Practical Ways to Accurately Measure Knowledge and Learning in Your Classroom

Ben O. Smith
University of Nebraska at Omaha

Jadrian J. Wooten
Virginia Tech

What is this about?

What In this workshop we will teach you to measure knowledge and learning in your classroom

Why You might want to measure learning in order to: determine the effectiveness of an educational technique, measure learning for assessment, develop ways of evaluating teaching, etc.

How We will show you how to use the Assessment Disaggregation software for exam data, and Project Based Assessment for rubric-based instruments

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- Do a pre-and post-test and look at the difference
- Calculate average scores on rubric instruments
- Use a threshold metric: E.g. 80% of students scored >70%

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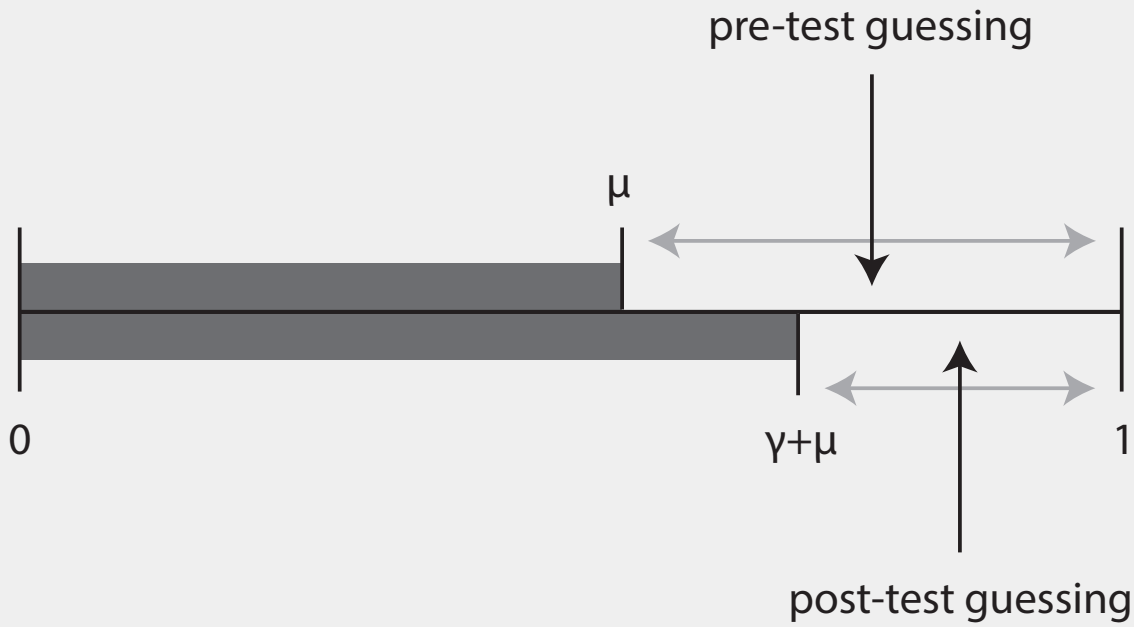
The Problem with post-pre



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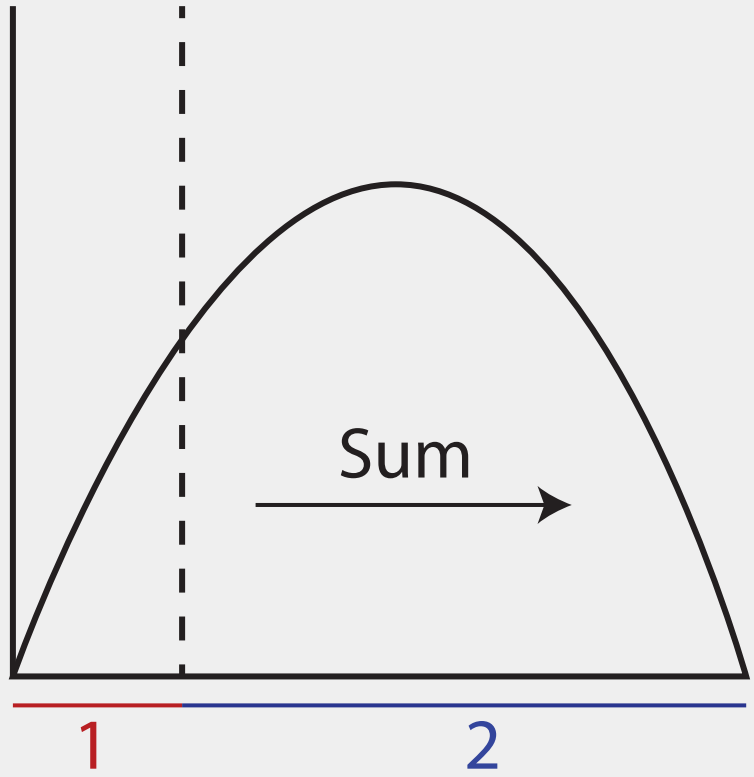
- Use a threshold metric: E.g. 80% of students scored >70%
  - Problem: Threshold is arbitrary
  - Problem: Threshold represents an information reduction

