But

https://youtu.be/-gQMulb6T2o

Real-time graphics





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A covert way in

to domains with approximation skeptics



Our community's greatest weakness: quality metrics



Veni, vidi... generalizi? Let's steal ideas and generalize them to other domains!



