30 - Applications of Machine Learning in Life Insurance Modeling

2019 Valuation Actuary Symposium

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30, Applications of machine learning in life insurance modeling

2019-08-27

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- Do not discuss what you or other entities plan to do in a particular geographic or product markets or with particular customers.
- Do not speak on behalf of the SOA or any of its committees unless specifically authorized to do so.
- Do leave a meeting where any anticompetitive pricing or market allocation discussion occurs.
- Do alert SOA staff and/or legal counsel to any concerning discussions
- Do consult with legal counsel before raising any matter or making a statement that may involve competitively sensitive information.

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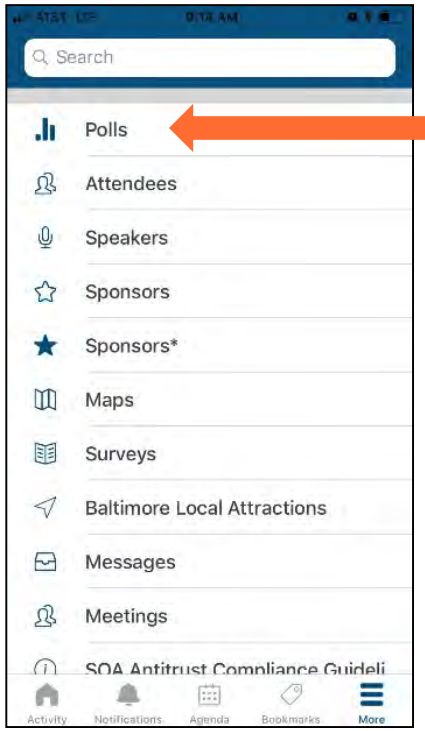

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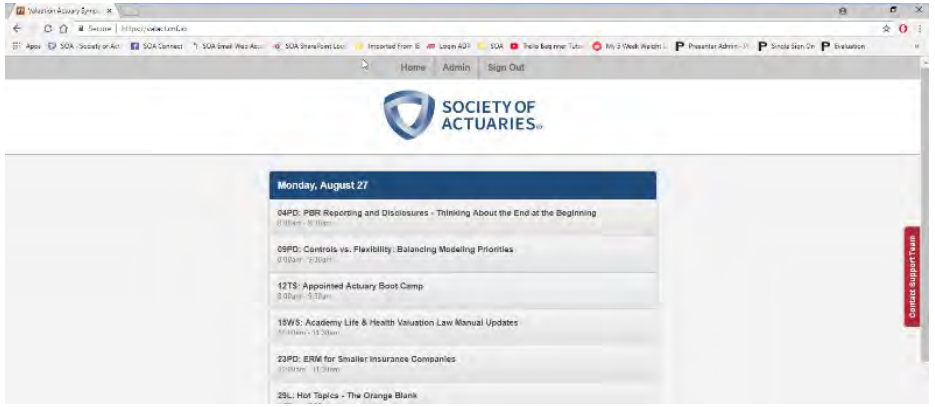