Problems with Threshold measures

- Measure of percent of students above a score
- Not centered on truth
- Throws away data



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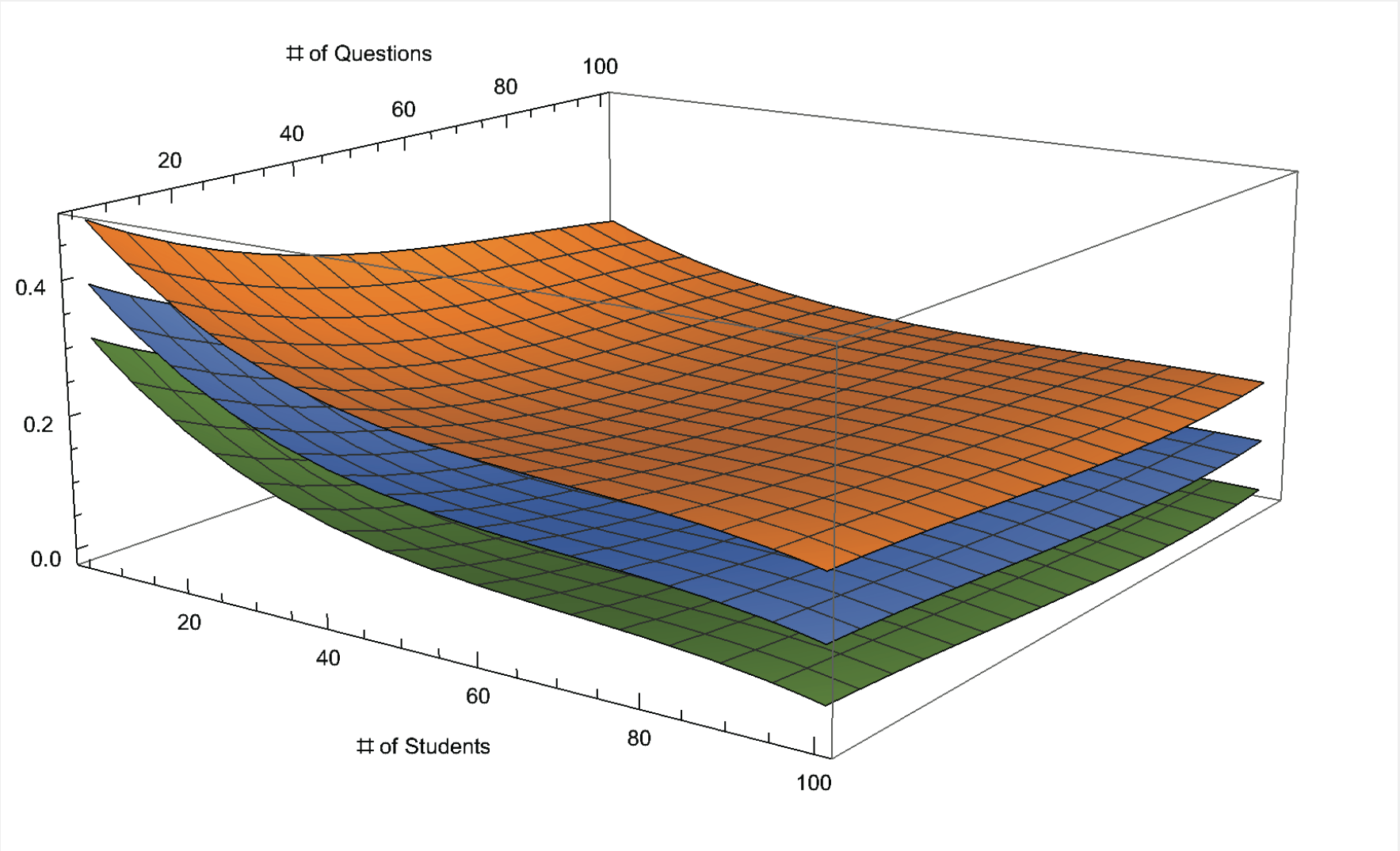
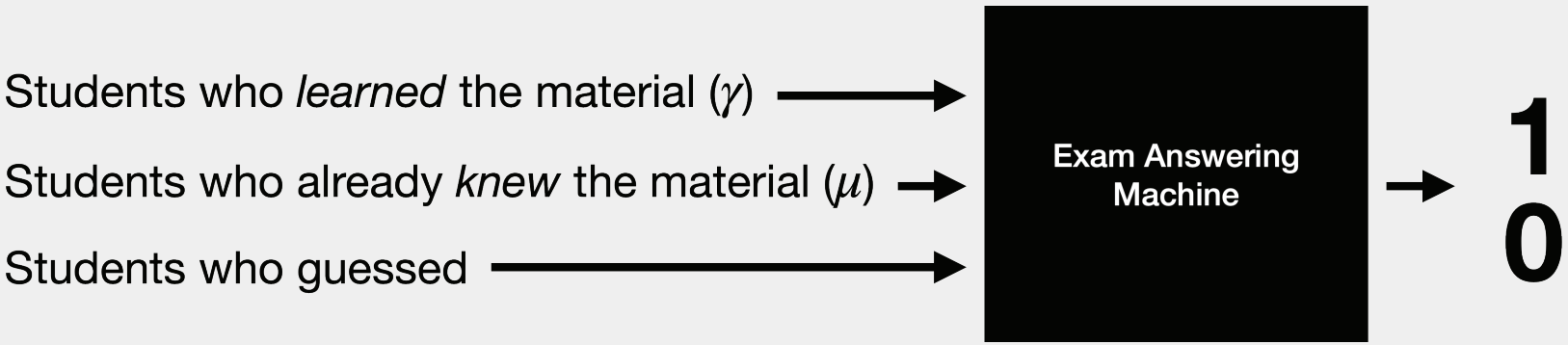


