Neural Decision Forests

and *multree*[1]

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[1]https://github.com/DavidRdgz/multree

Outline

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Foundations

Neural Trees

First studied by Stromberg in 1991 [SZI91].

Neural Decision Forest

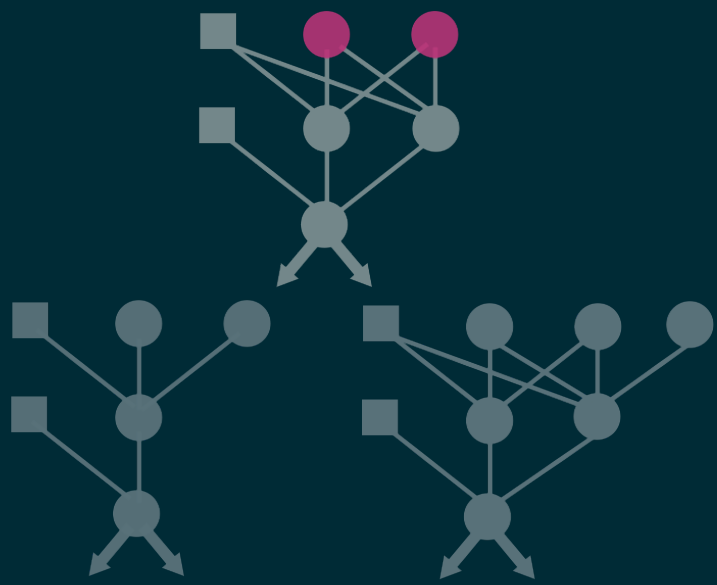
First studied by Bulo and Kontschieder in 2014 [RBK14].

Outline

Net Inputs

Feed Forward:

- Inputs: x, y.
- Flow to Output.



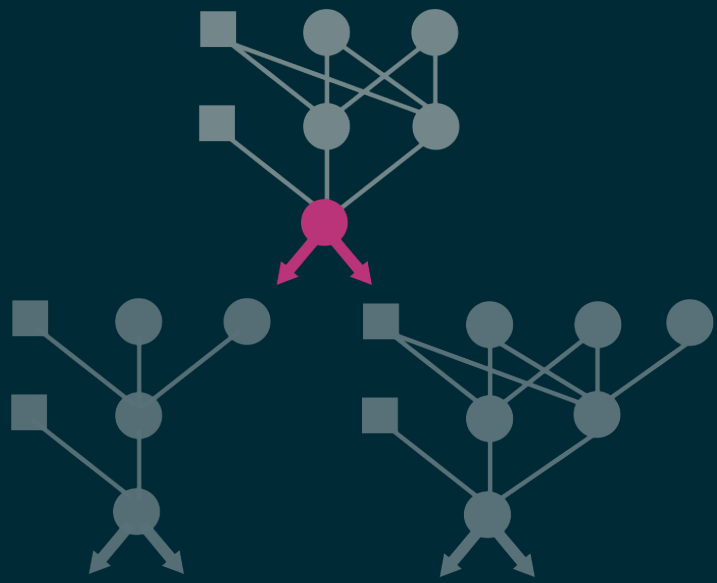
Net Output

Feed Forward:

- Output Activation

  $f(x) = [1 + e^{-x}]^{-1}$

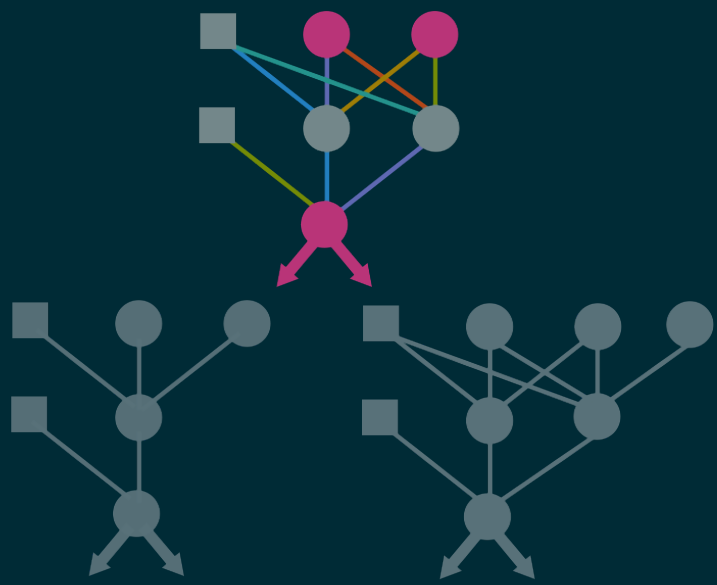
- Binary Class Seperation.



