An Analysis Of Protected Health Information Leakage In Deep-Learning Based De-Identification Algorithms

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Goal

Investigating potential leakage of sensitive information from a de-identification algorithm

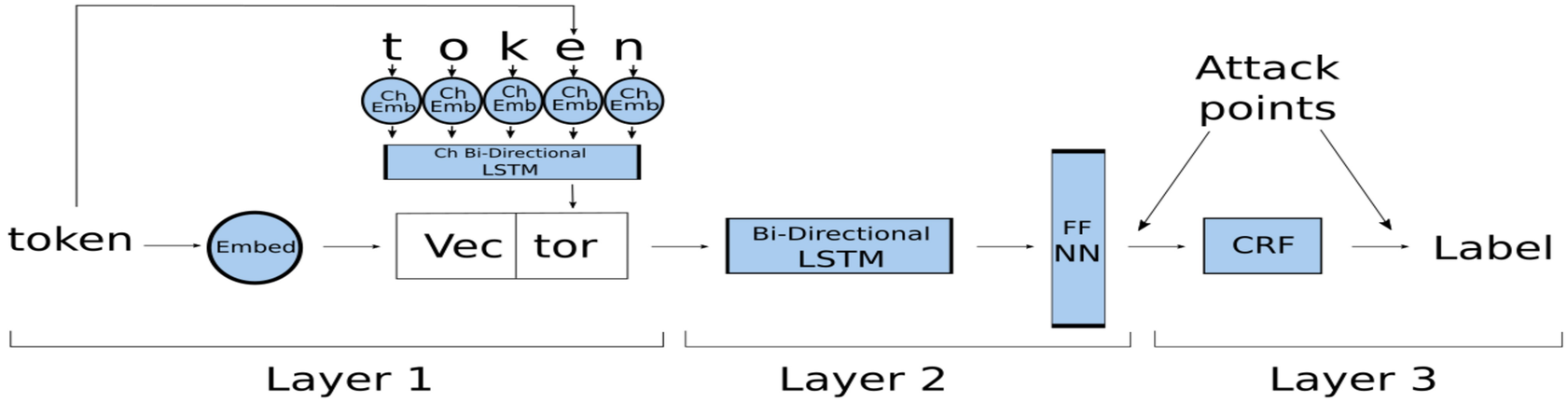
Investigated Model (NeuroNER)

NeuroNER
(State of the art De-identification Model)
Layer 1: Text tokenizer
Layer 2: Neural Networks
Layer 3: Conditional Random Field

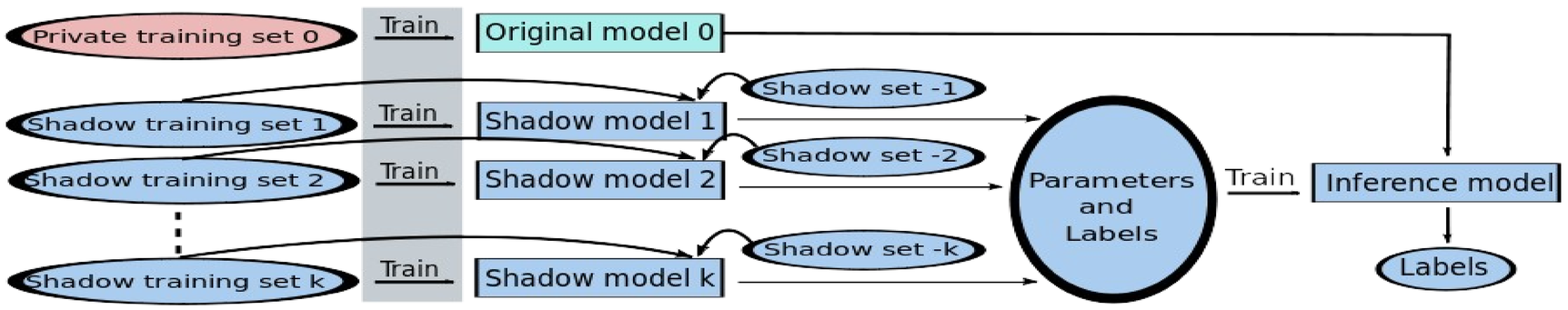
Re-identification Attacks

White Box Attempts:
- Naive cut-off
- Brute-force cut-off
- Membership inference attack

De-Identification Deep Neural Network Model (NeuroNER) And Investigated Attack Points



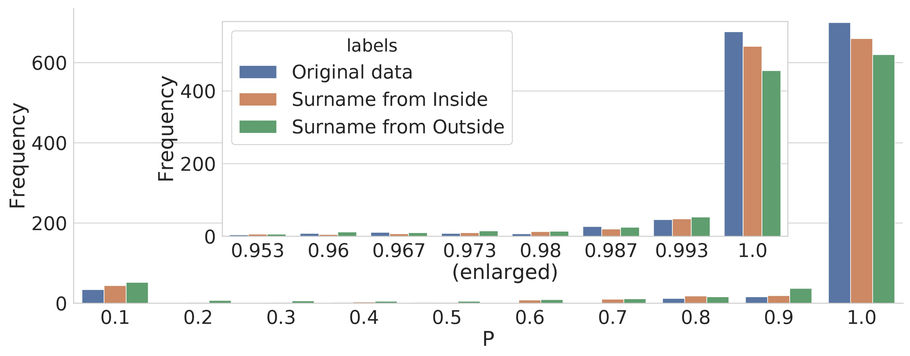
Membership Inference Attack



Results and Conclusions

- Despite different distributions, zero successful re-identification
- Model not prone to several implemented attacks
- Statistically different distributions but with overwhelming overlap for successful cut-off attacks

Histogram of Probabilities for Surnames



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