Choose your session

Respond to Polls when they appear

General steps of your modeling process

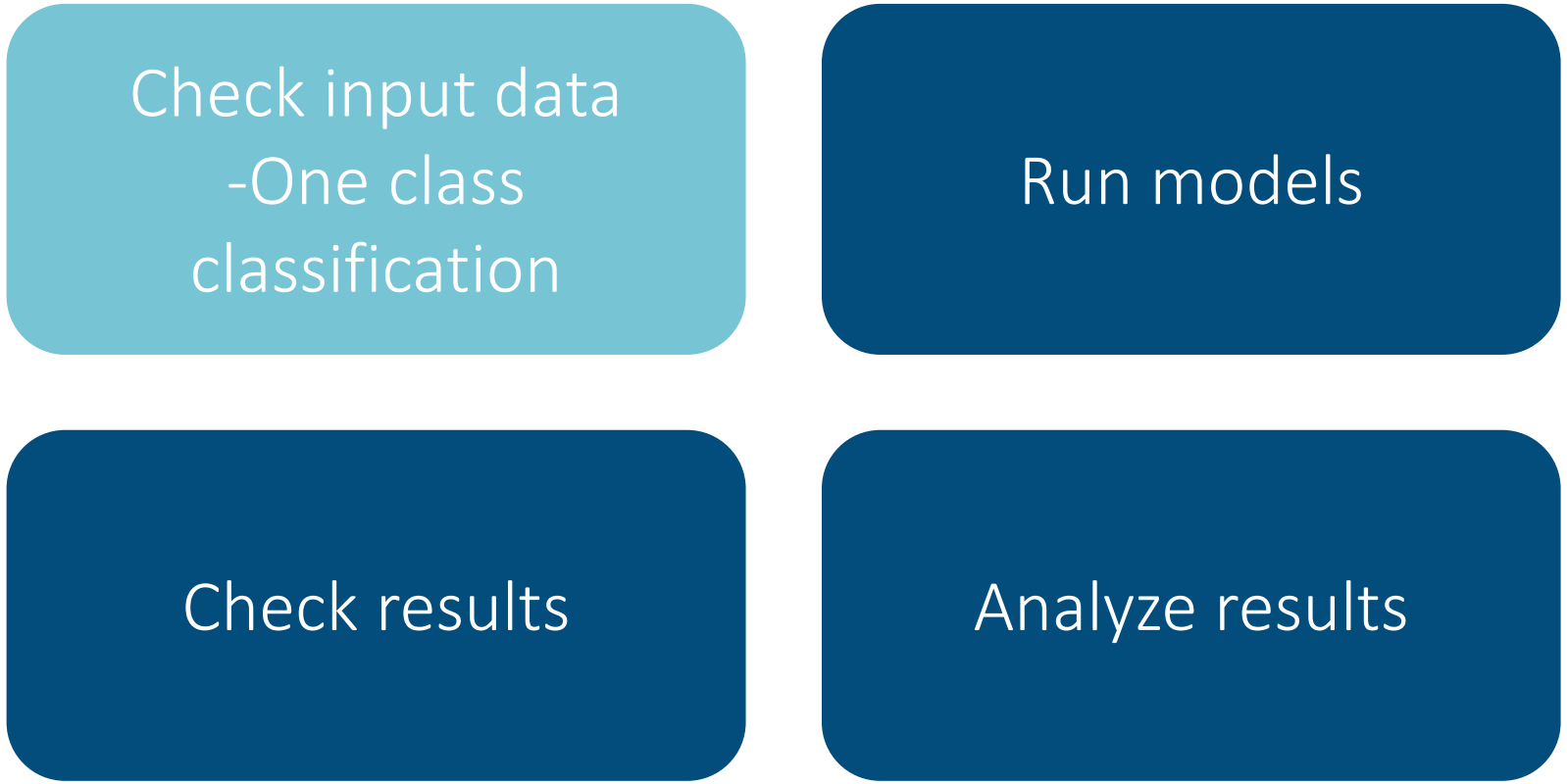
Check input data

Run models

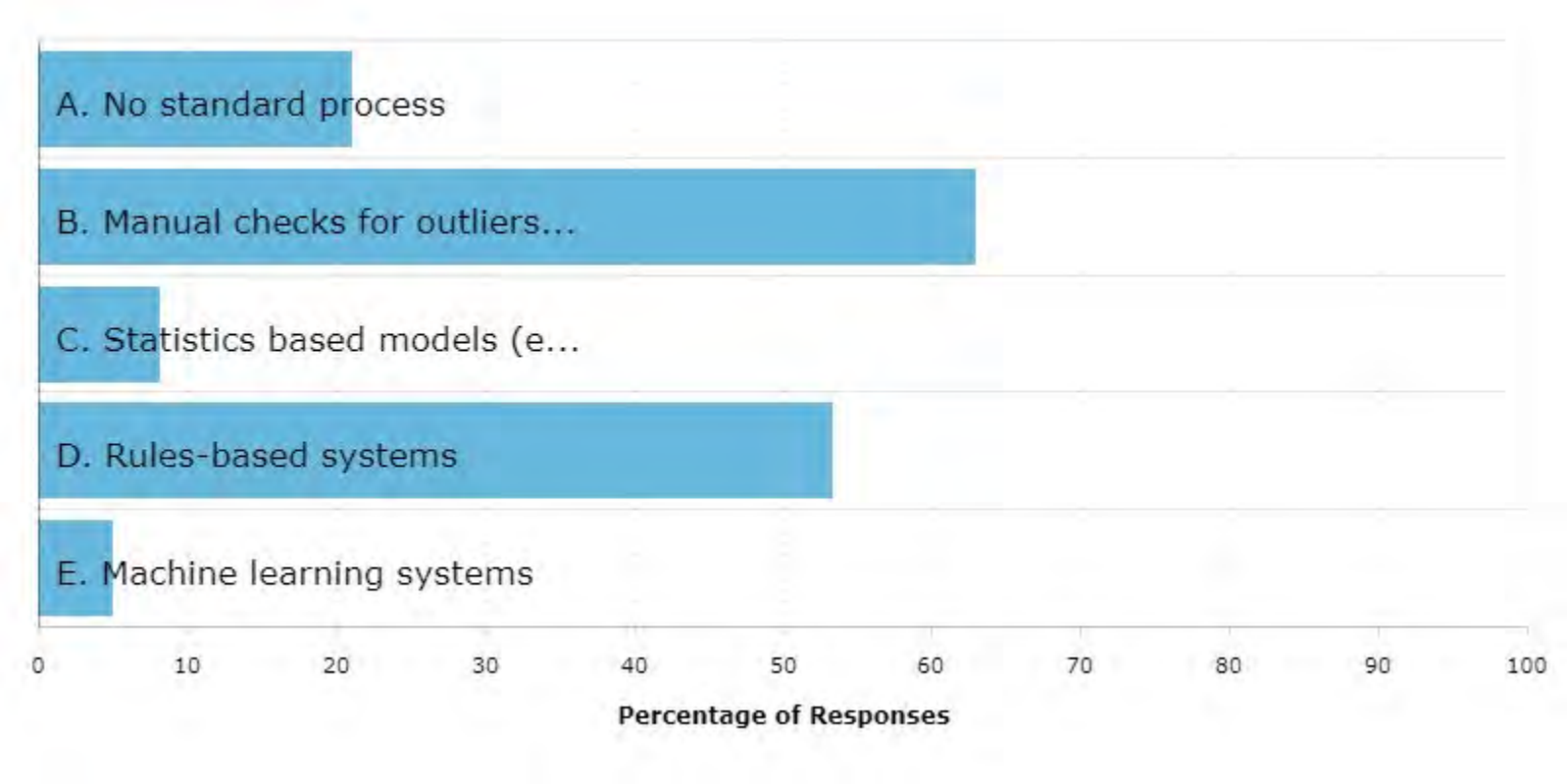
Check results

Analyze results

Checking input data with machine learning

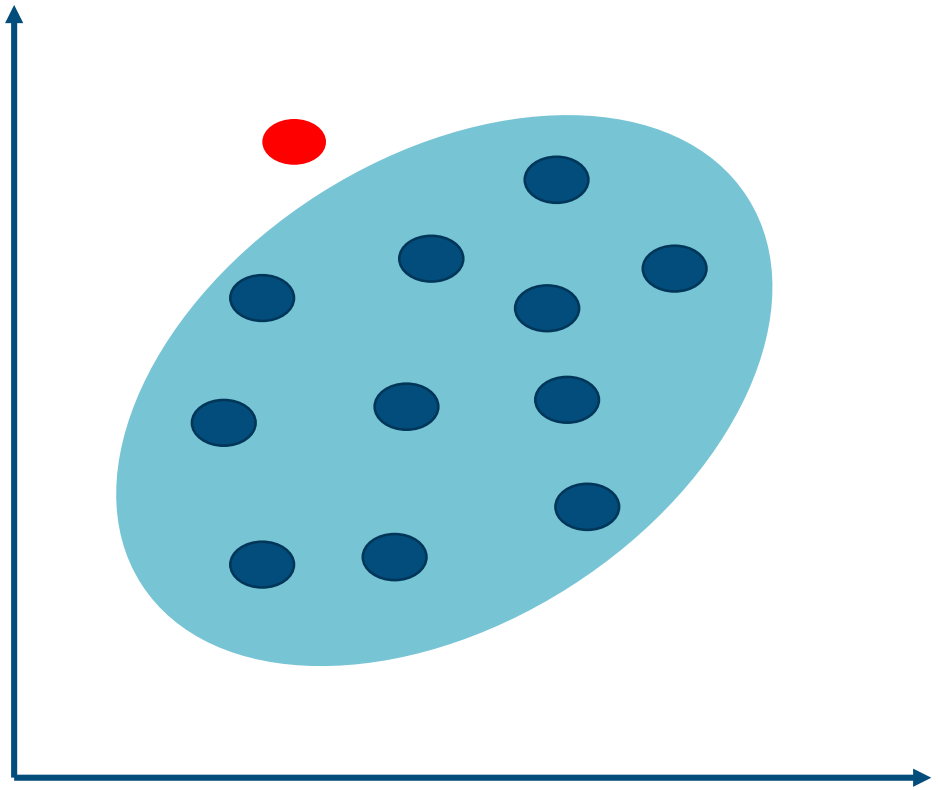


Poll: Checking input data methodology



One class classification

- Explanation: Classifies records as in-class or out of class, using observations of in-class only
- Application: Check your inforce files or assumptions to ensure that any new values are reasonable
- Typical techniques: SVM, k-means, k-nearest neighbors