Net Training

Training:

- L_2 Regularization.
- Done, divide.



Outline

Randomized Nets

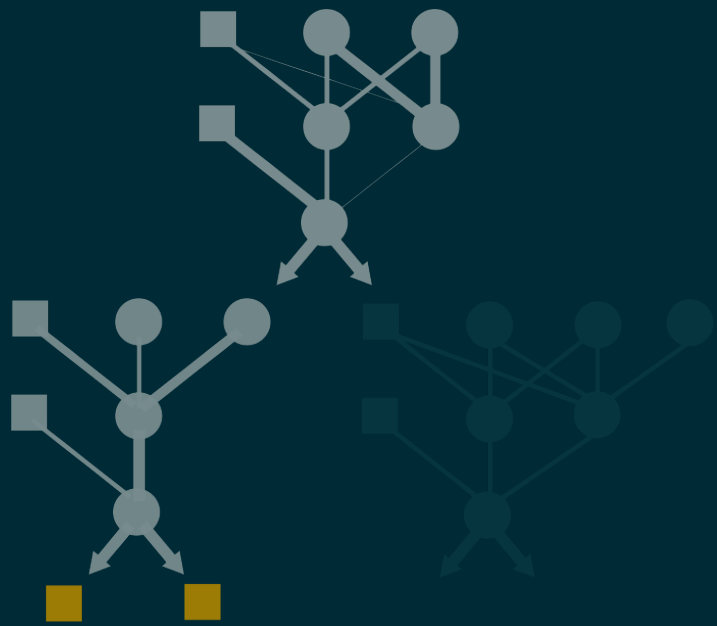
Randomized Nets:

- Input - random.
- Hidden layer - random.
- Output - binary.

Leaves

Leaf:

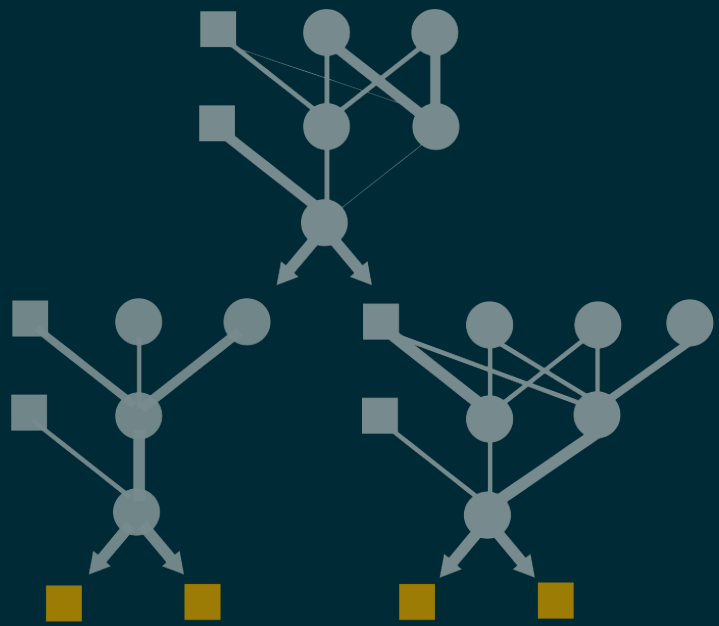
- Child subset - 1 class.



Greedy Trees

Iter:

- till all leaves.