Today we'll show you that you can properly measure learning and knowledge, and it does not require that much effort

Using Exams to Properly Measure Learning

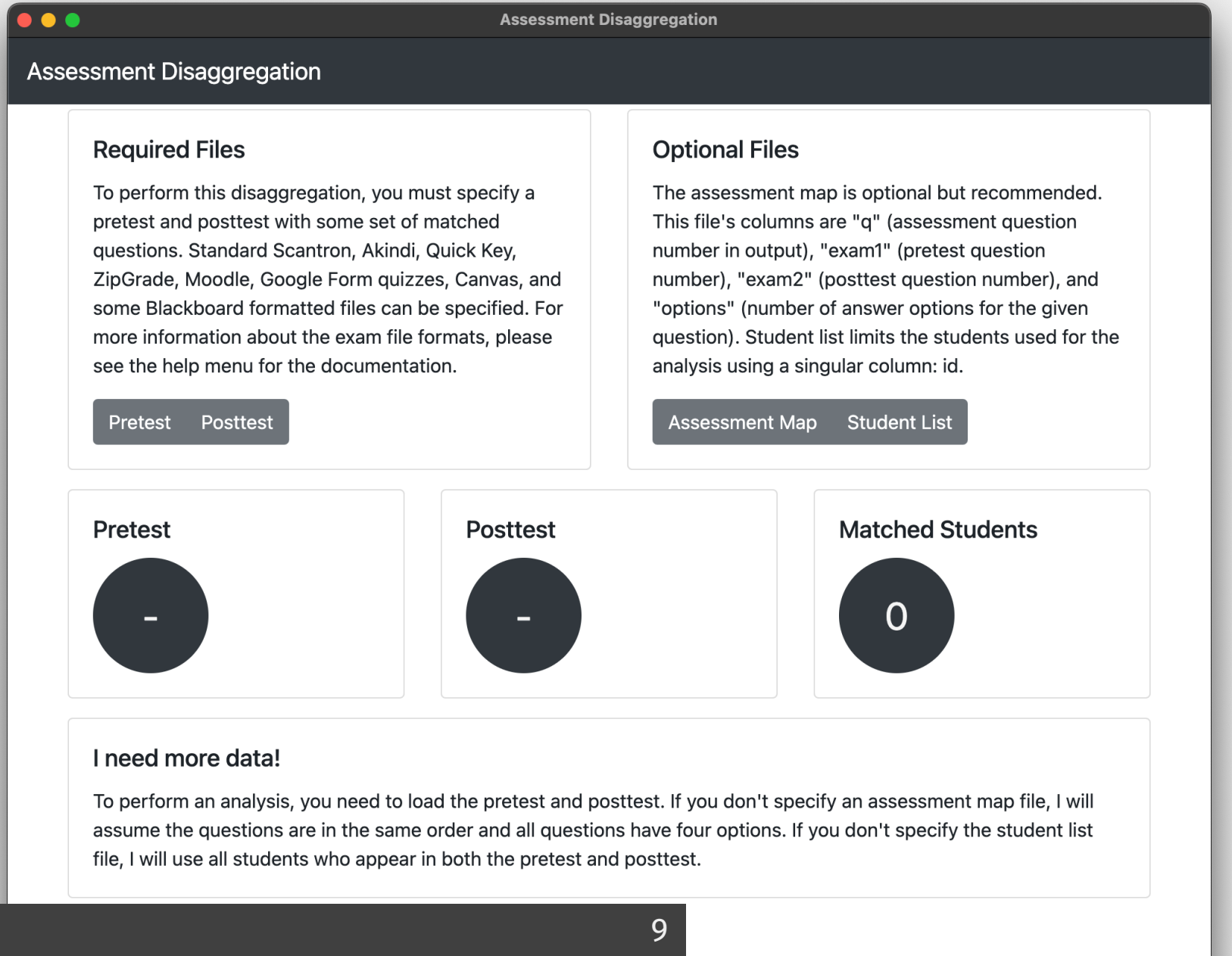
Exam Answering Machine



Necessary Ingredients

1. Pre-test: Because otherwise, we can't distinguish between students who knew the material before the class and those who learned it in your class.
2. Post-test: Because need to know how much the students know at the end of the class.
3. Mapping: Because we need to match the pre-test questions with the post-test questions.
4. The probability of guessing correctly: Because some students may have answered correctly by chance!

Assessment Disaggregation



Stuff You Need

1. Assessment Disaggregation:
   `https://www.assessmentdisaggregation.org`
2. Some Demo Files:
   `https://bit.ly/learningdemofiles`

