ANALYSIS CHILD LEARNING STATS AND EVALUATE CLASSIFICATION MODELS

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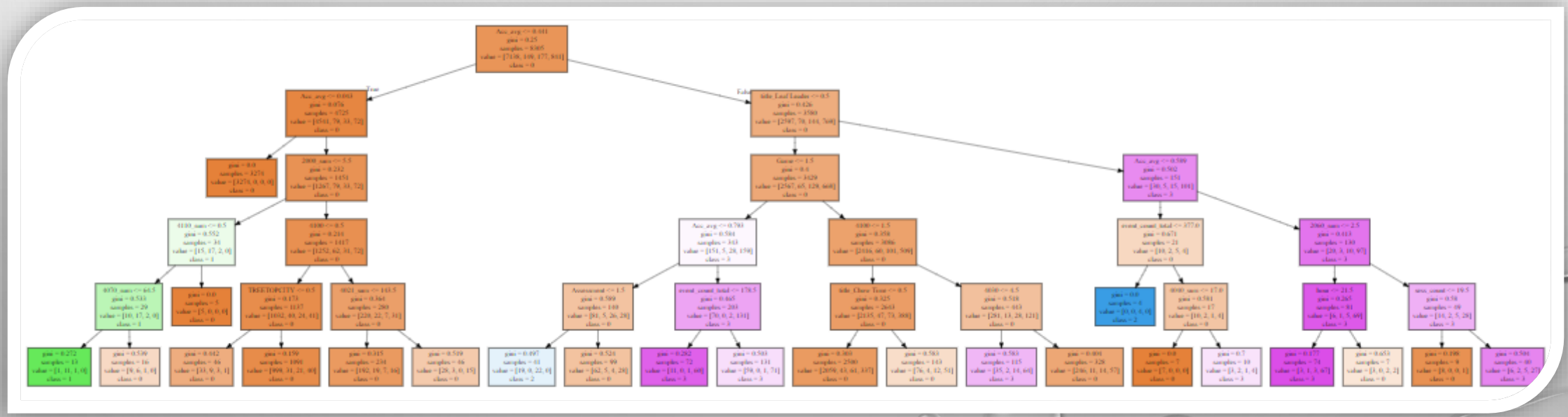
Overview

- Child learning App data (“PBS KIDS Measure Up!” APP)
  - 10382 Entries: 80% train-test split
  - 128 Features
  - 4 Classes: number of attempts to get correct answer in an Assessment

Research Question & Approach

- Visualise and quantify the relationships between learning outcome and features
  - H0: past assessment history will affect the final learning outcome
  - Feature Importance – Decision Tree Classifier



Decision Tree – Result

- Average accuracy (accuracy in the past)

```
[('Acc_avg', 0.47186434421601736),
 ('title_Leaf Leader', 0.14484520860975122),
 ('Game', 0.12163936254502887),
 ('4030', 0.056445128042438286),
 ('4100', 0.04341021935752289),
 ('title_Chow Time', 0.03524762853480693),
 ('2000_sum', 0.025529184622731772),
 ('event_count_total', 0.02314090246537647),
 ('Assessment', 0.0194193861525324),
 ('sess_count', 0.012218038468430507),
 ('4021_sum', 0.0081490091509724),
 ('2060_sum', 0.007245052323811948),
 ('hour', 0.0071725432427105626),
 ('4110_sum', 0.006252756050341388),
 ('4070_sum', 0.006193148207730218),
 ('TREETOPCITY', 0.005793735503659002),
 ('4040_sum', 0.005434352506137684)]
```

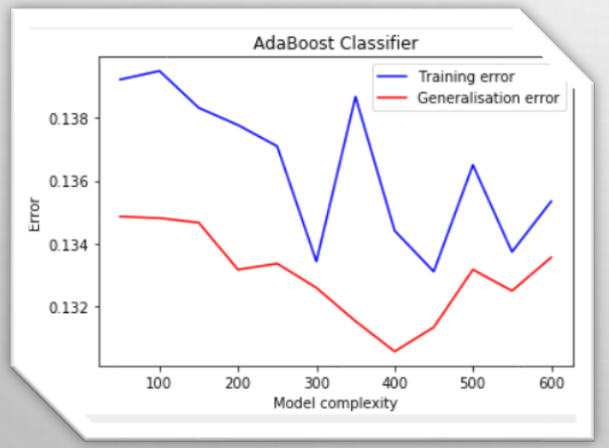
Feature Importance

```
Best parameters: {'criterion': 'gini', 'max_depth': 6, 'splitter': 'best'}
              precision    recall  f1-score   support

           0       0.90      0.98      0.94      1786
           1       0.11      0.03      0.05        35
           2       0.42      0.14      0.20        37
           3       0.73      0.34      0.46       219

    accuracy                           0.88      2077
   macro avg       0.54      0.37      0.41      2077
weighted avg       0.86      0.88      0.86      2077
```

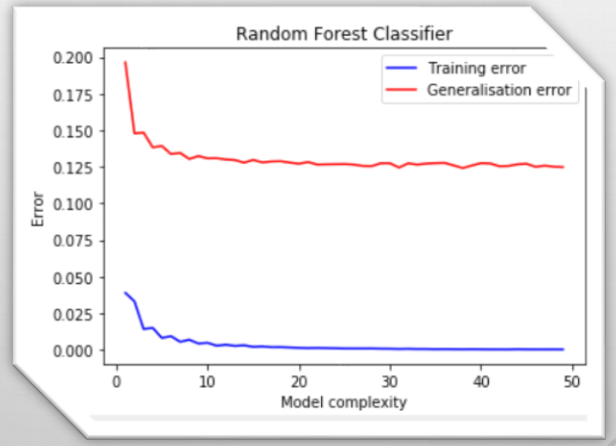
Classification Report

Research Question & Approach

- Apply and compare different classification models on the dataset
  - Ada Boost Classifier, Random Forest Classifier, K Neighbors Classifier
  - Plot error-complexity $\Longrightarrow$ Grid Search Cross Validation
  - Pair-wise McNemar's Test ($\alpha = 0.05$), Classification f1-score



Number of estimates



Number of estimates

Number of neighbours

Model Selection – McNemar's Test Result

P value / Test statistic	Decision Tree	Ada Boosting	Random Forest	K Neighbors
Decision Tree	/	0.01174338	0.82826254	0.00149112
Ada Boosting	6.34920635e+00	/	0.02144822	0.1138463
Random Forest	4.70588235e-02	5.29000000	/	0.00445953
K Neighbors	1.00895522e+01	2.50000000	8.08653846	/
f1-score	0.86	0.80	0.86	0.80

Conclusion: Decision Tree > Random Forest > ADA Boosting = K Neighbours

THANK YOU