

[![Logo](../../_static/logo.png)](../../index.html)

Getting Started

- * [Installation](../../docs/installation.html)

- * [Install with pip](../../docs/installation.html#install-with-pip)

- * [Install with Conda](../../docs/installation.html#install-with-conda)

- * [Install from Source](../../docs/installation.html#install-from-source)

- * [Editable Install](../../docs/installation.html#editable-install)

- * [Install PyTorch with CUDA support](../../docs/installation.html#install-pytorch-with-cuda-support)

- * [Quickstart](../../docs/quickstart.html)

- * [Sentence Transformer](../../docs/quickstart.html#sentence-transformer)

- * [Cross Encoder](../../docs/quickstart.html#cross-encoder)

- * [Next Steps](../../docs/quickstart.html#next-steps)

Sentence Transformer

- * [Usage](../../docs/sentence_transformer/usage/usage.html)

- * [Computing Embeddings](../../applications/computing-embeddings/README.html)

- * [Initializing a Sentence Transformer Model](../../applications/computing-embeddings/README.html#initializing-a-sentence-transformer-model)

- * [Calculating Embeddings](../../applications/computing-embeddings/README.html#calculating-embeddings)

- * [Prompt Templates](../../applications/computing-embeddings/README.html#prompt-templates)

- * [Input Sequence Length](../../applications/computing-embeddings/README.html#id1)

* [Multi-Process / Multi-GPU

Encoding](../../applications/computing-embeddings/README.html#multi-process-multi-gpu-encoding)

* [Semantic Textual

Similarity](../../docs/sentence_transformer/usage/semantic_textual_similarity.html)

* [Similarity

Calculation](../../docs/sentence_transformer/usage/semantic_textual_similarity.html#similarity-calculation)

* [Semantic Search](../../applications/semantic-search/README.html)

* [Background](../../applications/semantic-search/README.html#background)

* [Symmetric vs. Asymmetric Semantic

Search](../../applications/semantic-search/README.html#symmetric-vs-asymmetric-semantic-search)

* [Manual

Implementation](../../applications/semantic-search/README.html#manual-implementation)

* [Optimized

Implementation](../../applications/semantic-search/README.html#optimized-implementation)

* [Speed Optimization](../../applications/semantic-search/README.html#speed-optimization)

* [Elasticsearch](../../applications/semantic-search/README.html#elasticsearch)

* [Approximate Nearest

Neighbor](../../applications/semantic-search/README.html#approximate-nearest-neighbor)

* [Retrieve & Re-Rank](../../applications/semantic-search/README.html#retrieve-re-rank)

* [Examples](../../applications/semantic-search/README.html#examples)

* [Retrieve & Re-Rank](../../applications/retrieve_rerank/README.html)

* [Retrieve & Re-Rank

Pipeline](../../applications/retrieve_rerank/README.html#retrieve-re-rank-pipeline)

* [Retrieval: Bi-Encoder](../../applications/retrieve_rerank/README.html#retrieval-bi-encoder)

* [Re-Ranker:

Cross-Encoder](../../applications/retrieve_rerank/README.html#re-ranker-cross-encoder)

* [Example Scripts](../../applications/retrieve_rerank/README.html#example-scripts)

* [Pre-trained Bi-Encoders

(Retrieval)](../../applications/retrieve_rerank/README.html#pre-trained-bi-encoders-retrieval)

* [Pre-trained Cross-Encoders

(Re-Ranker)](../../applications/retrieve_rerank/README.html#pre-trained-cross-encoders-re-ranker)

* [Clustering](../../applications/clustering/README.html)

* [k-Means](../../applications/clustering/README.html#k-means)

* [Agglomerative Clustering](../../applications/clustering/README.html#agglomerative-clustering)

* [Fast Clustering](../../applications/clustering/README.html#fast-clustering)

* [Topic Modeling](../../applications/clustering/README.html#topic-modeling)

* [Paraphrase Mining](../../applications/paraphrase-mining/README.html)

*

[`paraphrase_mining()'](../../applications/paraphrase-mining/README.html#sentence_transformers.
util.paraphrase_mining)

