Operational Risk Text Classification Using Weak Supervision

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Introduction

- Operational risk events
- Basel II risk events types
  - Internal fraud
  - External fraud
  - Employment practices and workplace safety
  - Clients, products and business practices
  - Damage to physical assets
  - Business disruption and system failures
- No labels -> Weak supervision -> Snorkel

Literature Review

- Apply the text mining approach into operational risk domain to comprehensively identify risk factors

  Comprehensive identification of operational risk factors based on textual risk disclosures

- Text classification based on computing the similarity between the documents to be classified and a rich description of the categories label

  Towards Unsupervised Text Classification Leveraging Experts and Word Embeddings

- Weak supervision snorkel framework

  Snorkel: Rapid Training Data Creation with Weak Supervision

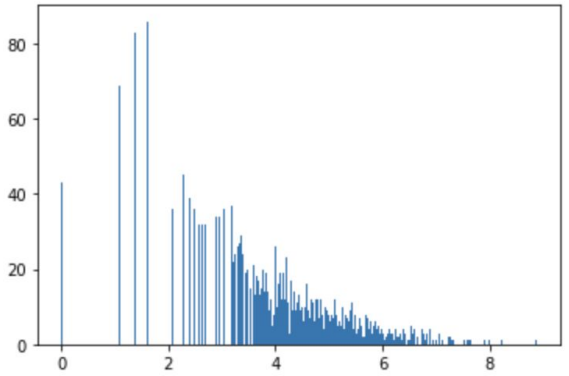
Empirical Analysis

- Dataset

```
acquisit disposit asset registr announc januar...
event januari itt financi corpor wholli own su...
financi statement pro forma financi inform exh...
b not beeninclud file impractic prepar financi...
event decemb meridian bancorp inc meridian and...
```

- Length of each text

  (After taking the log transformation)



Labeling Function

- Keyword search

	j	Polarity	Coverage	Overlaps	Conflicts
internalfraud	0	[1]	0.135534	0.081553	0.0
externalfraud	1	[1]	0.142913	0.048544	0.0
employmentworkplace	2	[1]	0.249320	0.235728	0.0
clientsproducts	3	[1]	0.093981	0.088544	0.0
physicalassets	4	[1]	0.168544	0.166990	0.0
disruptionsystem	5	[1]	0.009709	0.007379	0.0
executiondelivery	6	[1]	0.160000	0.121165	0.0

Labeling Function

- Pattern matching

	j	Polarity	Coverage	Overlaps	Conflicts
similarity	0	[1]	0.092039	0.0	0.0

- Third party models

	j	Polarity	Coverage	Overlaps	Conflicts
textblob_polarity	0	[1]	0.149903	0.062136	0.062136
textblob_subjectivity	1	[0]	0.299806	0.062136	0.062136

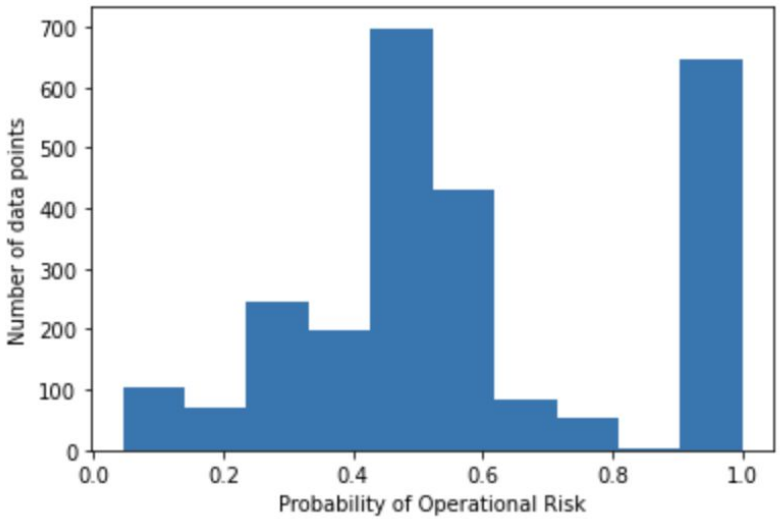
- SpaCy Name Entity Recognition

	j	Polarity	Coverage	Overlaps	Conflicts
has_people	0	[1]	0.063216	0.0	0.0
has_product	1	[1]	0.000395	0.0	0.0
has_event	2	[]	0.000000	0.0	0.0