Running models with machine learning

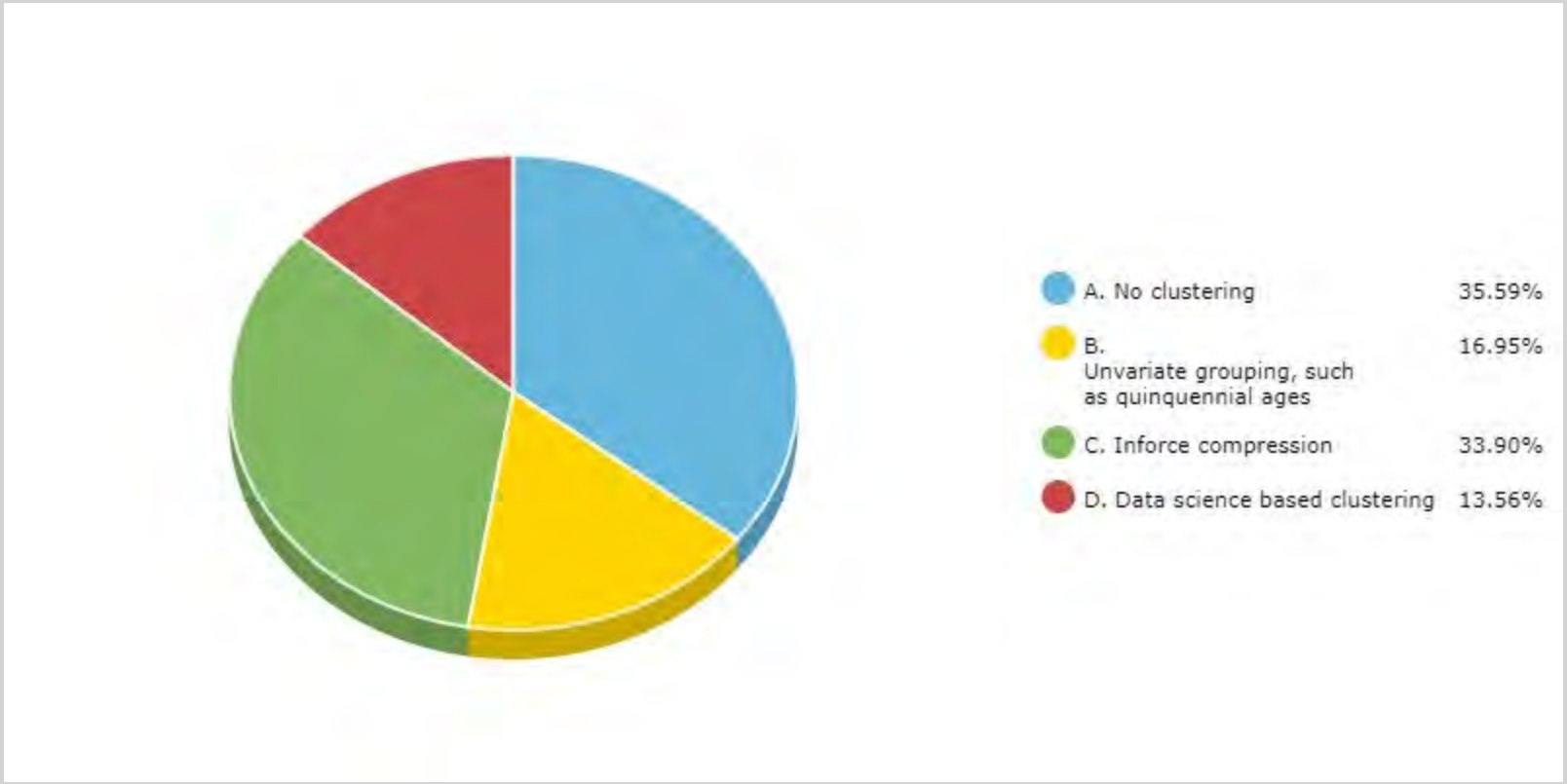
Check input data

Run models
-Clustering
-Principal components

Check results

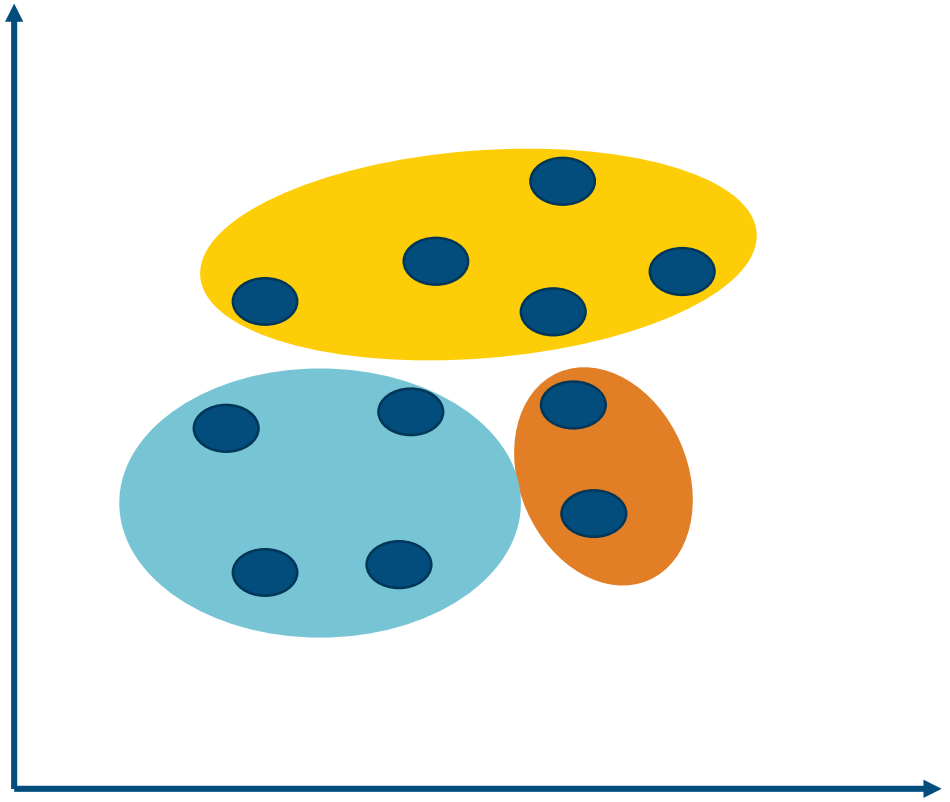
Analyze results

Poll: Do you do any inforce clustering?

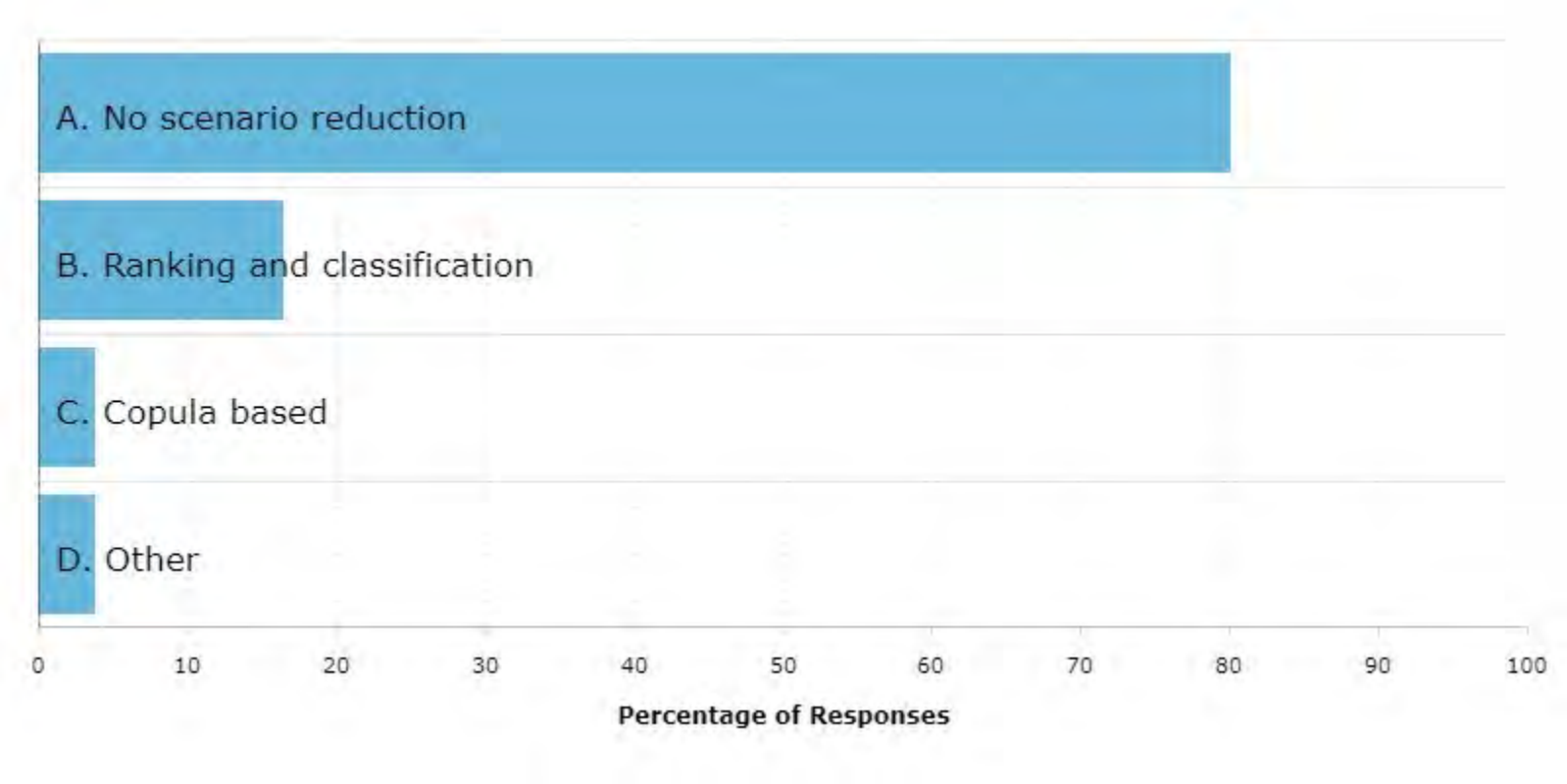


Clustering

- Explanation: Classifies records into groups based on their distributions
- Application: Reduce inforce model points by running them once and clustering based on results
- Typical methods: k-means, k-nearest neighbors, decision trees