* [Translated Sentence Mining](../../applications/parallel-sentence-mining/README.html)

* [Margin Based

Mining](../../applications/parallel-sentence-mining/README.html#margin-based-mining)

* [Examples](../../applications/parallel-sentence-mining/README.html#examples)

* [Image Search](../../applications/image-search/README.html)

* [Installation](../../applications/image-search/README.html#installation)

* [Usage](../../applications/image-search/README.html#usage)

* [Examples](../../applications/image-search/README.html#examples)

* [Embedding Quantization](../../applications/embedding-quantization/README.html)

* [Binary

Quantization](../../applications/embedding-quantization/README.html#binary-quantization)

Quantization](../applications/embedding-quantization/README.html#scalar-int8-quantization)

- * [Additional extensions](../applications/embedding-quantization/README.html#additional-extensions)
- * [Demo](../applications/embedding-quantization/README.html#demo)
- * [Try it yourself](../applications/embedding-quantization/README.html#try-it-yourself)
- * [Speeding up Inference](../docs/sentence_transformer/usage/efficiency.html)
- * [PyTorch](../docs/sentence_transformer/usage/efficiency.html#pytorch)
- * [ONNX](../docs/sentence_transformer/usage/efficiency.html#onnx)
- * [OpenVINO](../docs/sentence_transformer/usage/efficiency.html#openvino)
- * [Benchmarks](../docs/sentence_transformer/usage/efficiency.html#benchmarks)
- * [Creating Custom Models](../docs/sentence_transformer/usage/custom_models.html)
- * [Structure of Sentence Transformer Models](../docs/sentence_transformer/usage/custom_models.html#structure-of-sentence-transformer-models)
- * [Sentence Transformer Model from a Transformers Model](../docs/sentence_transformer/usage/custom_models.html#sentence-transformer-model-from-a-transformers-model)
- * [Pretrained Models](../docs/sentence_transformer/pretrained_models.html)
- * [Original Models](../docs/sentence_transformer/pretrained_models.html#original-models)
- * [Semantic Search Models](../docs/sentence_transformer/pretrained_models.html#semantic-search-models)
- * [Multi-QA Models](../docs/sentence_transformer/pretrained_models.html#multi-qa-models)
- * [MSMARCO Passage Models](../docs/sentence_transformer/pretrained_models.html#msmarco-passage-models)
- * [Multilingual Models](../docs/sentence_transformer/pretrained_models.html#multilingual-models)

[* \[Semantic Similarity Models\]\(../../docs/sentence_transformer/pretrained_models.html#semantic-similarity-models\)](#)
[* \[Bitext Mining\]\(../../docs/sentence_transformer/pretrained_models.html#bitext-mining\)](#)
[* \[Image & Text-Models\]\(../../docs/sentence_transformer/pretrained_models.html#image-text-models\)](#)
[* \[INSTRUCTOR models\]\(../../docs/sentence_transformer/pretrained_models.html#instructor-models\)](#)
[* \[Scientific Similarity Models\]\(../../docs/sentence_transformer/pretrained_models.html#scientific-similarity-models\)](#)
[* \[Training Overview\]\(../../docs/sentence_transformer/training_overview.html\)](#)
[* \[Why Finetune?\]\(../../docs/sentence_transformer/training_overview.html#why-finetune\)](#)
[* \[Training Components\]\(../../docs/sentence_transformer/training_overview.html#training-components\)](#)
[* \[Dataset\]\(../../docs/sentence_transformer/training_overview.html#dataset\)](#)
[* \[Dataset Format\]\(../../docs/sentence_transformer/training_overview.html#dataset-format\)](#)
[* \[Loss Function\]\(../../docs/sentence_transformer/training_overview.html#loss-function\)](#)
[* \[Training Arguments\]\(../../docs/sentence_transformer/training_overview.html#training-arguments\)](#)
[* \[Evaluator\]\(../../docs/sentence_transformer/training_overview.html#evaluator\)](#)
[* \[Trainer\]\(../../docs/sentence_transformer/training_overview.html#trainer\)](#)
[* \[Callbacks\]\(../../docs/sentence_transformer/training_overview.html#callbacks\)](#)
[* \[Multi-Dataset Training\]\(../../docs/sentence_transformer/training_overview.html#multi-dataset-training\)](#)
[* \[Deprecated Training\]\(../../docs/sentence_transformer/training_overview.html#deprecated-training\)](#)
[* \[Best Base Embedding Models\]\(../../docs/sentence_transformer/training_overview.html#best-base-embedding-models\)](#)

