Logical minimization tools can’t deal well with a big number of inputs. Machine Learning methods such as Decision Trees (DT) can provide better results compared to traditional tools.

**METHODOLOGY**

Using a data set with 100 benchmarks composed by incomplete truth tables from the IWLS 2020 contest, simplification results from C5.0 and Scikit-Learn (both DT tools) were compared Espresso’s ones.

- Parsing PLA to Decision Tree inputs
- EQN format (intermediate)
- C5.0 SPAXM
- Evaluation with ABC

**Proposed Learning Flow**

Espresso was not able to end its optimization for larger benchmarks.

**DISCUSSION AND CONCLUSION**

Decision Trees can reach accuracy and number of nodes similar to Espresso for incomplete truth tables.

- DTs showed to be a faster alternative
- C5.0 SPAXM had a slight improvement compared to SOP and POS.
- SK reached the best accuracy, but the number of inputs had to be considerably higher to do so.

**Next Steps:**

Explore the proposed flow to fast logic minimization
Extend the proposed flow englobing the synthesis steps

**Figure of Merit: (# of Nodes)/Acc**

<table>
<thead>
<tr>
<th>Method</th>
<th>#Nodes</th>
<th>Acc (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Espresso</td>
<td>797.11</td>
<td>78.05</td>
</tr>
<tr>
<td>C5.0 SOP</td>
<td>56.39</td>
<td>75.57</td>
</tr>
<tr>
<td>C5.0 POS</td>
<td>62.19</td>
<td>76.63</td>
</tr>
<tr>
<td>C5.0 SPAXM</td>
<td>123.44</td>
<td>77.84</td>
</tr>
<tr>
<td>SK SOP</td>
<td>1149.08</td>
<td>81.58</td>
</tr>
</tbody>
</table>