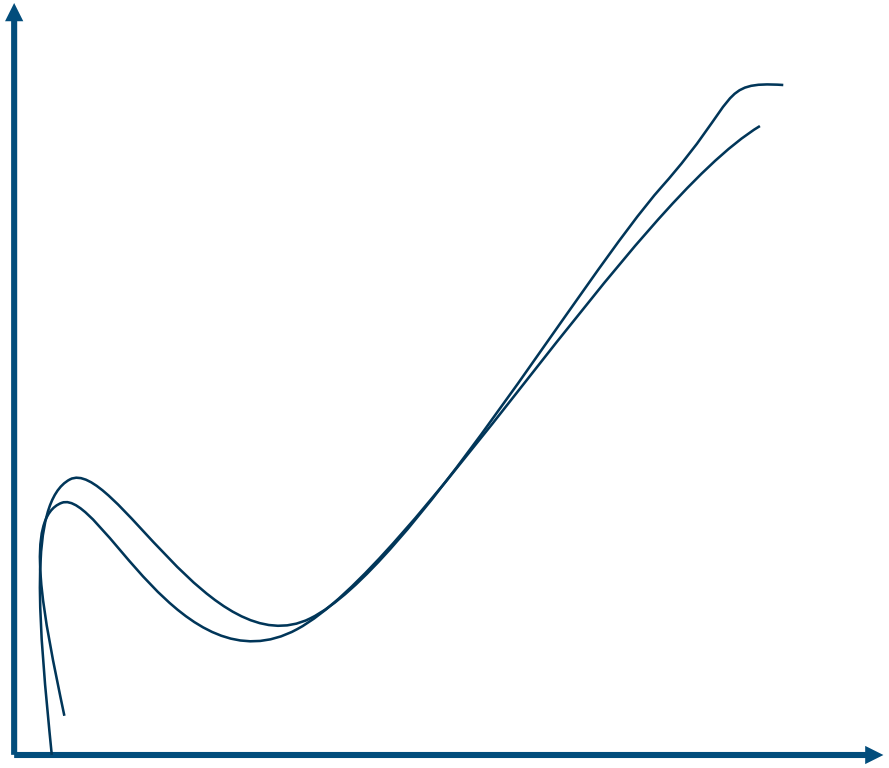


Poll: Do you do any scenario reduction?



Principal components

- Explanation: Take a series of correlated variables and make fewer uncorrelated ones using linear algebra
- Application: Use PCA to reduce your scenarios by simplifying their construction
- Typical methods: Principal components analysis