- * [Dataset Overview](../../docs/sentence_transformer/dataset_overview.html)
- * [Datasets on the Hugging Face Hub](../../docs/sentence_transformer/dataset_overview.html#datasets-on-the-hugging-face-hub)
- * [Pre-existing Datasets](../../docs/sentence_transformer/dataset_overview.html#pre-existing-datasets)
- * [Loss Overview](../../docs/sentence_transformer/loss_overview.html)
- * [Loss modifiers](../../docs/sentence_transformer/loss_overview.html#loss-modifiers)
- * [Distillation](../../docs/sentence_transformer/loss_overview.html#distillation)
- * [Commonly used Loss Functions](../../docs/sentence_transformer/loss_overview.html#commonly-used-loss-functions)
- * [Custom Loss Functions](../../docs/sentence_transformer/loss_overview.html#custom-loss-functions)
- * [Training Examples](../../docs/sentence_transformer/training/examples.html)
- * [Semantic Textual Similarity](../sts/README.html)
- * [Training data](../sts/README.html#training-data)
- * [Loss Function](../sts/README.html#loss-function)
- * [Natural Language Inference](../nli/README.html)
- * [Data](../nli/README.html#data)
- * [SoftmaxLoss](../nli/README.html#softmaxloss)
- * [MultipleNegativesRankingLoss](../nli/README.html#multiplenegativesrankingloss)
- * [Paraphrase Data](../paraphrases/README.html)
- * [Pre-Trained Models](../paraphrases/README.html#pre-trained-models)
- * [Quora Duplicate Questions](../quora_duplicate_questions/README.html)
- * [Training](../quora_duplicate_questions/README.html#training)
- * [MultipleNegativesRankingLoss](../quora_duplicate_questions/README.html#multiplenegativesrankingloss)

- * [Pretrained Models](../quora_duplicate_questions/README.html#pretrained-models)
- * [MS MARCO](../ms_marco/README.html)
- * [Bi-Encoder](../ms_marco/README.html#bi-encoder)
- * [Matryoshka Embeddings](../matryoshka/README.html)
- * [Use Cases](../matryoshka/README.html#use-cases)
- * [Results](../matryoshka/README.html#results)
- * [Training](../matryoshka/README.html#training)
- * [Inference](../matryoshka/README.html#inference)
- * [Code Examples](../matryoshka/README.html#code-examples)
- * [Adaptive Layers](../adaptive_layer/README.html)
- * [Use Cases](../adaptive_layer/README.html#use-cases)
- * [Results](../adaptive_layer/README.html#results)
- * [Training](../adaptive_layer/README.html#training)
- * [Inference](../adaptive_layer/README.html#inference)
- * [Code Examples](../adaptive_layer/README.html#code-examples)
- * [Multilingual Models](../multilingual/README.html)
- * [Extend your own models](../multilingual/README.html#extend-your-own-models)
- * [Training](../multilingual/README.html#training)
- * [Datasets](../multilingual/README.html#datasets)
- * [Sources for Training Data](../multilingual/README.html#sources-for-training-data)
- * [Evaluation](../multilingual/README.html#evaluation)
- * [Available Pre-trained Models](../multilingual/README.html#available-pre-trained-models)
- * [Usage](../multilingual/README.html#usage)
- * [Performance](../multilingual/README.html#performance)
- * [Citation](../multilingual/README.html#citation)
- * [Model Distillation](../distillation/README.html)
- * [Knowledge Distillation](../distillation/README.html#knowledge-distillation)

