Scoring of B.E.S.T. Writing in 2023–2024 and Beyond

Florida Organization of Instructional Leaders

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Definitions:

- Human scoring: Traditionally used in Florida, highly-trained and qualified human scorers independently review and score student responses, with extensive quality controls in place before, during, and after scoring.
- Automated scoring (AS): Previously used on a trial basis in Florida, AS is the use of human-scored responses to train an engine that models scoring of student responses.
- Hybrid scoring: Hybrid scoring uses automated scoring as the primary scorer, while routing a subset of responses for human scoring.

The Human Component

- Florida educators
  - Rubric Development
  - Passage and Prompt Review
  - Field Test Rangefinder
  - Operational Rangefinder
- Human scorers
  - All human scorer training and qualifying materials are approved by Florida educators.
  - All field test responses are minimally double-human scored.
  - Exact agreement
  - 5,000 student responses per field test prompt
- Resulting materials are used in AS training.

AS Responses Routed to Humans

- Responses the AS engine has not been trained to score
- Creative/unusual responses
- Condition codes
- Responses with low confidence scores
- A percentage of all responses

Planned Approach to Scoring B.E.S.T. Writing

- Overview
- Autoscore
- Training Methods
- Hybrid Scoring
- Retraining

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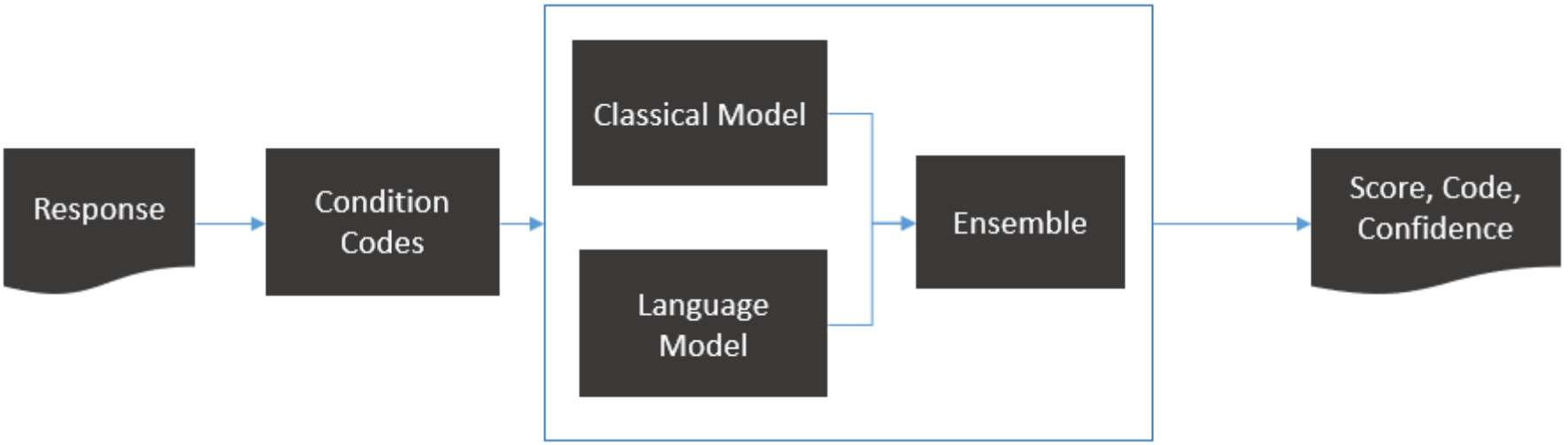
Autoscore

Automated Scoring (AS)

- AS produces scores more quickly, ensures consistent score application within and across test administrations, reduces cost to taxpayers, and produces high-quality scores.
- AS engines will be used in Florida in conjunction with additional human scoring for certain types of student responses.
- AS is used across the country in several statewide, summative assessments, as well as in several interim assessment programs.
- Outside of Florida, Cambium's AS system currently scores more than 3 million responses in a typical school year.

High-Level AS Flow



Two Models Used to Score Each response

Classical Model

- Writing quality features include syntax; grammar; spelling; sentence and paragraph quality.
- Semantic features via *Latent Semantic Analysis,* which analyzes the distribution and relationships among terms and concepts found in the stimulus, prompt, and response.