Checking results with machine learning

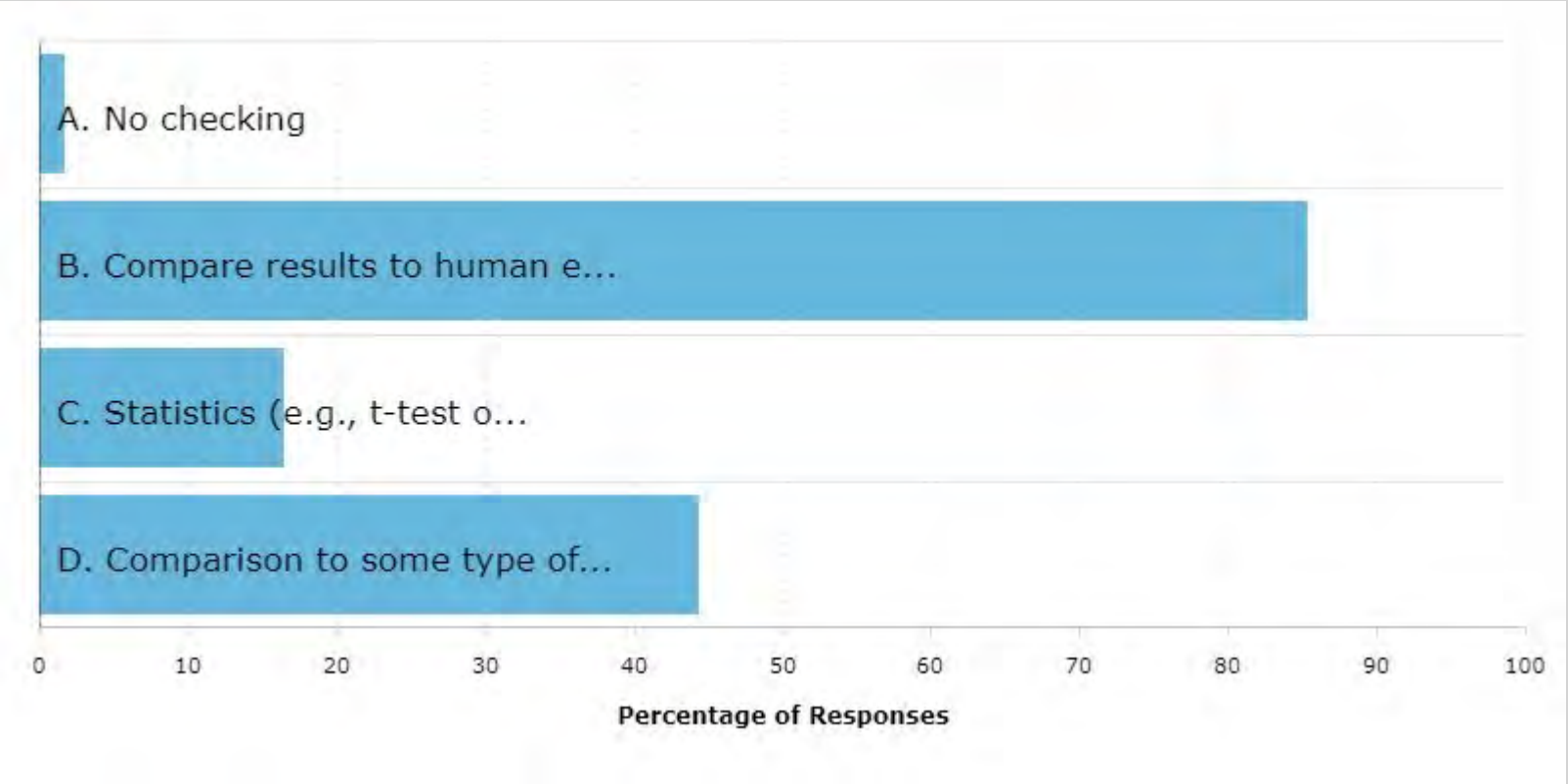
Check input data

Run models

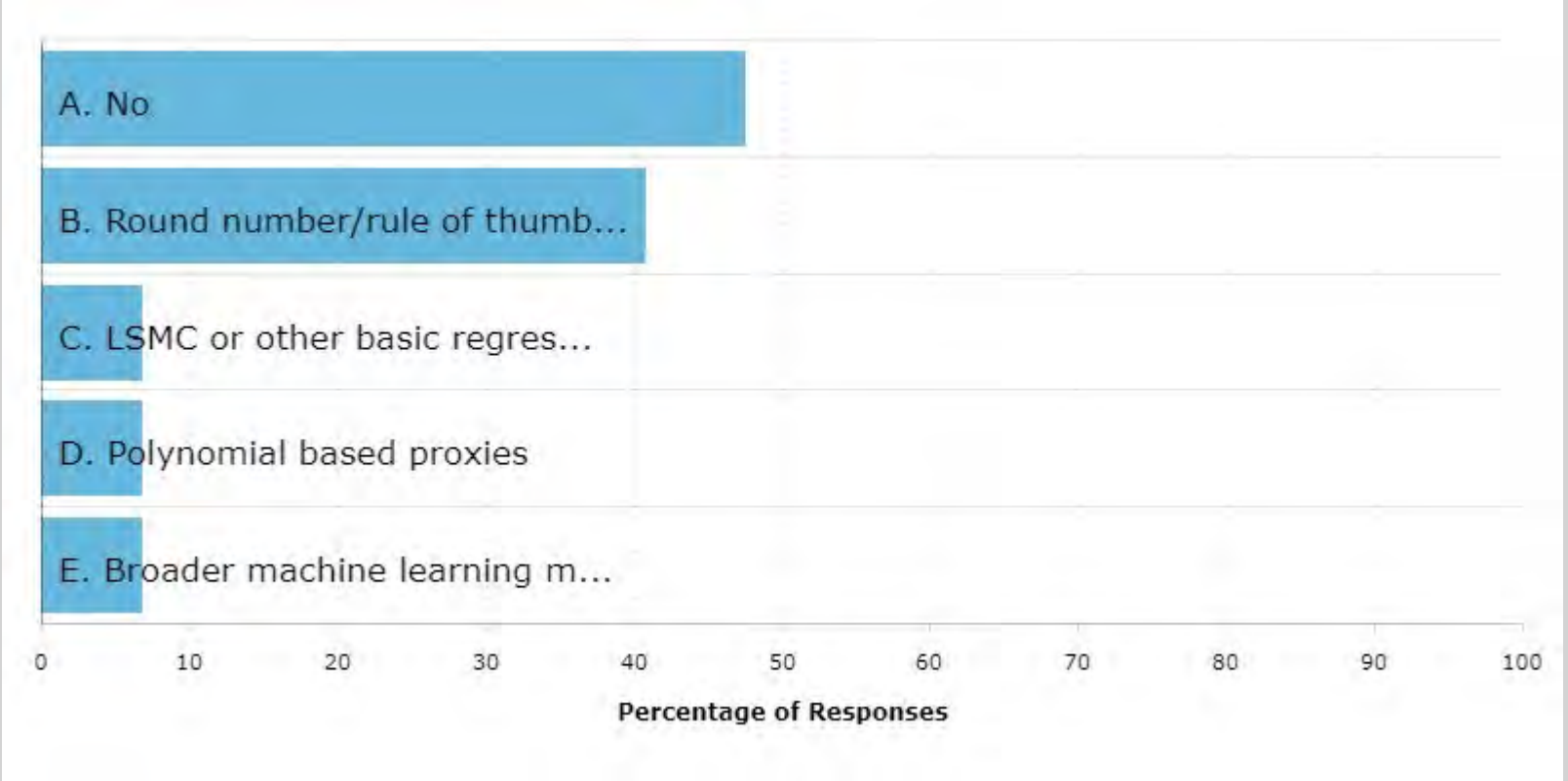
Check results
