Measuring Students' Performance on Programming Tasks

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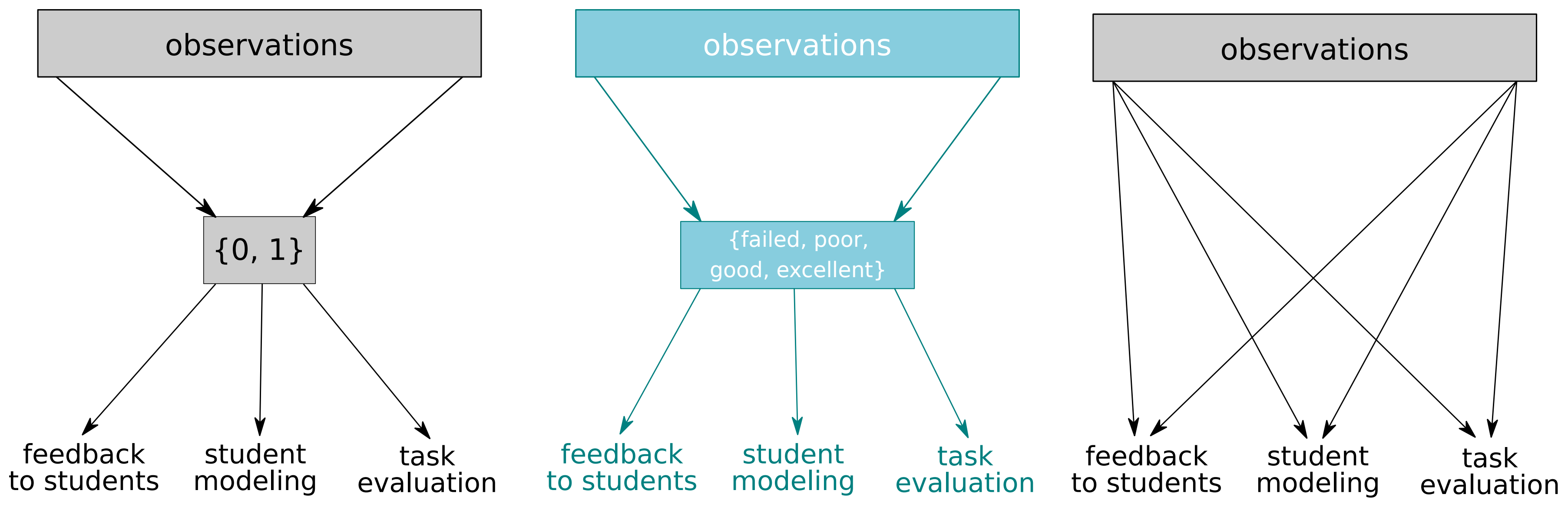
Motivation

Binary success provides too little information for student and tutor modeling.

Using detailed observations hinders reuse, and complicates the development of learning systems.

Proposal: Use discrete performance measures with just a few distinct values.

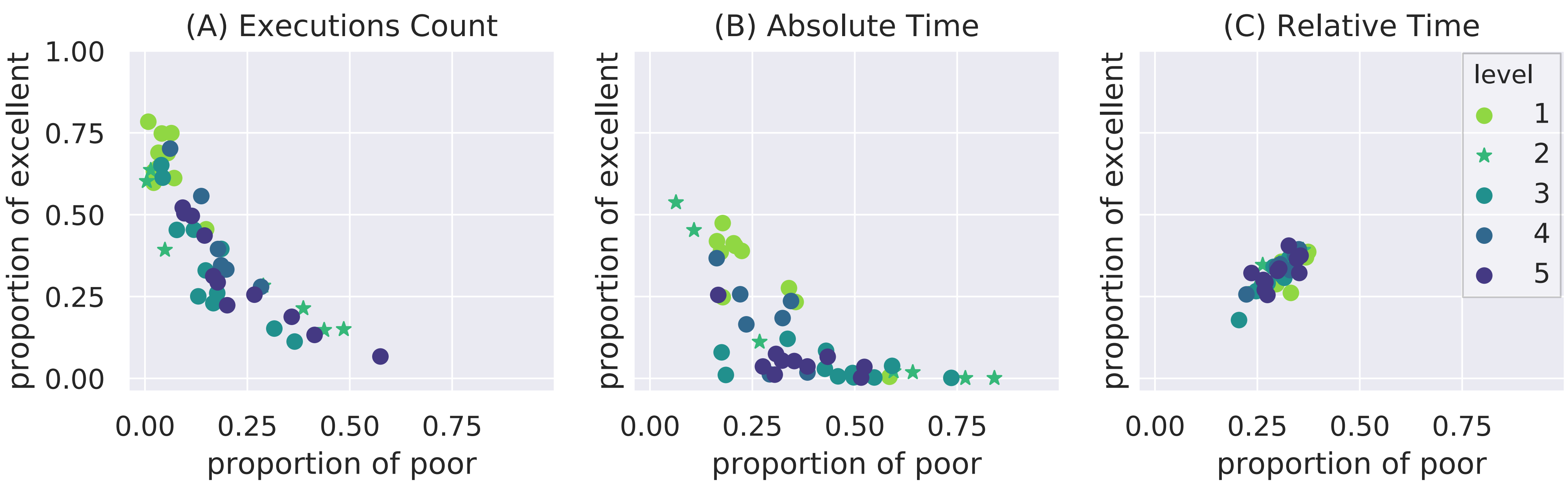
Performance levels and interpretation:
– weak performance . . . too difficult task
– good performacne . . . appropriate task
– excellent performance . . . too easy task



