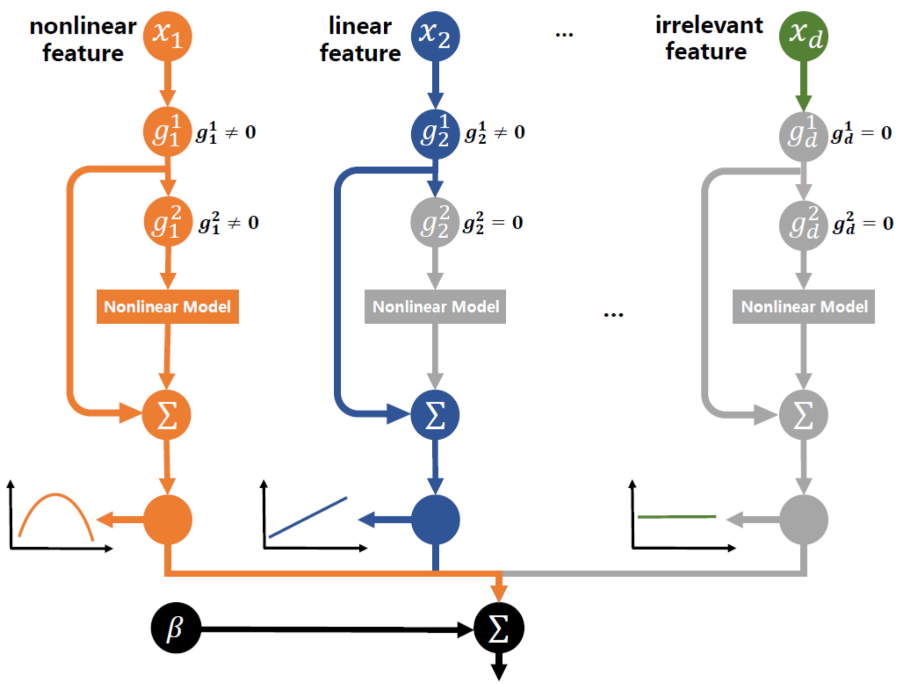
Neural Partially Linear Additive Model

Liangxuan ZHU, Han LI,
Xuelin ZHANG, Lingjuan WU, Hong CHEN

Frontiers of Computer Science, DOI: 10.1007/s11704-023-2662-3

Problems & Ideas

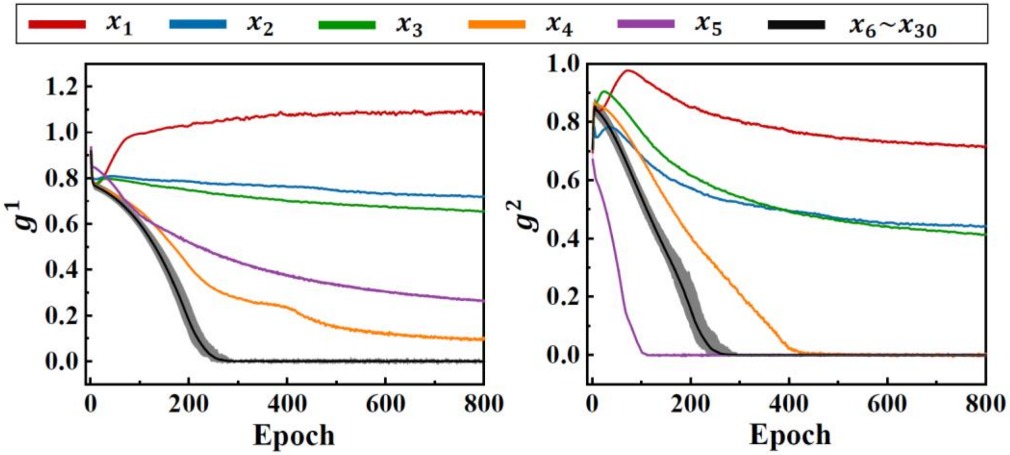
- Problems of conventional feature selection approaches:
  - The feature selection model may overfit when fitting linear features;
  - The conventional partially linear additive model has insufficient fitting ability when fitting more complex nonlinear functions.
- Ideas: Combining partially linear additive models and neural networks to automatically distinguish insignificant, linear, and nonlinear features.



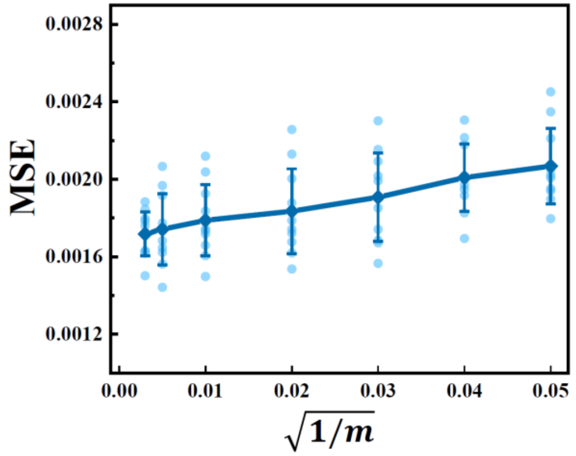
g^1 represents feature selection gate. g^2 represents structure discovery gate.

Main Contributions

- Contributions:
  - Neural Partially Linear Additive Model（NPLAM）can selection import features and discover whether thie feature has a linear structure by introducing learnable double gates and lasso penalties;
  - The sample complexity of learning NPLAM is studied by providing a new bound on the Rademacher complexity;
  - Experimental results demonstrate that NPLAM has good fitting ability, as well as can automatically filter out redundant features and identify whether the important features should be modeled with linear structure or nonlinear structure.



The convergence path of double gates under simulation dataset.
g^1 represents feature selection gate. g^2 represents structure discovery gate.



Effects of varying sample size.
m represents the sample size