Language Model

- Representation of language, based on modeling on prompt and a large number of responses, which is then fine-tuned based on each prompt.
- More sensitive to words not appearing in the responses used to train the AS engine due to use of natural language processing of root words and *word-pieces*.
- Considers word order in modeling.

Ensembling

- The purpose of the ensemble is to use outputs from both models to produce an accurate score.
  - Language model typically outperforms the classical model.
  - Ensemble performs slightly better than each individual model.

Condition Codes

Rule- and threshold-based

Code	Description
No Response	Response was empty or consisted only of white space (space characters, tab characters, return characters).
Not Enough Data	Response has too few words to be considered a valid attempt.
Duplicate Text	Response contains a significant amount of duplicate or repeated text.
Prompt Copy Match	Response consists primarily of text from the passage.
Common Refusals	Response is a refusal to respond, in a form such as "idk" or "I don't know."
Non-Scorable Language	Response is written mostly in another language
Unusual vocabulary	Most words in the response do not appear in typical responses.
Non Specific	Response displays characteristics of condition codes assigned by humans that do not fall under the above condition code categories.

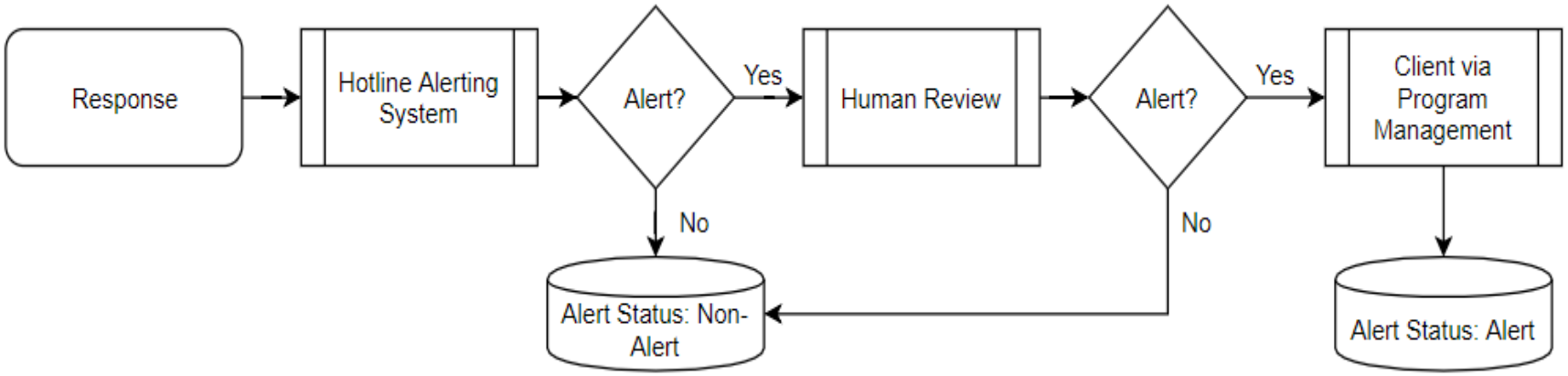
Confidence

- Autoscore produces a *confidence index* for each response.
- This index reflects the degree to which Autoscore 'thinks' it is producing an accurate score, or the score an expert scorer would have assigned.
- Based upon a statistical approach
- Lower-confidence responses will be routed for human verification.

Automated Troubled Child Alert Identification

- Automated detection system for ‘crisis’ papers or alerts uses the Hotline system, which is separate from AS.
- Scans student-written text, including notes, for phrasing indicating harm to self or others.
- Combined with human review, ensures systematic and timely review of every piece of text written by students.
- Typically provide alerts within 24 hours of identification.