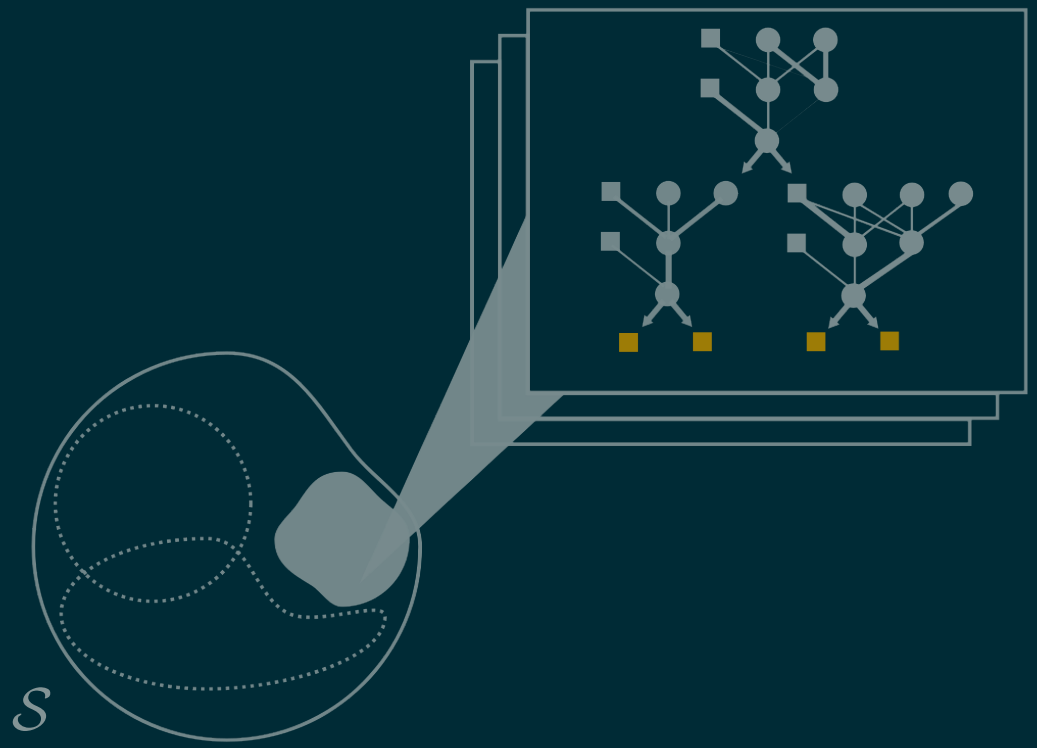


Outline

Ensemble Predictors

Forest:

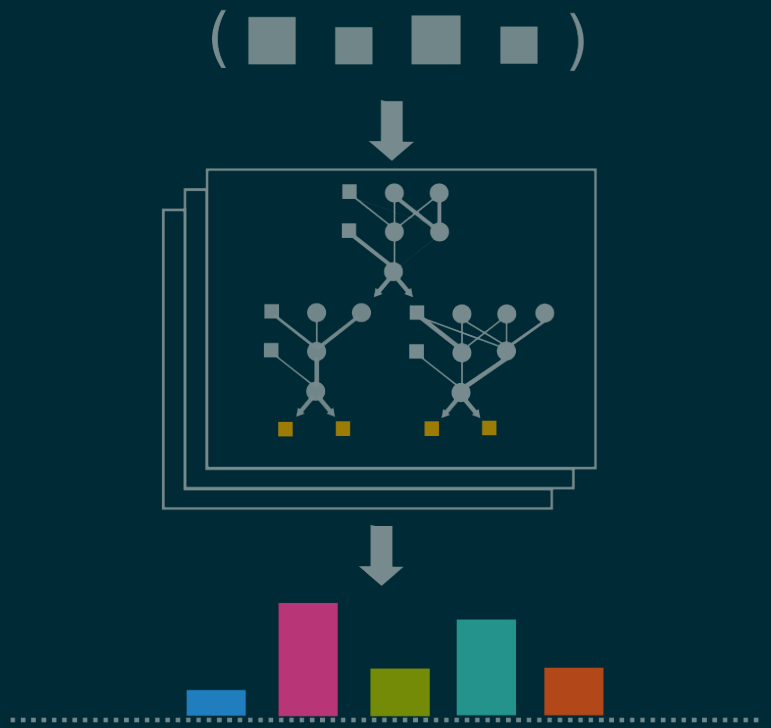
- Bootstrap Aggregating.



1-Vote, Popular Vote

Prediction:

- Histogram.
- Predict pink.



Outline

Conclusion

Neural decision forests

Prevent Overfitting

Using ensemble with low bias + low variance = low error.

Embedded Variable Selection

Embedded at each rNet.

