Scaling Down – Squaring Deep Neural Networks for explainability and lightweight deployment

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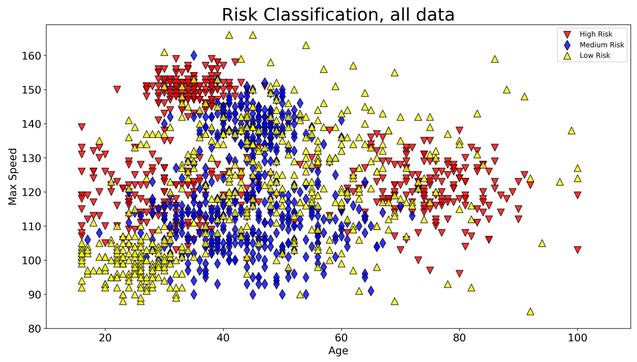
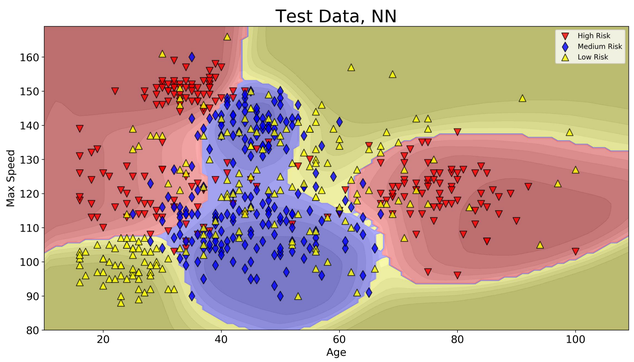
http://scaledml.org/2020/

Use Case - Risk Prediction

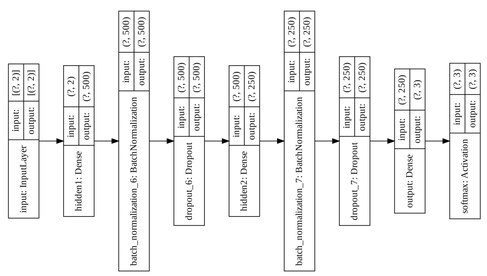
We want to score the risk of potential customers based on their age the max speed of their cars.



Deep Neural Networks can solve this

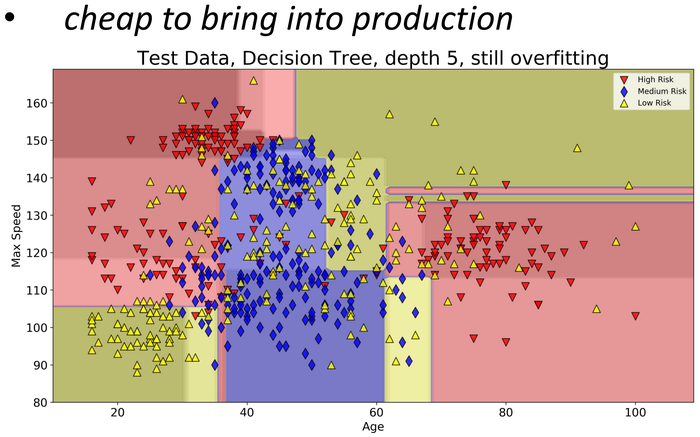


gives high accuracy without any overfitting, but also 130k parameters make this a block box



Decision Trees offer explainability

- *the right to explanation is well established by the GDPR and United States' Credit score*
- *shallow decision trees allow for at least a basic level understanding,*
- *but tend to overfit even when regularized*
- *can be used to generate readable code from*
- *cheap to bring into production*

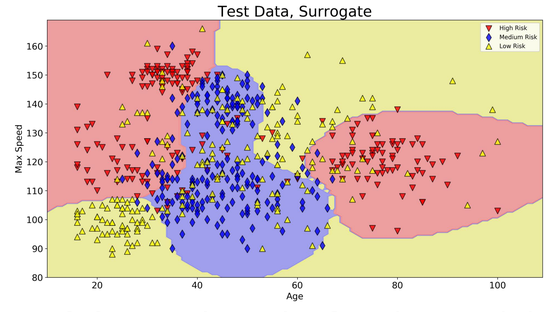


Best of both worlds – use DNN as a teacher for Decision Trees

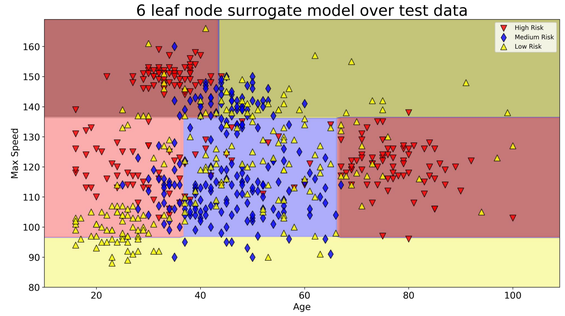
1. *high capacity deep neural network is trained and regularized like shown in left column*
2. *used to predict a dense set of data over complete range of domain*
3. *this data, not original data, is used to train decision tree*
4. *does not overfit*

Student Decision Tree can be tuned for

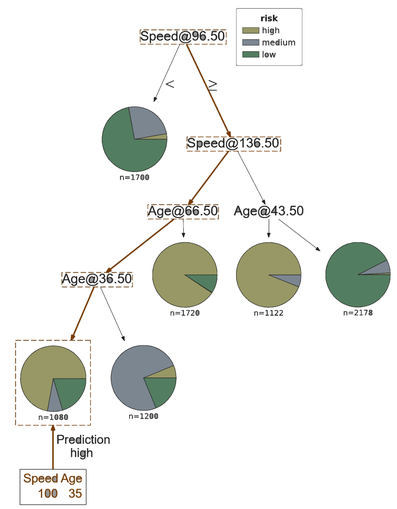
accuracy: *same score as teacher, but depth of 12*



explainability: *only six leaf nodes, and depth of 4*



Sample prediction path



Notebook: http://bit.ly/scaling-down-2020