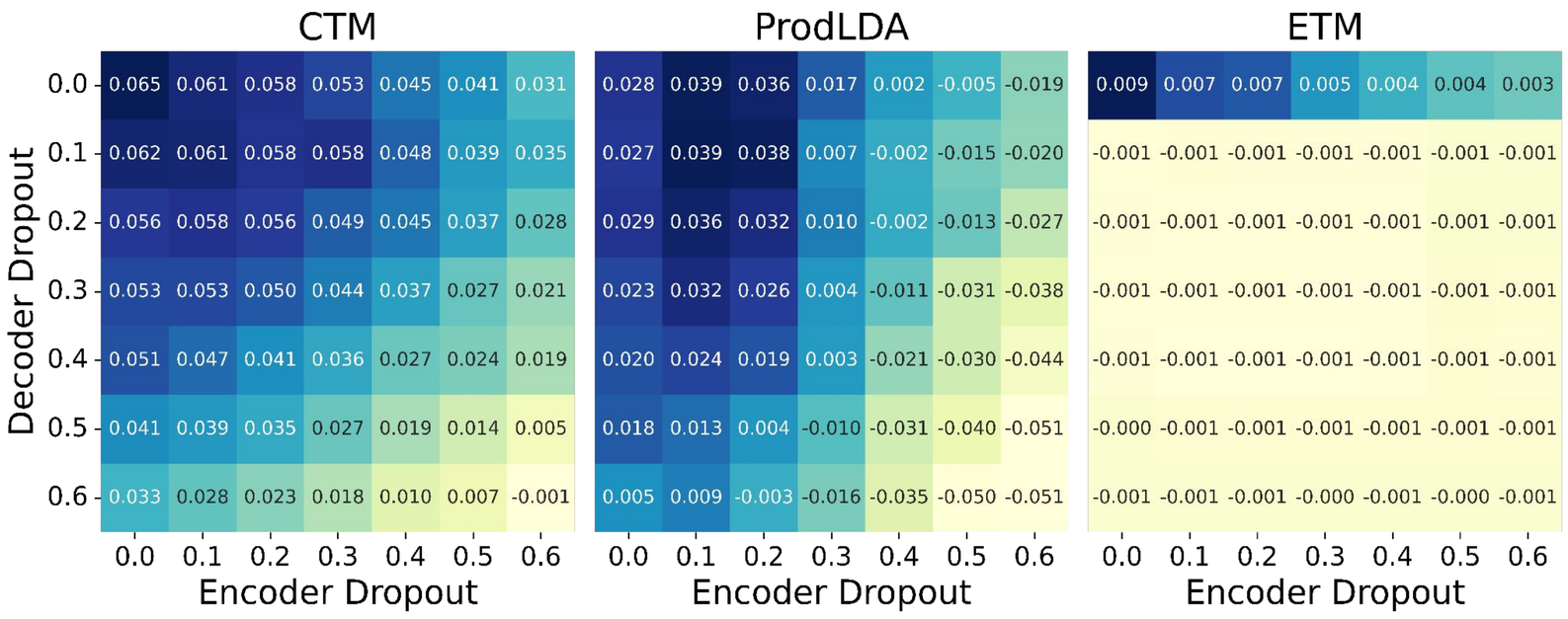
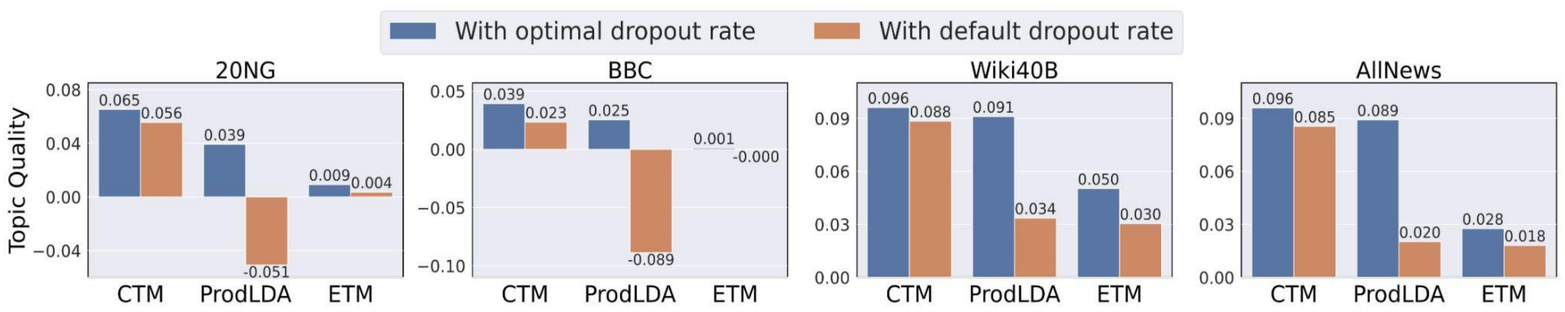
Do Neural Topic Models Really Need Dropout?