-Proxy models

Analyze results

Poll: How do you check your model results?

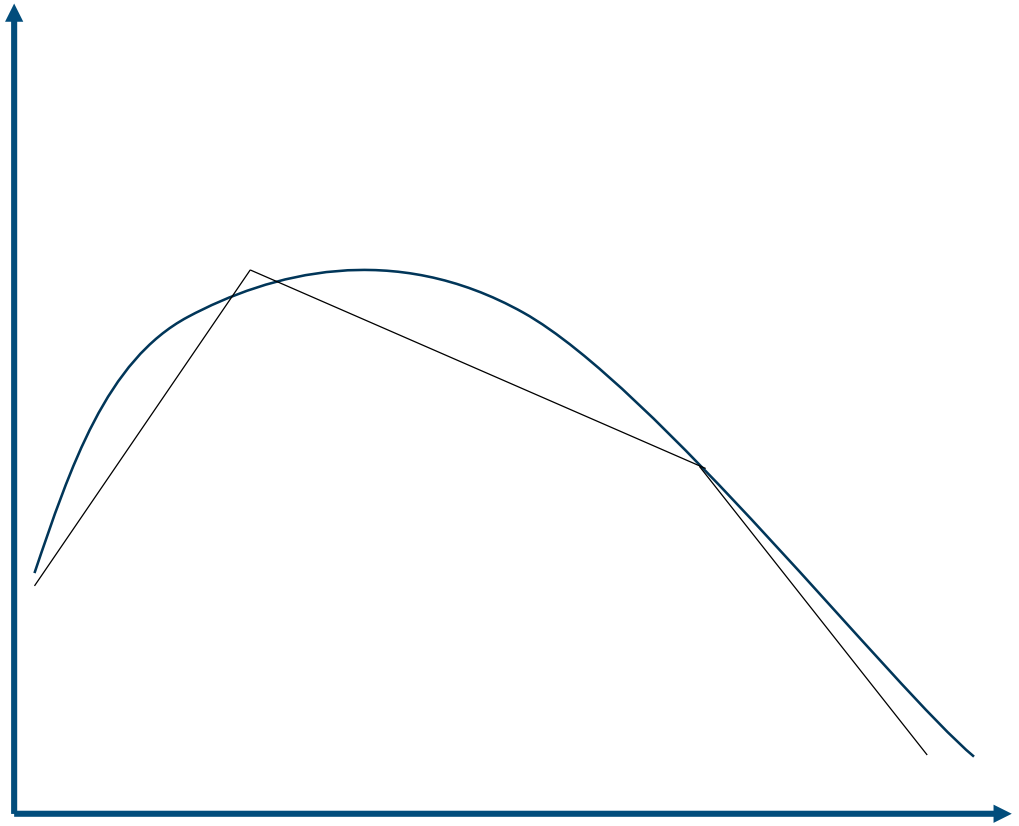


Poll: Do you do any proxy modeling?