(A) Binary performance   (B) Discrete performance   (C) Detailed observations

Case study: Design of a performance measure

- adaptive learning system for introductory programming
- 85 tasks, 9 levels x 3 sublevels
- performance measures based on
  (A) executions count
  (B) solving time, thresholds per sublevel
  (C) solving time, thresholds per problem



Result: The choice of performance measure matters. Different reasonable choices lead to very different measurements.

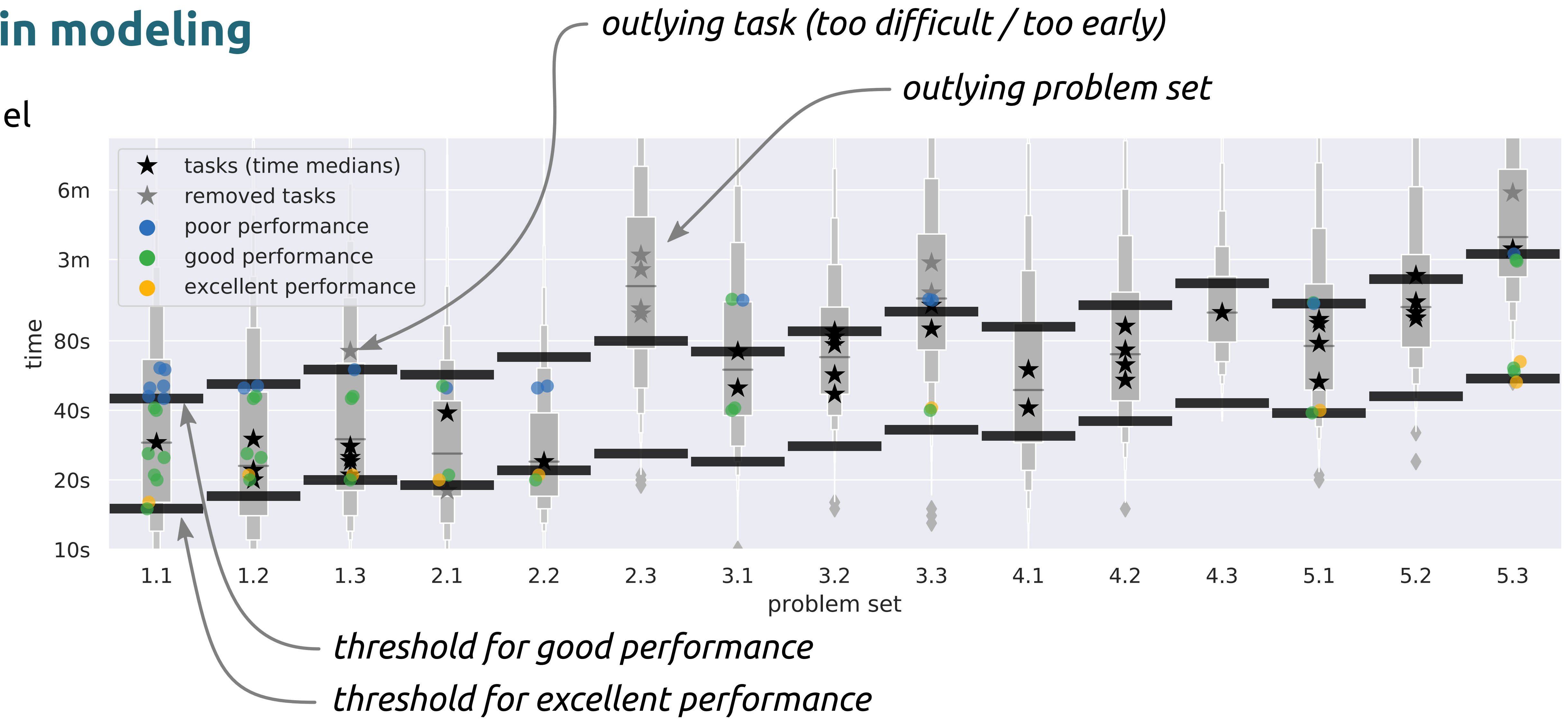
Interaction with domain modeling

Issue: Flaws in the domain model impact the accuracy of a performance measure.

Consequence: Unconstrained optimization leads to a wild performance measure.

Solution: Impose a constraint on the threshold progression (e.g., a constant increase between sublevels).

Side effect: The flaws in the domain model are detected.



outlying task (too difficult / too early)

outlying problem set

threshold for good performance

threshold for excellent performance

Summary

Instead of using binary success, the currently prevalent choice of performance measure, we propose to use a few discrete performance levels with universal interpretation, such as failed, weak, good, and excellent.

Design of a performance should take into account possible interaction with domain modeling.

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