Student Alert Response Flow



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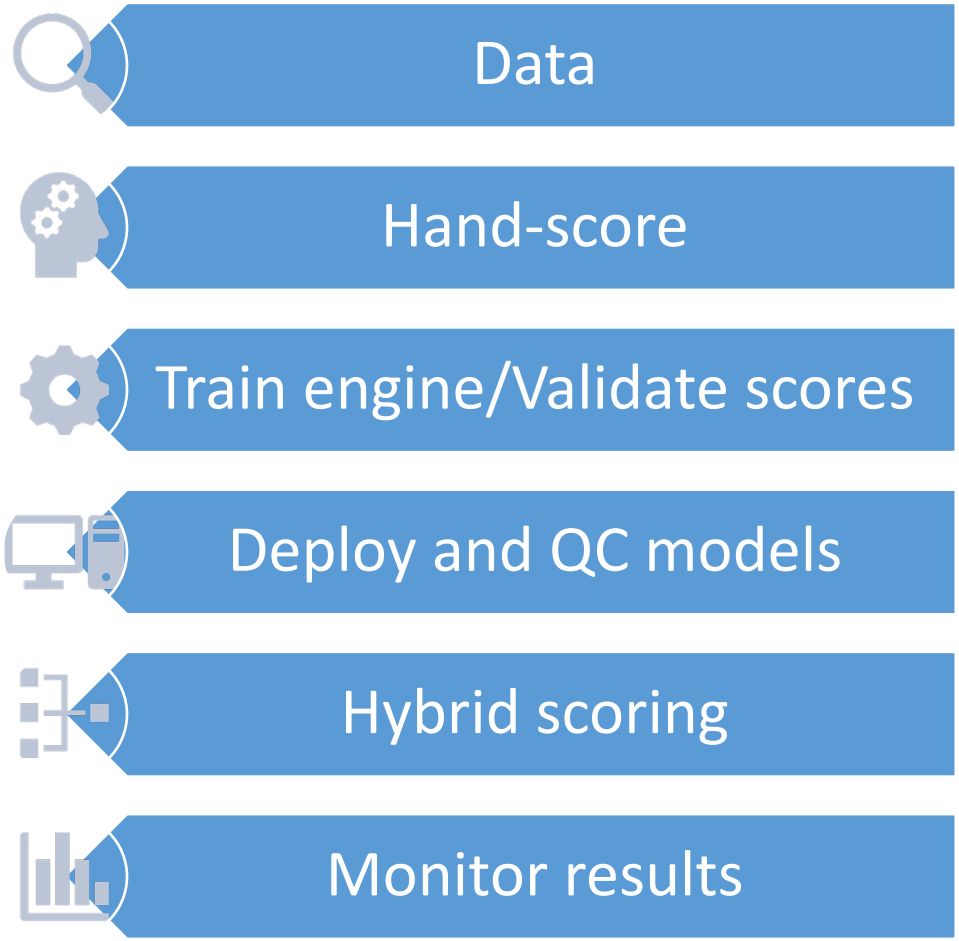
Autoscore Training Methods

Overall Process



Data

- Models built for each prompt
- Identify pool of available responses
  - Administration conditions match anticipated conditions
  - 2,500-4,000 recommended
  - Stratify to ensure sufficient score point representation, if possible
  - Typically part of embedded or stand-alone field test, but could be drawn from operational samples
    - Will use Spring 2023 Writing Field Test responses
    - May draw from future operational samples as needed

Handscoring

- Obtain the highest-quality score on which to train the engine
- Training Materials
  - Scores and condition codes
  - Rater training, qualification, and monitoring materials
- Scoring Responses
  - Rater training, qualification, and monitoring
  - Two independent reads
  - Non-exact adjudication

Training

- Divide the sample into three sets: model training, ensembling, and validation.
- Train classical and language models separately using the model training sample.
- Use the score outputs from each of the classical and language models and train the engine using the ensembled data.
- Once the ensemble is built, use the ensemble to predict scores on the validation sample.

Criteria for Evaluation

- Consider human scoring to be the 'gold standard'
  - Engine-final resolved scores compared to the two human scores
- Florida will use multiple measures to monitor AS and to adjust as needed:
  - Does the engine give exactly the same score in the same proportions as humans do?
  - Does the engine agree with a human beyond what would be expected simply by chance the same way the two humans do?
  - Does the engine produce similar average scores compared to the humans?

Quality Control: Engine Changes and Model Deployment

- Standardized scripts for engine training and validation
- Test cases and models used to examine the impact of any software change
- Scripts to re-score validation data on deployed models
  - Must return same scores, condition codes, and confidence values
- Checks to assess adherence to scoring specifications

Monitoring Performance

- First N sample
  - Helps to identify any early issues
  - Examines performance early in the window but not throughout
  - Not representative
  - We should expect that the engine agreements with the human raters to be similar to those observed in the held-out validation sample.
- Lower-confidence sample
  - We should see generally lower agreements with the human raters.

