

software
... if ~~engineering~~, then NC State ...



In the age of Software 2.0, what role for software engineers?

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cs, se, ai, ncstate, usa

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Association for
Computing Machinery



Software 2.0: when software writes itself

What does that mean, exactly?

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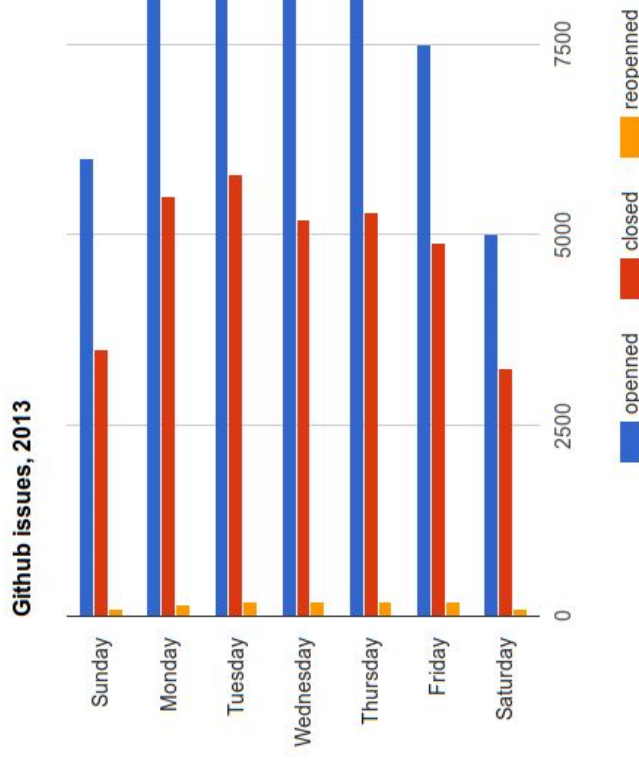
Erik Meijer

- Behind Every Great Deep Learning Framework Is An Even Greater Programming Languages
 - Software 1.0:
 - coffee + human = code
 - Software 2.0
 - humans say “**what**”
 - a agents automatically work out “**how**”



A counter-view: Programmers > programming

- Still much space for novel human creativity
- Programmers do **not** just sit in a backroom, just filling in the details to a spec
- Programming is **about software engineering**
 - The search for feedback on ideas.
 - Half the issues in Github: never closed
 - Programmers spend much time negotiating **which, what how, when, who**
- Feedback can be handled many ways
 - See below
 - **Need humans + automation**
 - Not one replacing the other



There are somethings humans just do better than AI

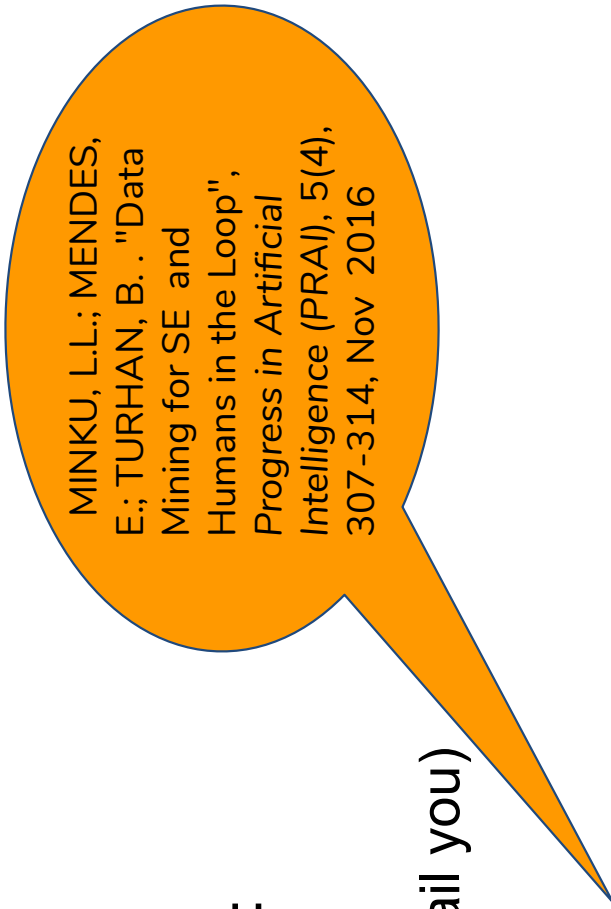
Human factors:

