



More data speeds up training time
in
learning halfspaces over sparse vectors

Amit Daniely, Nati Linial, Shai Shalev-Shwartz

Big data *alchemy* – turning data into a *computational* resource?

Data is nowadays *abundant*. Sometimes, *far more* than what is needed.



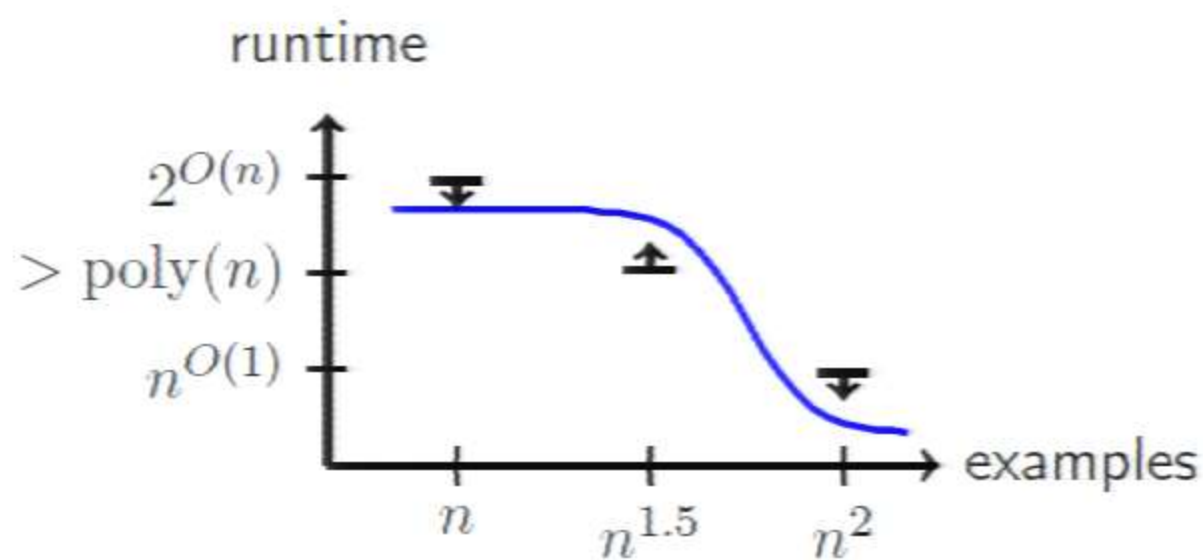
Are there learning tasks in which data, *beyond the information barrier*, can *provably* be leveraged to speed up computation?

First positive answer for a natural classification problem!

- Consider learning halfspaces over vectors with ≤ 3 non-zero coordinates.

Theorem (Main – informal)

- Information theoretically, $O(n)$ examples suffice for the task.
- Shifting from n to n^2 examples, runtime drops from $\exp(n)$ to $\text{poly}(n)$!



A new technique to lower bound improper learning!

- New (*non cryptographic!*) method to lower bound improper learning.
- In an upcoming paper (now on arXiv!), it is used to lower bound:
 - Learning DNFs!
 - Approximately learning halfspaces.
 - Learning intersection of $\omega(1)$ halfspaces.
 - And more...

coming soon..!