AS Validation Best Practices

- Engine design (deep-learning based)
- Engine performance evaluation (including bias)
- Unusual paper identification
- Lower-confidence identification
- Operational monitoring
  - Adherence to routing conditions
  - Agreements and mean differences
- Technical reporting and transparency
- Educator comparability workshops
- Help desk ticket reviews/responses

Continuous efforts to improve based upon findings

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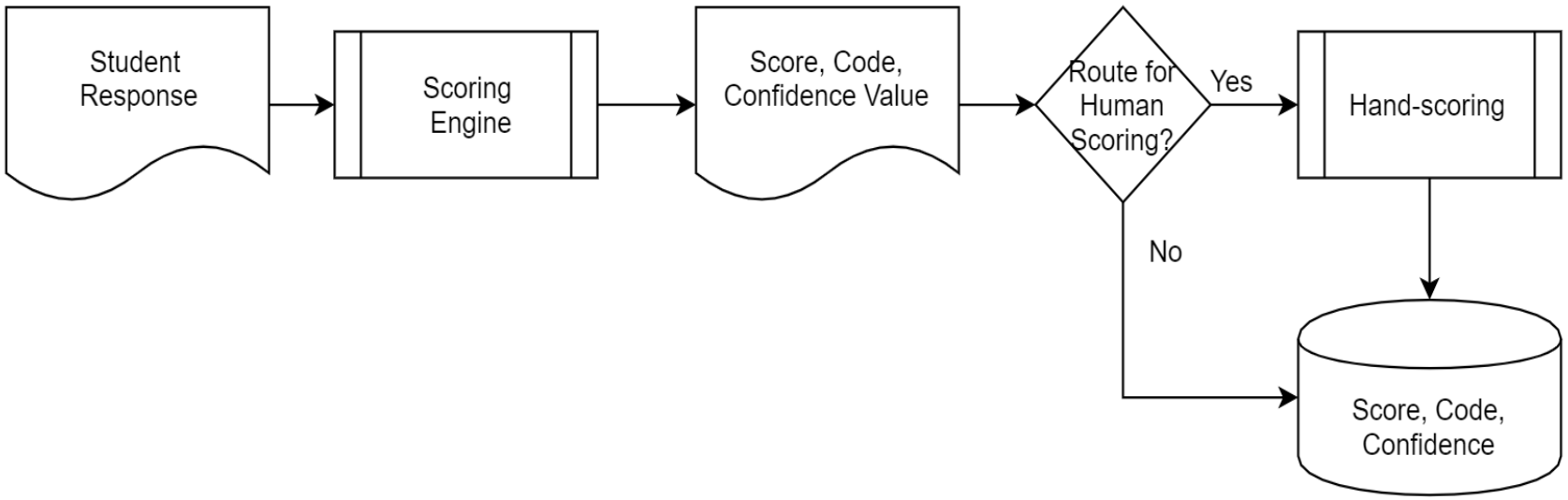
Hybrid Scoring

More about Hybrid Scoring

- In 2023–2024 and beyond, Florida will use a hybrid of AS and human scoring.
- What kinds of responses will be routed for human scoring?
  - Unusual responses
    - Certain condition codes
    - Lower-confidence responses
  - Monitoring responses
    - Can be set number of first responses or random sample
- Routing decisions are configurable, specifications-based, and will be annually approved by Florida Department of Education staff.

Routing Florida



Responses routed for human scoring are scored by trained professional scorers.

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Retraining

Rationale

- Causes of low AS-HS agreement can include:
  - Changes in how students respond to test items
  - Insufficient data in engine training
  - Changes in handscoring
- It can be difficult to unpack the source of the issue.
  - Changes in handscoring should be examined with validity papers, potentially including the data used to train the engine.
- Possible recalibration with training data that includes both the original data and new operational data; this is most appropriate when we suspect training data are insufficient or responses have changed.
  - Need representative operational data
  - Need to ensure adherence to original rubric interpretation

Methods

- Train with original training sample and subset of operational data.
- Two validation sets:
  - Original held-out validation
  - Operational held-out validation
- Ensures adequate performance on both validation samples:
  - First, ensures adherence to the original interpretation of the rubric.
  - Second, examines performance in live scoring.
- If both datasets meet criteria, then use retrained model.

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