



Programming, Software Development, and Computer Science: A Golden Triangle

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University-wide intro course Computer Science

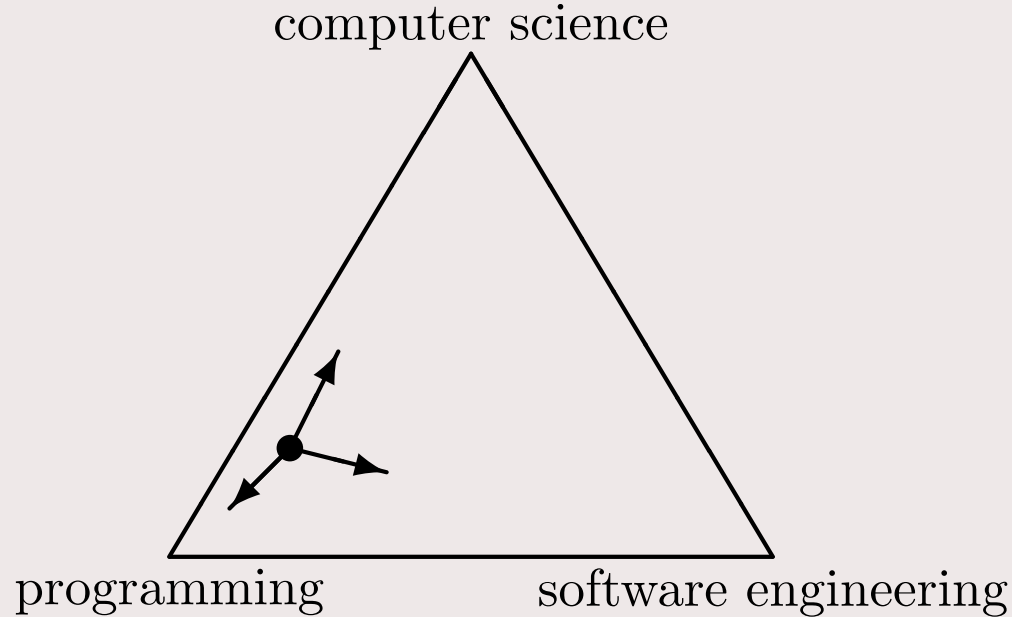
- Why teach some CS to everyone (at a STEM university)?
 - The world is much more computational nowadays, in general
 - All STEM involves computational aspects: in development, and in products
 - It is interesting, in itself
- What CS to teach?
 - With or without computer?
 - With or without programming?

Brian Kernighan (of C fame)

- 2008 article: *What should an educated person know about computers?*
- 2011 book (1st Ed.): *D is for Digital: What a Well-informed Person Should Know about Computers and Communications*
- 2017 book (2nd Ed.): *Understanding the Digital World: What you Need to Know about Computers, the Internet, Privacy, and Security*
- Includes some programming (JavaScript), some CS, hardly any SE



The “golden” triangle: a force field



Course content discussions

- Computer Science
 - Without programming: not realistic, not practical, too abstract (for some)
 - With programming:
 - Dilemma of choosing a programming language, tools, problem domain(s)
 - You run into all kinds of practical frustrations
- Programming
 - Without SE: frustrating, and not good when students need to apply it
 - Without CS theory: less useful in practice
- Software Engineering
 - Without programming/CS: too abstract; hardly effective

My personal opinions

- Functional programming is underexposed
 - Referential transparency, Equational reasoning, Immutable data
 - Everything moves in that direction (too slowly)
- CS needs programming
- Programming needs SE (otherwise, too easy to create crap)
 - It does not make sense to learn all about programming first, and only then pay attention to layout, naming, coding idiom, coping with errors
 - Many facilities in programming languages exist for SE convenience
 - But it also requires **discipline** to use them well (this is SE)
- SE needs programming & CS

Thanks

Questions?