

End-To-End Imitation Learning of Lane Following Policies Using Sum-Product Networks



IME - Instituto de
Matemática e Estatística

Renato Lui Geh, Denis Deratani Mauá

Department of Computer Science, Institute of Mathematics and Statistics, University of São Paulo, Brazil

{renatolg,ddm}@ime.usp.br

1. Task

Task: Complete whole course without going off track.

Input: Single frontal camera image.

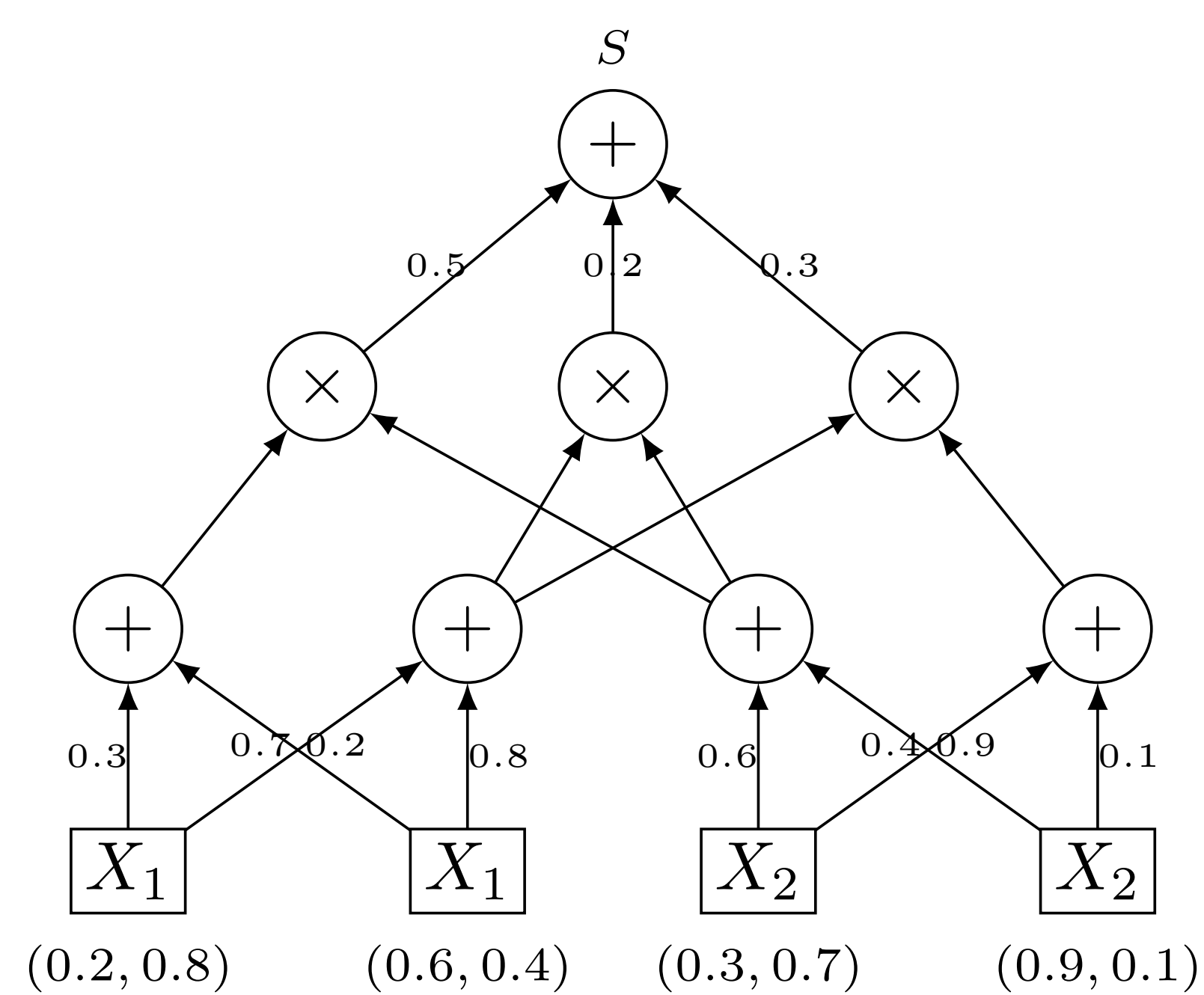
Output: Policy π with probabilities of actions.

Actions: Turn left, right or go straight.



