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Improving Predictive Models with IBM SPSS Modeler

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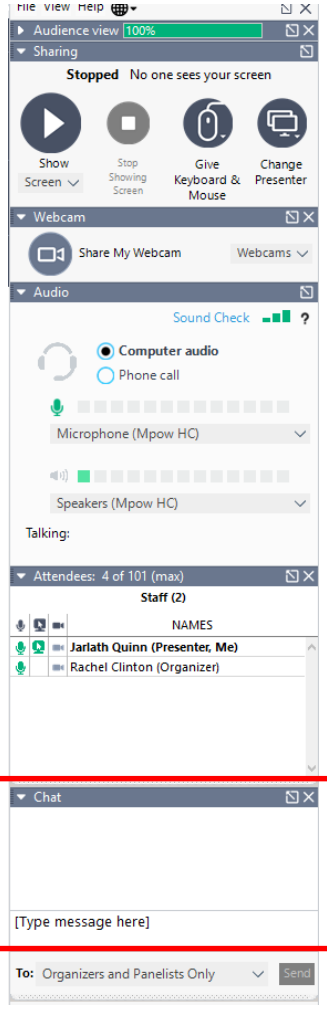

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- Premier accredited partner to IBM and Predictive Solutions specialising in advanced analytics & big data technologies
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Agenda

- Bootstrap aggregation
- Boosted models
- Feature engineering
- Ensemble models
- Meta-modelling
- Split-method models

Method 1:

Bootstrap Aggregation (Bagging)

Bootstrap Aggregation or 'Bagging'

- If I build a single predictive model on a given sample of data, how likely is it that I would get the same results using a slightly different sample?
- In fact, what if I took a random sub-sample comprised of 95% of the data and built a predictive model and then compared that model to another one built using a different random sub-sample based also based on 95% of the data?
- The fact is that models vary from one sample to another. So which one is best?
- Answer: All of them

Bootstrap Aggregation or 'Bagging'

- Bootstrap aggregation, also called bagging, is a random ensemble method designed to increase the stability and accuracy of models.
- It involves creating a series of models from the same training data set by randomly sampling with replacement the data. Sampling with replacement means that a specific row of data may appear more than once in the subsequent random sample.
- This means that each resultant model is trained against a slightly different sample of data. The resultant predictions from the multiple models are then all combined to create a single score

Method 2: Boosting

Boosting

- Why does a model accurately predict outcomes with some records in the dataset but not others?
- Is it simply random? Or are certain sub-sets of data harder to predict with a generic ‘one-size-fits-all’ model?
- What if we could build a predictive model that paid more attention to the parts of the dataset where it is least accurate?

Boosting

- Boosting is another ensemble model-building method that was designed to help develop strong classification models from weak classifiers
- Boosting methods focus on *error* (or misclassifications) that occur in prediction. After an initial model is built, the Boosting algorithm applies a series of weights to the data so that cases that were inaccurately predicted are given larger values and those that were accurately predicted smaller values.
- The classification algorithm is then re-applied to the data, but this time greater emphasis is given to correctly predicting the previously misclassified cases (i.e. those with the larger weights).
- The idea is that by repeatedly applying this approach, the algorithm attempts to hunt down the harder to classify cases.

Method 3: Feature Engineering

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Feature Engineering

- Rather than trying to find the best technique or the optimal parameters for a predictive model, perhaps the more sensible approach would be to create new structures or ‘features’ in the data to help the technique accurately predict the outcome in question.

Feature Engineering

- Re-scaling predictor fields
- Replacing missing values
- Excluding outliers and extreme values
- Creating new fields based on the ratio of one variable to another
- Using Factor Analysis/PCA to create new linear combinations of existing correlated variables
- Using Cluster Analysis to create groups in the data based on the similarity of cases

Method 4: Ensemble Models

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Ensemble Models

- Trying to find the ultimate modelling technique can be frustrating.
- You might find that no single method performs well across *all* the subgroups of the data.
- How about combining the predictions of different methods?
- You could predict outcomes based on the model with the highest confidence score, or just using the average probability from different models or perhaps calculate a weighted score.

Method 5: Meta-Models

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Meta Models

- What if you used the predictions from one model as an input variable for another predictive model?
- By adding the predictions generated by an initial modelling technique to an existing pool of predictor field, a second technique can then exploit these predictions to build a final, hopefully more accurate model.

Method 6: Split Models

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Split Models

- Split models or split population modelling is another technique that allows the user to build multiple models which can then be combined to create a single prediction.
- The idea with split modelling is that if the data represent different populations or contain separate groups that behave in very different ways, assuming that a single model can explain all the inherent variability across these distinct populations might be unreasonable.
- In which case, why not build separate local models for these key segments in the data and aggregate the resultant scores with the aim of increasing overall accuracy.

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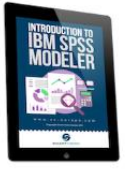

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