Analysis of the Effect of Dropout in Topic Modeling



Topic quality on 20NG dataset.

Low dropout rate leads to a significant **improvement in the performance** of VAE-NTMs



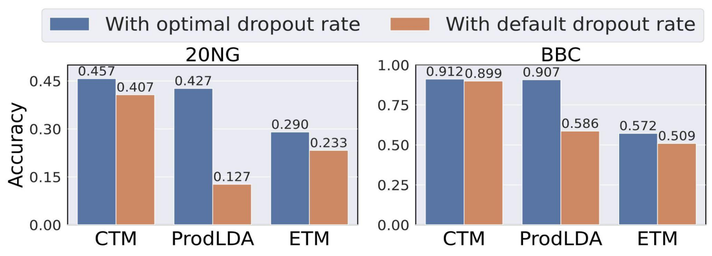
Topic quality for models with optimal and default dropout rates.

Qualitative Evaluation

Model	Topics
ProdLDA (0.1, 0.1)	window, driver, *mode*, run, mouse, session, server, program, manager, install
	car, engine, buy, company, vehicle, *make*, brake, tire, dealer, road
	signal, voltage, output, circuit, noise, power, switch, wire, connector, *degree*
ProdLDA (0.6, 0.6)	*line*, window, *gun*, read, space, run, *statement*, datum, drive, *make*
	make, battery, engine, *homosexual*, *assault*, *reason*, *place*, *single*, *large*, *attempt*
	voltage, *damn*, signal, *usual*, *label*, *hour*, *bio*, *leg*, *bullet*, *hundred*

Some selected topics from 20NG.

Extrinsic Evaluation

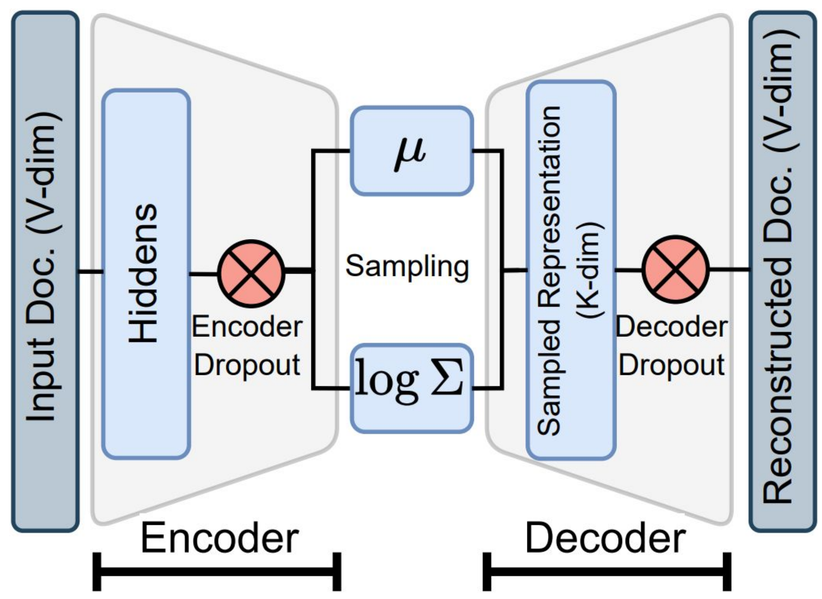


Accuracy scores for topic models with **optimal** and **default** dropout rates in document classification task.

Suman Adhya
Avishek Lahiri
Debarshi Kumar Sanyal

GitHub

VAE Framework in Neural Topic Models (NTMs)



Encoder:
Input: Document representation
Dropout on: Output of the hidden layer(s)
Returns: Posterior distribution

Decoder:
Input: Document-topic distribution vector
Dropout on: Document-topic distribution
Returns: Reconstructed document

Experimental Setup

Dataset	Type	#Docs
20NG	Newsgroups posts	16309
BBC	News articles from BBC	2225
Wiki40B	Wikipedia text	24774
AllNews	News articles	49754

Evaluation metrics:

- **NPMI:** Topic-word relevancy
- **TD:** Topic diversity
- **Topic Quality:** NPMI × TD

Optimal Dropout Rates

Model	20NG	BBC	Wiki40B	AllNews
CTM (0.2, 0.2)	(0.0, 0.0)	(0.0, 0.0)	(0.2, 0.1)	(0.0, 0.1)
ProdLDA (0.6, 0.6)	(0.1, 0.1)	(0.0, 0.0)	(0.1, 0.1)	(0.1, 0.1)
ETM (0.5, 0.0)	(0.0, 0.0)	(0.1, 0.0)	(0.0, 0.0)	(0.1, 0.0)

Default dropout rates and dataset-dependent **optimal** dropout rates for (encoder, decoder) of each model.

Indian Association for the Cultivation of Science
Jadavpur, Kolkata 700032, INDIA

EACL 2023