Labeling Function

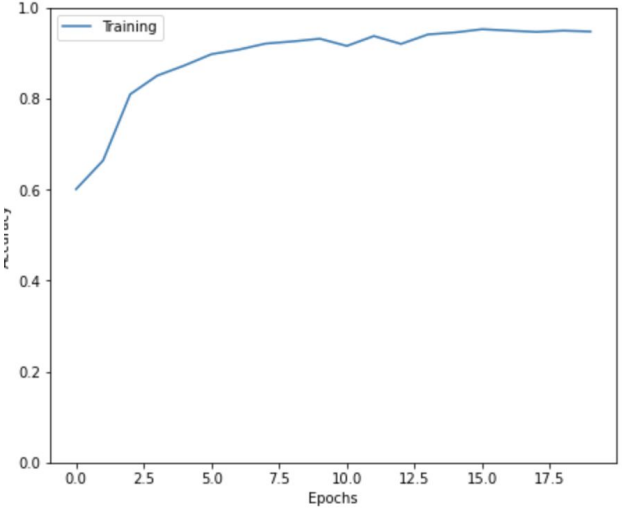
- Aggregation

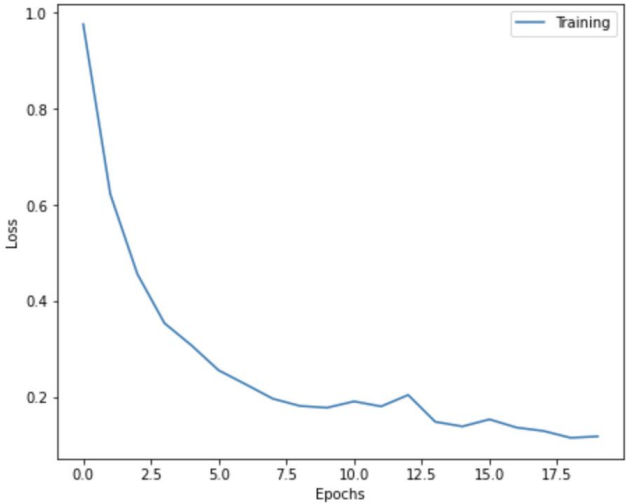
	j	Polarity	Coverage	Overlaps	Conflicts
internalfraud	0	[1]	0.137890	0.112604	0.026867
externalfraud	1	[1]	0.145397	0.088898	0.037535
employmentworkplace	2	[1]	0.253655	0.246938	0.101936
clientsproducts	3	[1]	0.095614	0.093244	0.022126
physicalassets	4	[1]	0.171474	0.170684	0.067562
disruptionsystem	5	[1]	0.009878	0.009087	0.003556
executiondelivery	6	[1]	0.162782	0.137495	0.062426
similarity	7	[1]	0.093639	0.086922	0.045832
textblob_polarity	8	[1]	0.152509	0.118530	0.063216
textblob_subjectivity	9	[0]	0.305018	0.208613	0.208613
has_people	10	[1]	0.063216	0.043461	0.005531
has_product	11	[1]	0.000395	0.000395	0.000395
has_event	12	[]	0.000000	0.000000	0.000000



Training Models

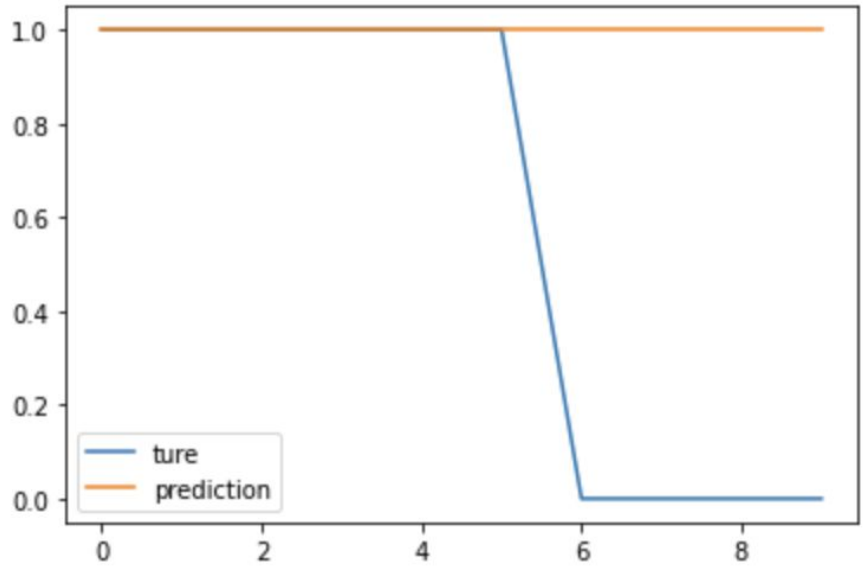
- Scikit-Learn classification model
- Neural network model
- LSTM model





Result

We get the test accuracy of 60%.



	0	1	2	3	4	5	6	7	8	9
test	1	1	1	1	1	1	0	0	0	0
predict	1	1	1	1	1	1	1	1	1	1

Conclusion

- Weak supervision text classification based on the snorkel model
- Improvement:
  - Add more uncorrelated labeling functions to the model
  - Find a test dataset with more data
- Next step:
  - Multiplication text classification task
  - Identify key risk indicators
  - Train deep learning models

Thank you!