Signal Processing

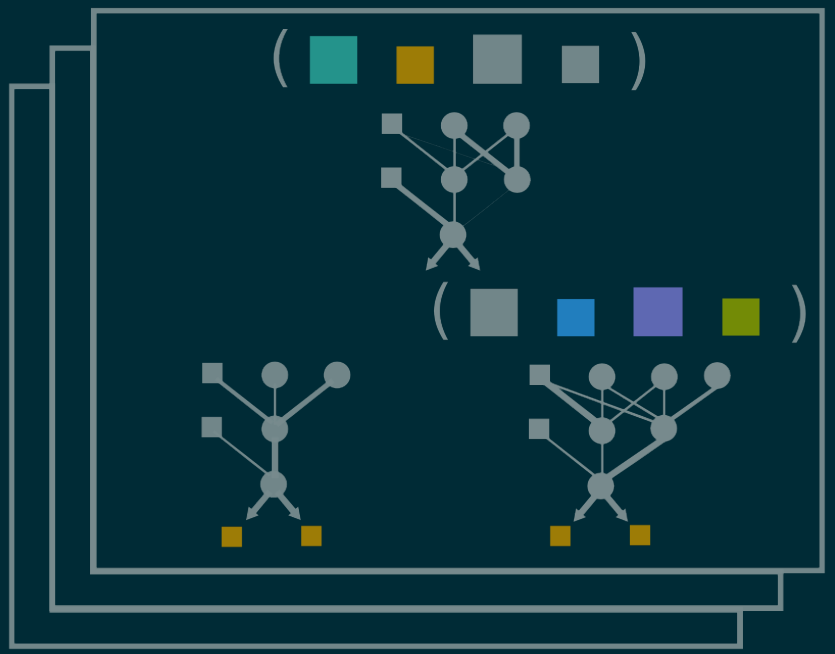
Windowing techniques.

Outline

Signal Processing

Window:

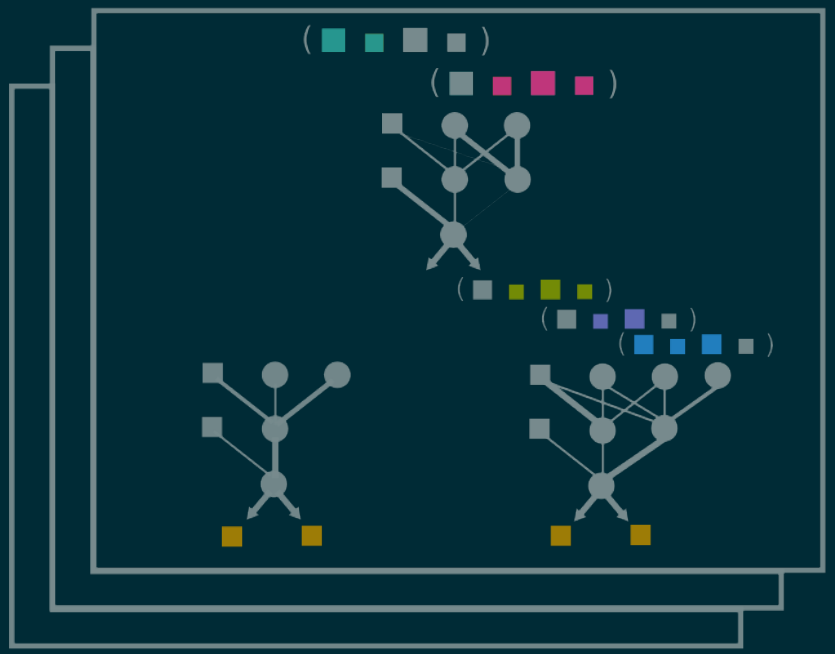
- Sample sequence.



Signal Processing

Random Window:

- N-Sampled sequences
  - rNet 1: 2 samples.
  - rNet 2: 3 samples.



For Further Reading I

- S. Rota Bulo and P. Kontschieder, *Neural decision forests for semantic image labelling*, Computer Vision and Pattern Recognition (CVPR), 2014 IEEE Conference on, June 2014, pp. 81–88.
- J. Stromberg, J. Zrida, and Alf Isaksson, *Neural trees-using neural nets in a tree classifier structure*, Acoustics, Speech, and Signal Processing, 1991. ICASSP-91., 1991 International Conference on, Apr 1991, pp. 137–140 vol.1.