Proxy modeling

- Explanation: Replace complicated model runs with simplified ones for analysis
- Application: Compare proxy model with actual results to confirm actuarial model results are correct
- Typical methods: Regression, GAM, GBM



Analyzing results with machine learning

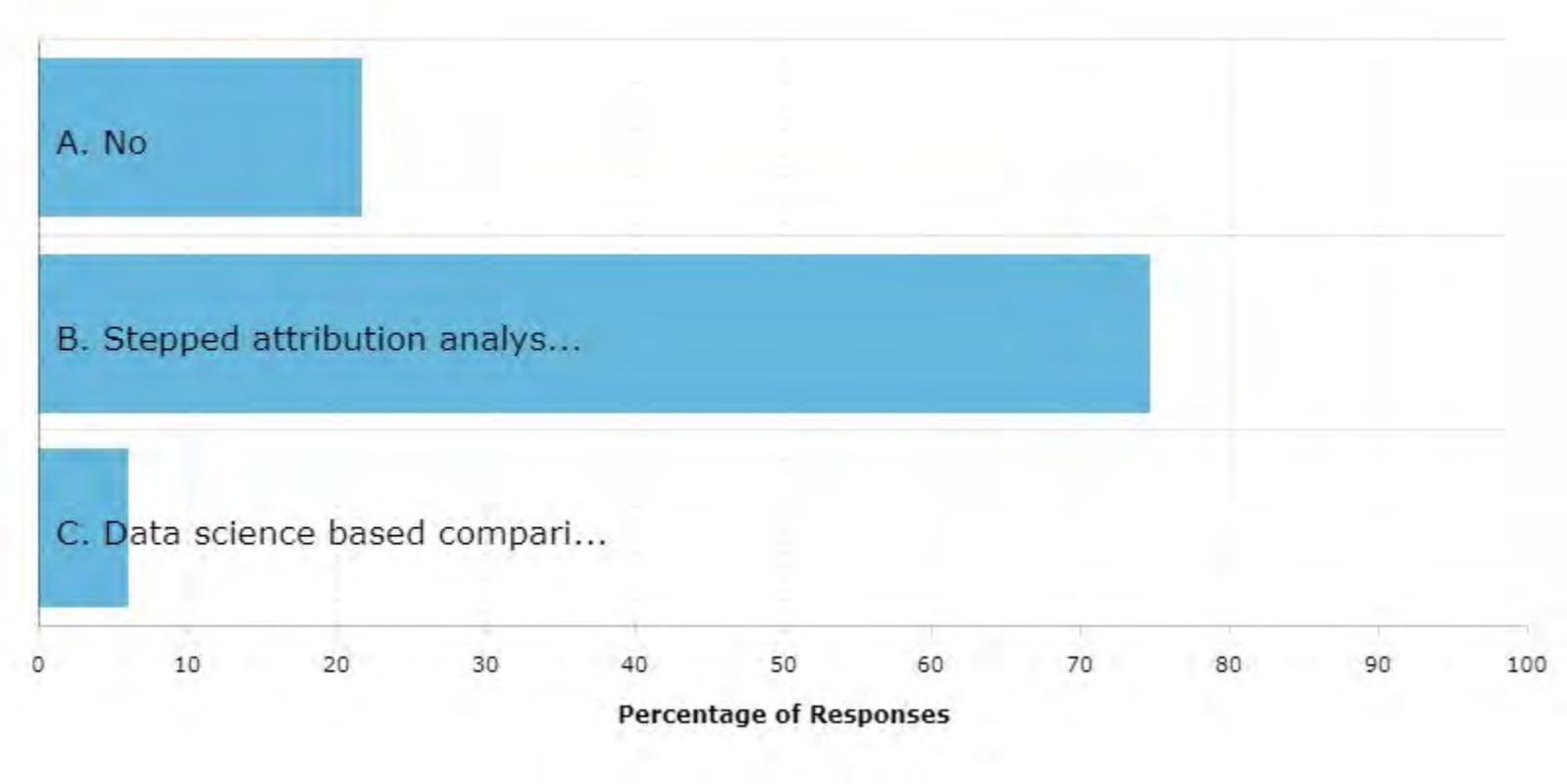
Check input data

Run models

Check results

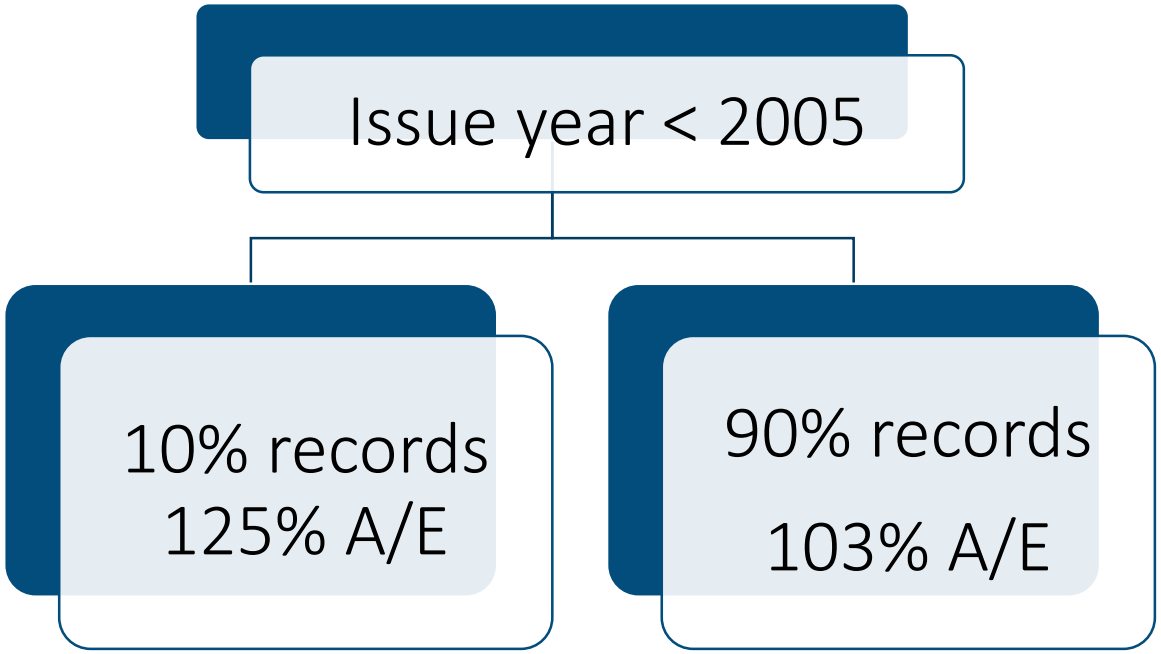
Analyze results
-Rule based models

Poll: Do you perform any analytics on your results?