- Convincing you that the system is trustable
- Helping you when the systems fails

Current roles of SE experts

when adopting data mining approaches:

- Problem definition.
- Data collection.
- Data “surrogates” (when the joins fail you)
- Model building.
- **Managing organizational impact**



MINKU, L.L.; MENDES, E.; TURHAN, B. . "Data Mining for SE and Humans in the Loop", Progress in Artificial Intelligence (PRAI), 5(4), 307-314, Nov 2016

Potential roles of SE experts

when adopting data mining approaches :

- Model building involvement.
- Expert domain knowledge.

AI = Not automatic. A large buffet of options. Needs skilled human engineers



Can't just throw all problems at huge CPU farms

- Zhe's summer at Google: 3 years of CPU/day
- Wang et al., FSE'13. 15 years of CPU to evaluate software clone configurations
- Truede and Wagner: 30 years of CPU to tune clusters for each corpus

Cannot get humans out of the loop (though some want to try)

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- “The notion of user cannot be precisely defined and therefore has no place in CS or SE”
 - Edsger Dijkstra, ICSE 4, 1979



- “.. kill living human experts and resurrect the dead ones”
 - Anonymous machine learning researcher, 1986

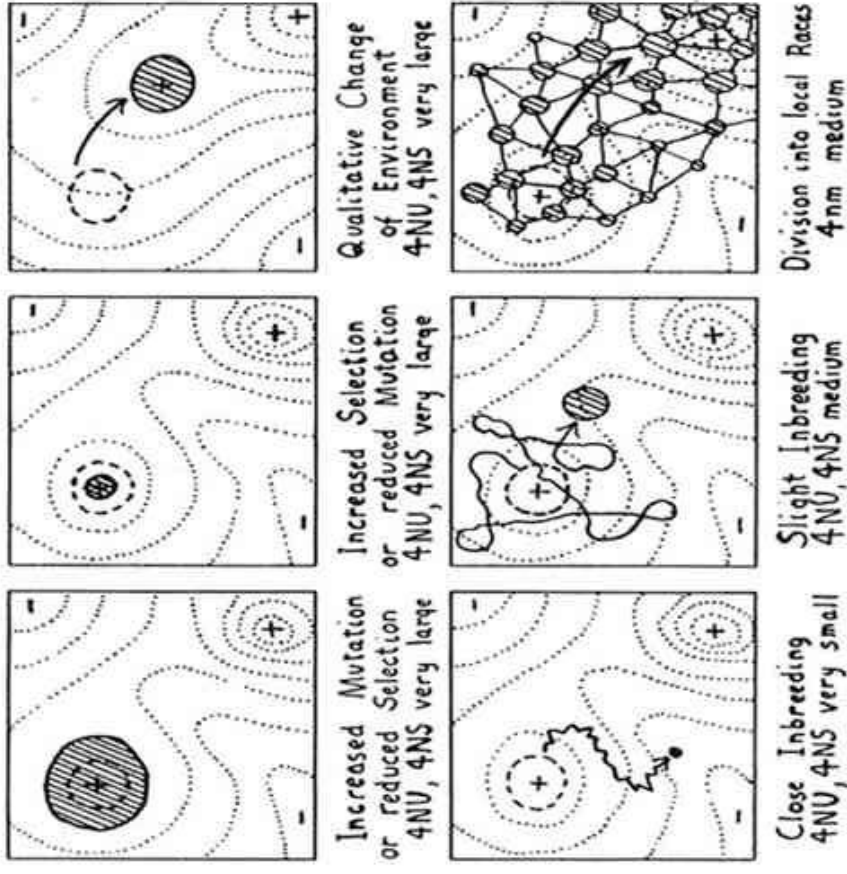
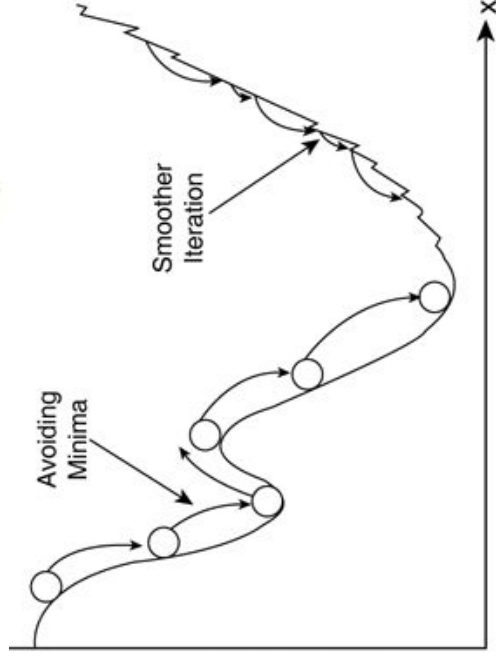
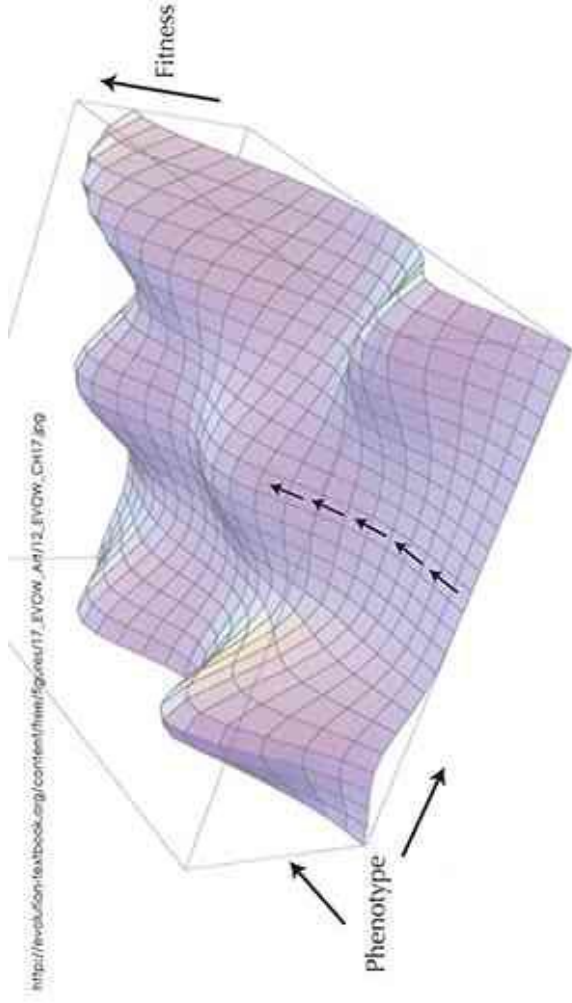


Humans exist. We must work with them

- “The notion of user cannot be precisely defined and therefore has no place in CS or SE”
 - Edsger Dijkstra, ICSE 4, 1979
- Mathematically:
 - “User” = a force that shapes goal space
- Engineering = surfing goal space
- SE = building + using software that surfs
 - Tim Menzies, FSE 2018



The shape of goal space? Surfing?



Brand's favorite landscape,
1932 Rabbits.



@timmenzies

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Complaint: “But that’s not SE”

Reply “Times change”

- Once upon a time, ...
 - SE was not about **users** (Dijkstra, 79)
 - SE was not about **testing** (cleanroom, Mills, 1985)
 - SE was not about **requirements** (Paulk, 1993)
 - “Analysis and allocation of the system requirements is NOT the responsibility of the SE group but is a prerequisite for their work”
 - SE was not about **deployment** (before CI)
 - SE was not about **AI**
- But AI software is still **software**
 - needs maintenance, validation, interfacing, usability additions
 - i.e. **AI needs software engineers**