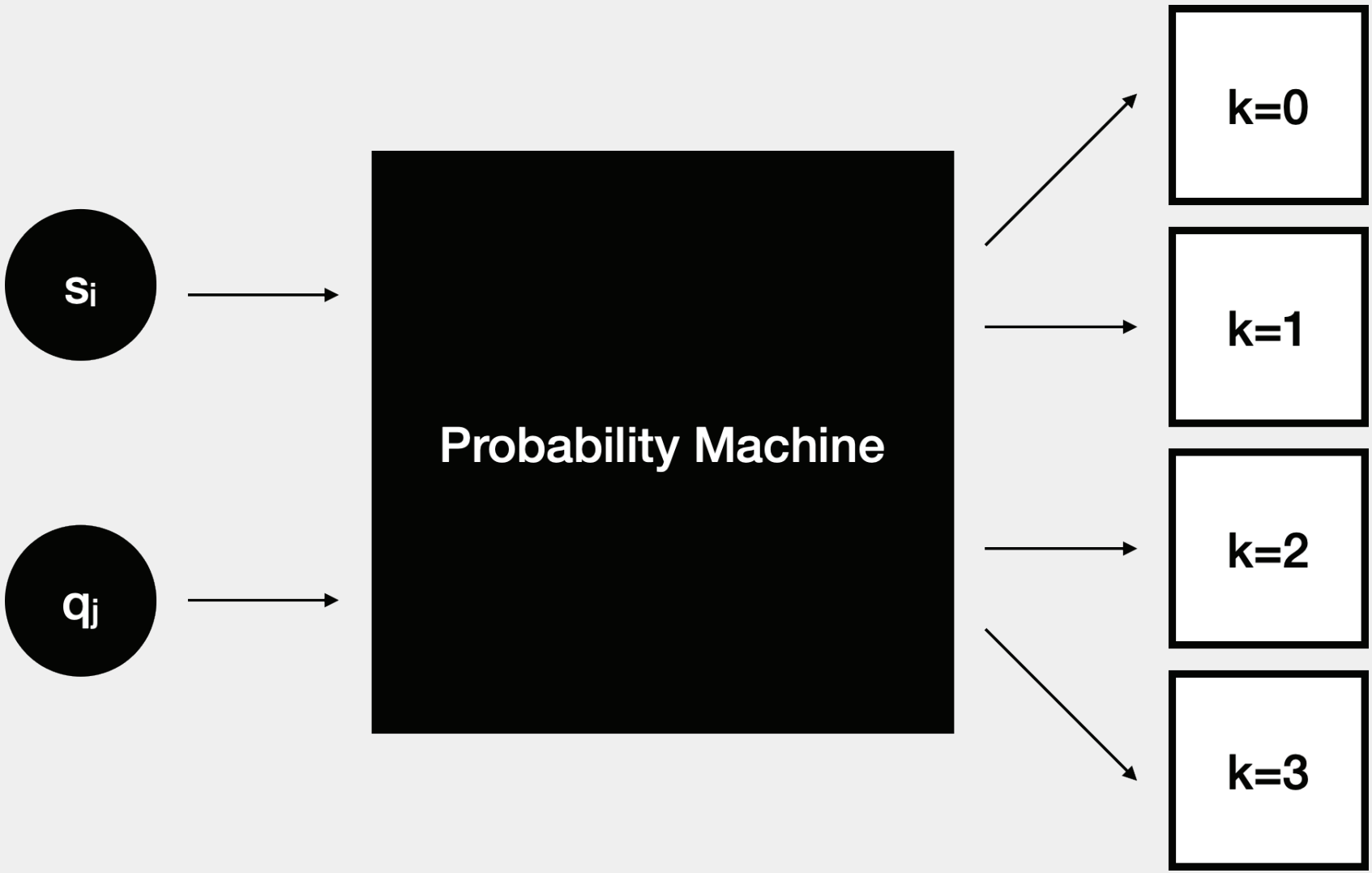
Disaggregation Demo

Using Rubric-based Instruments to Measure Knowledge

Example Rubric

Did not meet any of the require-ments	The chosen topic was on-topic for the course, but the literature was lacking	The literature review was complete but contained errors	Full credit
$k = 0$	$k = 1$	$k = 2$	$k = 3$

Probability Machine



Needed Ingredients

1. The k_{ij}/score value: The box they landed in from lowest (0) to highest (b_j)
2. Bound/b_j: The maximum k_{ij} value possible on a given rubric row
3. Identifier for the student
4. Identifier for the rubric row
5. Subset (optional): A list of students to treat as a separate group

Items (1) - (4) are simply in the same CSV file. Item (5) is a separate file.

ProjectAssessment.App

Project Based Assessment Docs Python Package E-Mail for Help Get Help over Zoom/Teams

Rubric Information

Variable	Value	Average Logistic	Average Marginal Logistic	Average Discrete Marginal Logistic
1	-1.681	0.067	-0.068	-0.131
2	0.587	0.286	0.099	0.087
3	0.811	0.325	0.149	0.127
4	-0.153	0.180	-0.018	-0.019
5	0.612	0.290	0.105	0.092
6	0.817	0.326	0.150	0.128
7	0.918	0.345	0.174	0.147
8	-0.472	0.145	-0.045	-0.053

Start Bootstrap Save

Model Fit

Student KDE Estimates

Stuff You Need

1. Project Based Assessment:
   `https://projectassessment.app`
2. Some Demo Files:
   `https://bit.ly/learningdemofiles`

Project Based Assessment Demo

Resources

- Both software packages have documentation sites:
  - `https://docs.assessmentdisaggregation.org`
  - `https://docs.projectassessment.app`
- The methods are based on statistics:
  - Assessment Disaggregation
    - `https://bit.ly/adjguess`
    - `https://bit.ly/onguess`
  - Project Based Assessment - `https://bit.ly/a-rubric-d`