



## **SurvNet: variable selection with false discovery rate control in deep neural networks**

Zixuan Song<sup>1</sup>; Jun Li<sup>1</sup>

<sup>1</sup> Department of Applied and Computational Mathematics and Statistics, University of Notre Dame, USA

### **Abstract:**

Deep neural networks (DNNs) are famous for their high prediction accuracy, but they are also known for their black-box nature and poor interpretability. We consider the problem of variable selection, that is, selecting the input variables that have significant predictive power on the output, in DNNs. Most existing variable selection methods for neural networks are only applicable to shallow networks or are computationally infeasible on large datasets; moreover, they lack a control on the quality of selected variables. We propose a backward elimination procedure called SurvNet, which is based on a new measure of variable importance that applies to a wide variety of networks. More importantly, SurvNet is able to estimate and control the false discovery rate (FDR) of selected variables empirically. Further, SurvNet adaptively determines how many variables to eliminate at each step in order to maximize the selection efficiency. The validity and efficiency of SurvNet are shown on various simulated and real datasets, and its performance is compared with other methods.

### **Keywords:**

variable selection; deep neural networks; false discovery rate