Tree based models

- Explanation: Models split data into like groups, and the rules provide an audit trail for users
- Application: Compare output from two valuation dates or models to see rules explaining where changes happen
- Typical methods: Decision trees



Discussion polls

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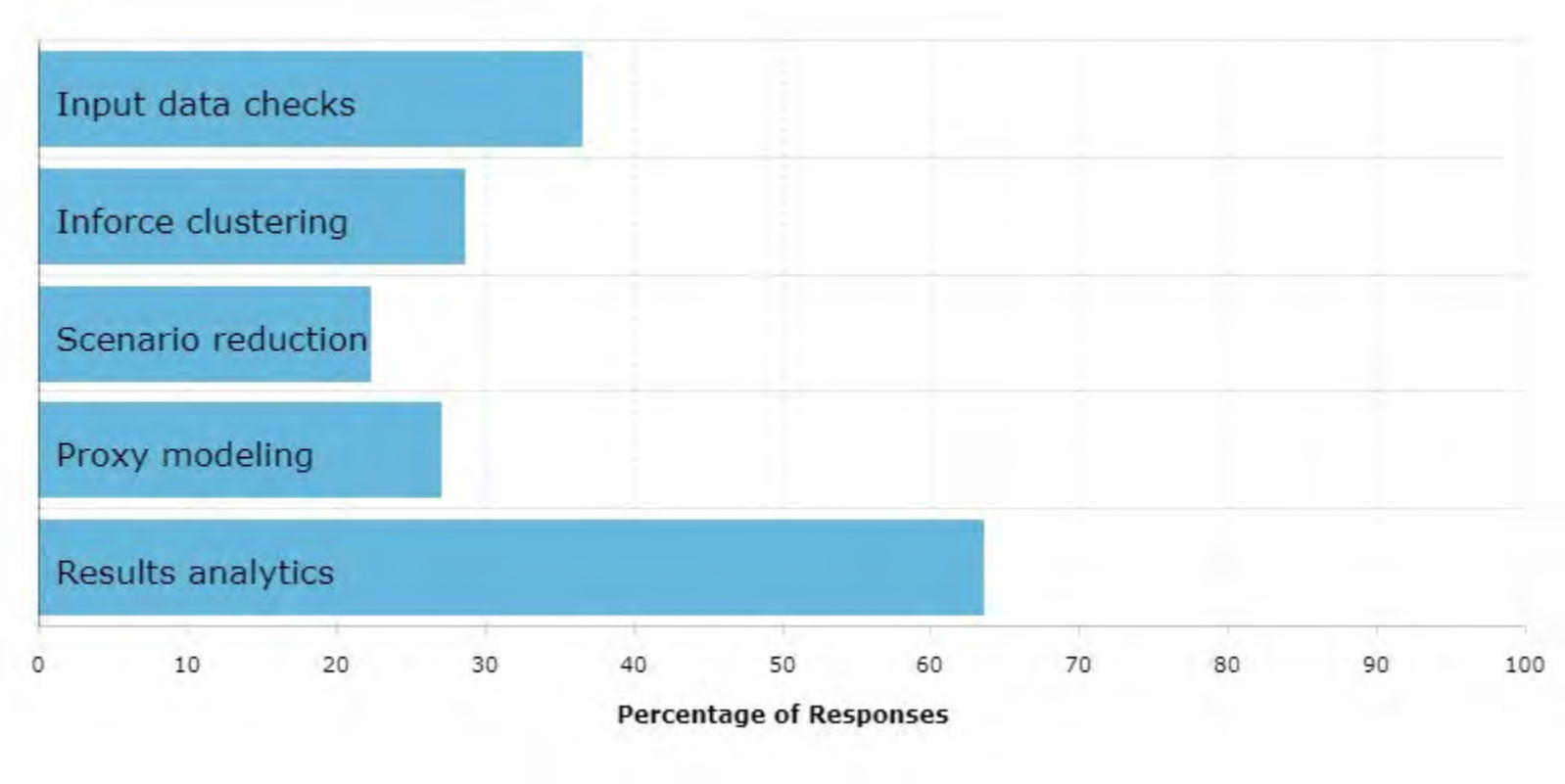
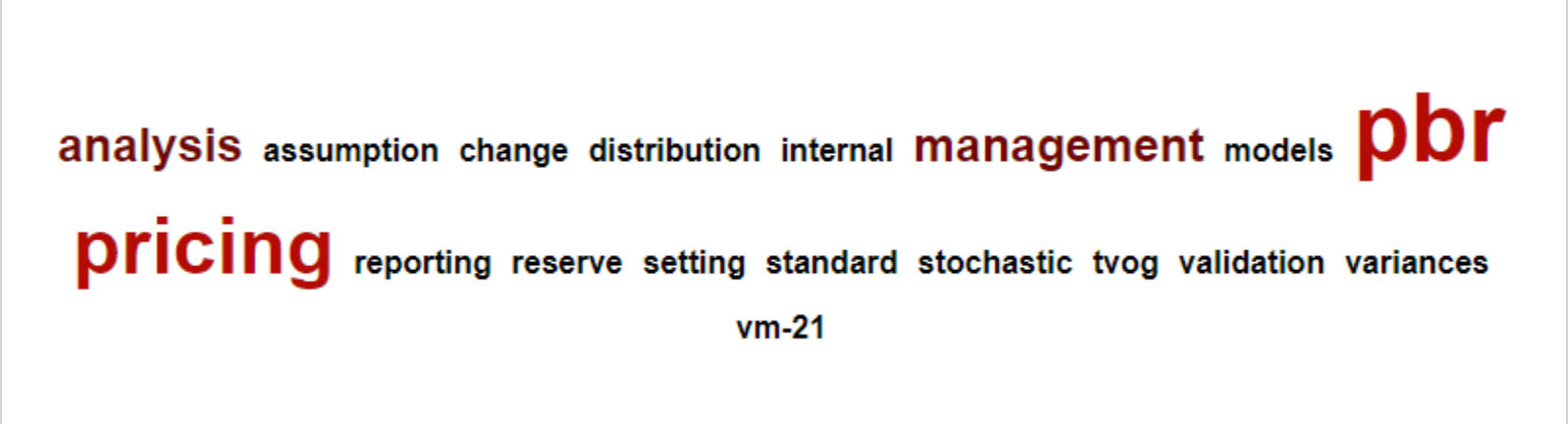
Poll: Which techniques discussed would you be most interested in testing?



Poll: What reporting purposes do you see the most benefit for machine learning?



Questions?

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GitHub portion

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