- * [\[Speed - Performance Trade-Off\]\(../distillation/README.html#speed-performance-trade-off\)](#)
- * [\[Dimensionality Reduction\]\(../distillation/README.html#dimensionality-reduction\)](#)
- * [\[Quantization\]\(../distillation/README.html#quantization\)](#)
- * Augmented SBERT
 - * Motivation
 - * Extend to your own datasets
 - * Methodology
 - * Scenario 1: Limited or small annotated datasets (few labeled sentence-pairs)
 - * Scenario 2: No annotated datasets (Only unlabeled sentence-pairs)
 - * Training
 - * Citation
- * [\[Training with Prompts\]\(../prompts/README.html\)](#)
 - * [\[What are Prompts?\]\(../prompts/README.html#what-are-prompts\)](#)
 - * [\[Why would we train with Prompts?\]\(../prompts/README.html#why-would-we-train-with-prompts\)](#)
 - * [\[How do we train with Prompts?\]\(../prompts/README.html#how-do-we-train-with-prompts\)](#)
- * [\[Training with PEFT Adapters\]\(../peft/README.html\)](#)
 - * [\[Compatibility Methods\]\(../peft/README.html#compatibility-methods\)](#)
 - * [\[Adding a New Adapter\]\(../peft/README.html#adding-a-new-adapter\)](#)
 - * [\[Loading a Pretrained Adapter\]\(../peft/README.html#loading-a-pretrained-adapter\)](#)
 - * [\[Training Script\]\(../peft/README.html#training-script\)](#)
- * [\[Unsupervised Learning\]\(../unsupervised_learning/README.html\)](#)
 - * [\[TSDAE\]\(../unsupervised_learning/README.html#tsdae\)](#)
 - * [\[SimCSE\]\(../unsupervised_learning/README.html#simcse\)](#)
 - * [\[CT\]\(../unsupervised_learning/README.html#ct\)](#)
 - * [\[CT \(In-Batch Negative Sampling\)\]\(../unsupervised_learning/README.html#ct-in-batch-negative-sampling\)](#)

(MLM)](../../unsupervised_learning/README.html#masked-language-model-mlm)

* [GenQ](../../unsupervised_learning/README.html#genq)

* [GPL](../../unsupervised_learning/README.html#gpl)

* [Performance

Comparison](../../unsupervised_learning/README.html#performance-comparison)

* [Domain Adaptation](../../domain_adaptation/README.html)

* [Domain Adaptation vs. Unsupervised

Learning](../../domain_adaptation/README.html#domain-adaptation-vs-unsupervised-learning)

* [Adaptive Pre-Training](../../domain_adaptation/README.html#adaptive-pre-training)

* [GPL: Generative

Pseudo-Labeling](../../domain_adaptation/README.html#gpl-generative-pseudo-labeling)

* [Hyperparameter Optimization](../hpo/README.html)

* [HPO Components](../hpo/README.html#hpo-components)

* [Putting It All Together](../hpo/README.html#putting-it-all-together)

* [Example Scripts](../hpo/README.html#example-scripts)

* [Distributed Training](../../docs/sentence_transformer/training/distributed.html)

* [Comparison](../../docs/sentence_transformer/training/distributed.html#comparison)

* [FSDP](../../docs/sentence_transformer/training/distributed.html#fsdp)

Cross Encoder

* [Usage](../../docs/cross_encoder/usage/usage.html)

* [Retrieve & Re-Rank](../../applications/retrieve_rerank/README.html)

* [Retrieve & Re-Rank

Pipeline](../../applications/retrieve_rerank/README.html#retrieve-re-rank-pipeline)

* [Retrieval: Bi-Encoder](../../applications/retrieve_rerank/README.html#retrieval-bi-encoder)

* [Re-Ranker:

Cross-Encoder](../../applications/retrieve_rerank/README.html#re-ranker-cross-encoder)

* [Example Scripts](../../applications/retrieve_rerank/README.html#example-scripts)

* [Pre-trained Bi-Encoders

(Retrieval)](../../applications/retrieve_rerank/README.html#pre-trained-bi-encoders-retrieval)

* [Pre-trained Cross-Encoders

(Re-Ranker)](../../applications/retrieve_rerank/README.html#pre-trained-cross-encoders-re-ranker)

