Understanding and Using Topic Modeling
Using inferred document clusters

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Presentation Overview

1 What is Topic Modeling

2 Why Topic Model

3 Generative Models

4 Understanding Model Space

5 After LDA

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Understanding
and Using Topic
Modeling

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What is Topic
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What is Topic Modeling
Our goal: mathematically model topics from a corpus

Topic modeling is a text processing technique for automatically grouping documents by topics. This is usually used as a strategy to describe documents in low dimensional space or an exploratory tool for document collections.

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Examples

In practice, this requires many more documents

The Tourist huddles in the station While slowly night gives way to dawn ; He finds a certain fascination In knowing all the trains are gone.

The Governess up in the attic Attempts to make a cup of tea ; Her mind grows daily more erratic From cold and hunger and ennui.

The Journalist surveys the slaughter, The best in years without a doubt; He pours himself a gin and water and wonders how it came about.

- Food
- Travel
- Time

From this annotation we know that Document 2 and 3 are about Food and Time

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What can I solve?

- Find similar document pairs
- Cluster documents into groups with similar content
- Find relevant documents to a query or user's interests
- Explore shape of document collection

  Topic modeling can usually be extended to address many other problems, and document embeddings can be used to inform downstream models.

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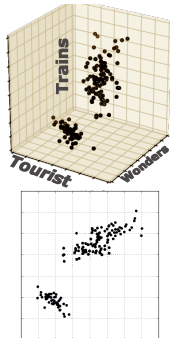
Applications of Topic Modeling

Figure:
Dimmentionality
Reduction
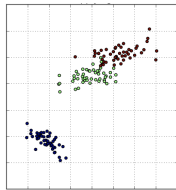
Figure: Cluster
Points
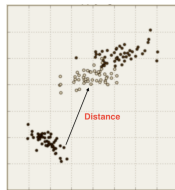
Figure:
Exploratory
Data Analysis

Figure: Analysis
of Topics

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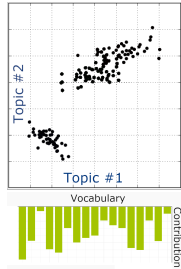
After LDA

Goals of generative models

A generative model

- Assume/Generalize how data could have been generated
- Fit distributions that describe the generalization
- Ask questions about the generalization in relation to data
- Ask questions about data in relation to the generalization

Generative models are much easier to extend, because they abstract the model from it's linear algebra dependencies.

Topic modeling generalizes how a document is generated by claiming that words come from topics, and documents have multiple topics.[1]

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[1]this is not a language model

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Latend Dirichlet Allocation
Bayesian extension to PLSA

- Represent document as Bag-of-Words[2]

- Model/Fit topics as mixture of words

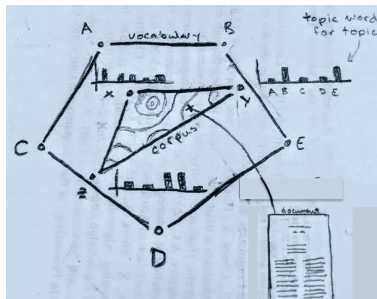- Documents are projected into or sampled from topic-space-distribution

Figure: Latent Dirichlet Allocation

Enormous body of work extending this model to address more specific problems.

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[2]equivalent to multinomial over the vocabulary

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Looking at top words

Mitigating apophenia is hard, topics difficult to interpret

Topic #1
- server
- connected
- access
- workstation
- outage
- user

Topic #2
- mode
- instrument
- safe
- spacecraft
- anomaly
- recovery

Topic #3
- uplink
- station
- dsn
- spacecraft
- lock
- ace

Although the model better describes our generation process, from the perspective of topics, it can be difficult to know what these topics actually represent.[3] This may require experts who are immune to apophenia.

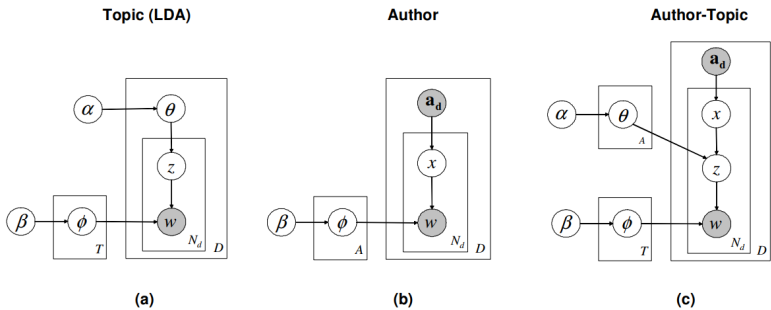[3]Supervised LDA attempts to addresses this concern, also applies to sentiment analysis

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Extensions

- Entity Boosted Topic Model (ETM)
- → Author Topic Model (ATM)
- Hierarchical Dirichlet Process (HDP)

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Author-Topic Model
Plate Diagrams

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Topic (LDA)

Author

Author-Topic

(a)

(b)

(c)

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Expert Modeling System
Matching Experts to Anomolous Tickets

https://github.com/probinso/expert-modeling-system