2. Sum-Product Networks

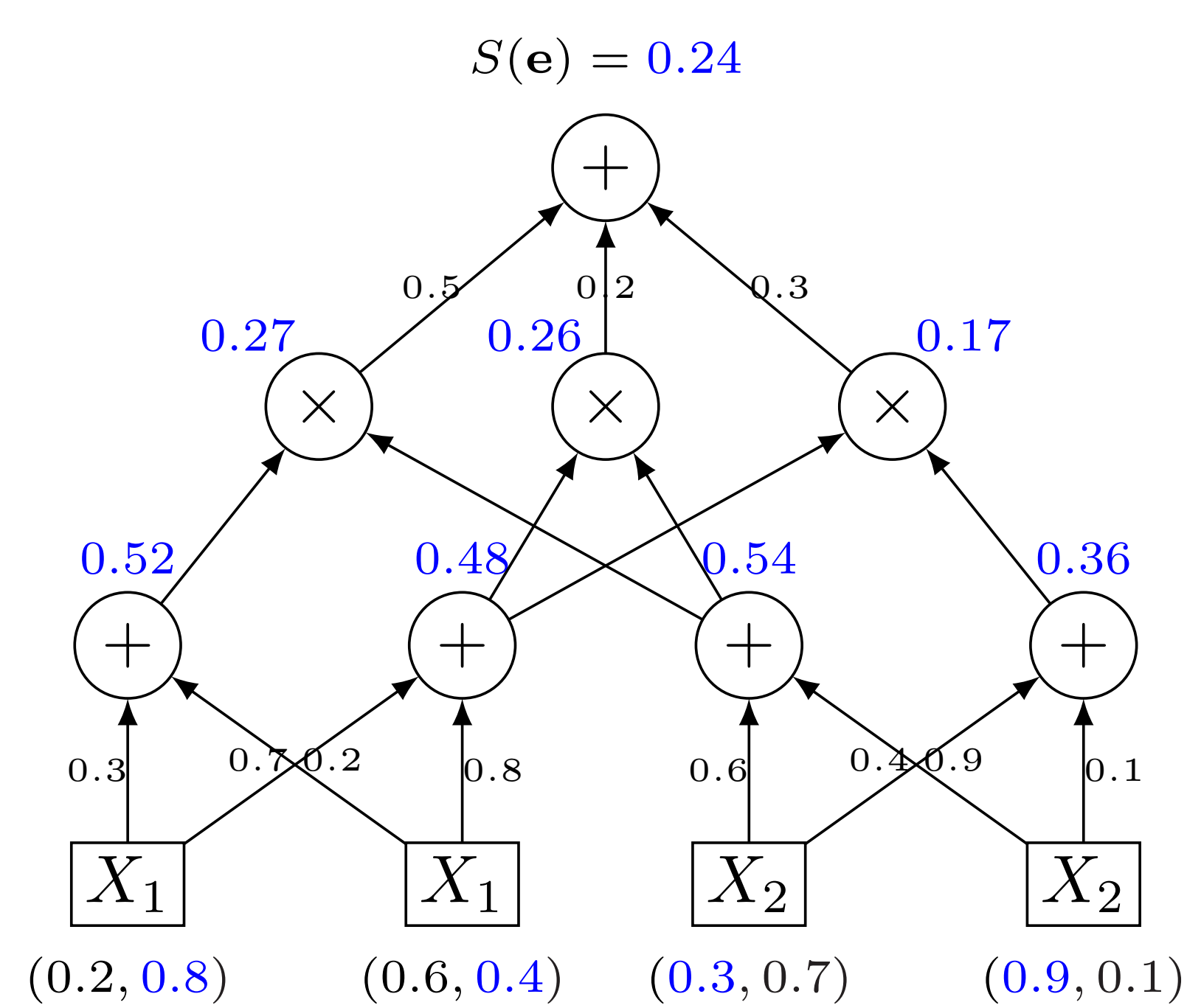
Sum-product networks (SPNs) are deep tractable density estimators with a neural network-like structure subject to only sums and products as activation functions.



In the above example, leaves are binomial distributions over each RV X_i .

3. Inference in SPNs

The probability of evidence of $\mathbf{e} = \{X_1 = 1, X_2 = 0\}$ is the value of its root.



$$P(\mathbf{e} = \{X_1 = 1, X_2 = 0\}) = S(\mathbf{e}) = 0.24$$

7. References and Acknowledgements

- [1] H. Poon and P. Domingos. Sum-product networks: A new deep architecture. In *UAI*, 2011.
- [2] R. Gens and D. Pedro. Learning the structure of sum-product networks. In *ICML*, 2013.
- [3] A. Dennis and D. Ventura. Learning the architecture of sum-product networks using clustering on variables. In *NIPS*, 2012.
- [4] P. Moraes and F. Salvatore. Self-driving pi car. https://github.com/felipessalvatore/self_driving_pi_car, 2018.