* [Pretrained Models](../../docs/cross_encoder/pretrained_models.html)

* [MS MARCO](../../docs/cross_encoder/pretrained_models.html#ms-marco)

* [SQuAD (QNLI)](../../docs/cross_encoder/pretrained_models.html#squad-qnli)

* [STSbenchmark](../../docs/cross_encoder/pretrained_models.html#stsbenchmark)

* [Quora Duplicate

Questions](../../docs/cross_encoder/pretrained_models.html#quora-duplicate-questions)

* [NLI](../../docs/cross_encoder/pretrained_models.html#nli)

* [Community Models](../../docs/cross_encoder/pretrained_models.html#community-models)

* [Training Overview](../../docs/cross_encoder/training_overview.html)

* [Training Examples](../../docs/cross_encoder/training/examples.html)

* [MS MARCO](../ms_marco/cross_encoder_README.html)

* [Cross-Encoder](../ms_marco/cross_encoder_README.html#cross-encoder)

* [Cross-Encoder Knowledge

Distillation](../ms_marco/cross_encoder_README.html#cross-encoder-knowledge-distillation)

Package Reference

* [Sentence Transformer](../../docs/package_reference/sentence_transformer/index.html)

*

[SentenceTransformer](../../docs/package_reference/sentence_transformer/SentenceTransformer.

html)

*

[SentenceTransformer](../../docs/package_reference/sentence_transformer/SentenceTransformer.html#id1)

*

[SentenceTransformerModelCardData](../../docs/package_reference/sentence_transformer/SentenceTransformer.html#sentencetransformermodelcarddata)

*

[SimilarityFunction](../../docs/package_reference/sentence_transformer/SentenceTransformer.html#similarityfunction)

* [Trainer](../../docs/package_reference/sentence_transformer/trainer.html)

*

[SentenceTransformerTrainer](../../docs/package_reference/sentence_transformer/trainer.html#sentencetransformertrainer)

* [Training Arguments](../../docs/package_reference/sentence_transformer/training_args.html)

*

[SentenceTransformerTrainingArguments](../../docs/package_reference/sentence_transformer/training_args.html#sentencetransformertrainingarguments)

* [Losses](../../docs/package_reference/sentence_transformer/losses.html)

*

[BatchAllTripletLoss](../../docs/package_reference/sentence_transformer/losses.html#batchalltripletloss)

*

[BatchHardSoftMarginTripletLoss](../../docs/package_reference/sentence_transformer/losses.html#batchhardsoftmargintripletloss)

*

[BatchHardTripletLoss](../../docs/package_reference/sentence_transformer/losses.html#batchhard

tripletloss)

*

[BatchSemiHardTripletLoss](../../docs/package_reference/sentence_transformer/losses.html#batchsemi-hard-triplet-loss)

*

[ContrastiveLoss](../../docs/package_reference/sentence_transformer/losses.html#contrastive-loss)

*

[OnlineContrastiveLoss](../../docs/package_reference/sentence_transformer/losses.html#online-contrastive-loss)

*

[ContrastiveTensionLoss](../../docs/package_reference/sentence_transformer/losses.html#contrastive-tension-loss)

*

[ContrastiveTensionLossInBatchNegatives](../../docs/package_reference/sentence_transformer/losses.html#contrastive-tension-loss-in-batch-negatives)

* [CoSENTLoss](../../docs/package_reference/sentence_transformer/losses.html#co-sent-loss)

* [AngleELoss](../../docs/package_reference/sentence_transformer/losses.html#angle-e-loss)

*

[CosineSimilarityLoss](../../docs/package_reference/sentence_transformer/losses.html#cosine-similarity-loss)

*

[DenoisingAutoEncoderLoss](../../docs/package_reference/sentence_transformer/losses.html#denoising-auto-encoder-loss)

*

[GISTEmbedLoss](../../docs/package_reference/sentence_transformer/losses.html#gist-embed-loss)

*

[CachedGISTEmbedLoss](../../docs/package_reference/sentence_transformer/losses.html#cachedgistembedloss)

* [MSELoss](../../docs/package_reference/sentence_transformer/losses.html#mseloss)

