Latent Dirichlet Allocation

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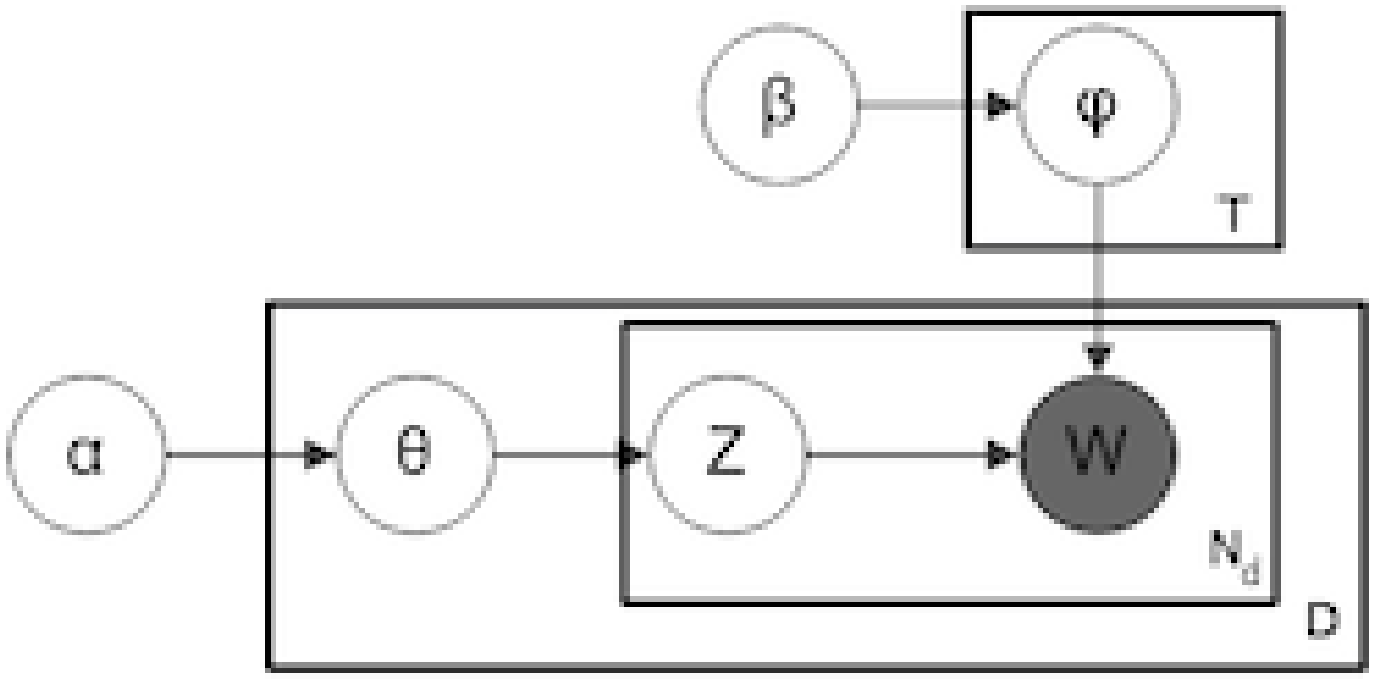
Topic models

- Extract topics from documents
- Unsupervised method
- Documents as bags of words
- Blei, Ng, Jordan 2003

Latent Dirichlet Allocation



$$P(W) = \prod_{k=1}^{T} P(\varphi_k; \beta) \prod_{j=1}^{D} P(\theta_j; \alpha) \prod_{w=1}^{N_d} P(Z_{j,w}|\theta_j) P(W_{j,w}|\varphi_{Z_{j,w}})$$

Inference method

- Gibbs sampling
- Have to learn two distributions
  - φ words-given-topics
  - θ topics-given-documents
- Efficient (couple of hours per run)

Data set

- science papers from arXiv.org quant-ph
- 20000 documents
- 10000 words in vocabulary
- 40 000 000 words in total
- preprocessing...
- Dave Newman `topicmodel` code

Example results

- t1 operator space operators let matrix set form case states function theorem defined functions dimensional general hilbert representation positive equation follows section product vector group ...
- t2 quantum time theory particle classical mechanics measurement state probability physical particles physics wave space equation spin momentum model function point position systems possible evolution
- t3 quantum state qubit qubits error number computation algorithm gate probability classical time gates spin computer unitary problem operation control operations single basis log code ...
- t4 phys field rev fig time phase energy state atom function lett atoms potential frequency cavity order case interaction photon atomic coupling wave cos hamiltonian ...
- t5 state states entanglement quantum phys information rev entangled measurement alice bob lett photon channel pure protocol local probability entropy bell case key measurements quant ...