*

[MarginMSELoss](../../docs/package_reference/sentence_transformer/losses.html#marginmseloss)

*

[MatryoshkaLoss](../../docs/package_reference/sentence_transformer/losses.html#matryoshkaloss)

*

[Matryoshka2dLoss](../../docs/package_reference/sentence_transformer/losses.html#matryoshka2dloss)

*

[AdaptiveLayerLoss](../../docs/package_reference/sentence_transformer/losses.html#adaptivelayerloss)

*

[MegaBatchMarginLoss](../../docs/package_reference/sentence_transformer/losses.html#megabatchmarginloss)

*

[MultipleNegativesRankingLoss](../../docs/package_reference/sentence_transformer/losses.html#multiplenegativesrankingloss)

*

[CachedMultipleNegativesRankingLoss](../../docs/package_reference/sentence_transformer/losses.html#cachedmultiplenegativesrankingloss)

*

[MultipleNegativesSymmetricRankingLoss](../../docs/package_reference/sentence_transformer/losses.html#multiplenegativessymmetricrankingloss)

*

[CachedMultipleNegativesSymmetricRankingLoss](../../docs/package_reference/sentence_transformer/losses.html#cachedmultiplenegativessymmetricrankingloss)

* [SoftmaxLoss](../../docs/package_reference/sentence_transformer/losses.html#softmaxloss)

* [TripletLoss](../../docs/package_reference/sentence_transformer/losses.html#tripletloss)

* [Samplers](../../docs/package_reference/sentence_transformer/sampler.html)

*

[BatchSamplers](../../docs/package_reference/sentence_transformer/sampler.html#batchsamplers)

*

[MultiDatasetBatchSamplers](../../docs/package_reference/sentence_transformer/sampler.html#multidatasetbatchsamplers)

* [Evaluation](../../docs/package_reference/sentence_transformer/evaluation.html)

*

[BinaryClassificationEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#binaryclassificationevaluator)

*

[EmbeddingSimilarityEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#embeddingsimilarityevaluator)

*

[InformationRetrievalEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#informationretrievalevaluator)

*

[NanoBEIREvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#nanobeirevaluator)

*

[MSEEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#mseevaluator)

)

*

[ParaphraseMiningEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#paraphraseminingevaluator)

*

[RerankingEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#rerankingevaluator)

*

[SentenceEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#sentenceevaluator)

*

[SequentialEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#sequentialevaluator)

*

[TranslationEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#translationevaluator)

*

[TripletEvaluator](../../docs/package_reference/sentence_transformer/evaluation.html#tripletevaluator)

* [Datasets](../../docs/package_reference/sentence_transformer/datasets.html)

*

[ParallelSentencesDataset](../../docs/package_reference/sentence_transformer/datasets.html#parallelsentencesdataset)

*

[SentenceLabelDataset](../../docs/package_reference/sentence_transformer/datasets.html#sentencelabeldataset)

*

[DenoisingAutoEncoderDataset](../../docs/package_reference/sentence_transformer/datasets.html#denoisingautoencoderdataset)

*

[NoDuplicatesDataLoader](../../docs/package_reference/sentence_transformer/datasets.html#noduplicatesdataloader)

* [Models](../../docs/package_reference/sentence_transformer/models.html)

*

[Main

Classes](../../docs/package_reference/sentence_transformer/models.html#main-classes)

*

[Further

Classes](../../docs/package_reference/sentence_transformer/models.html#further-classes)

* [quantization](../../docs/package_reference/sentence_transformer/quantization.html)

*

[`quantize_embeddings()`](../../docs/package_reference/sentence_transformer/quantization.html#sentence_transformers.quantization.quantize_embeddings)

*

[`semantic_search_faiss()`](../../docs/package_reference/sentence_transformer/quantization.html#sentence_transformers.quantization.semantic_search_faiss)

*

[`semantic_search_usearch()`](../../docs/package_reference/sentence_transformer/quantization.html#sentence_transformers.quantization.semantic_search_usearch)

* [Cross Encoder](../../docs/package_reference/cross_encoder/index.html)

* [CrossEncoder](../../docs/package_reference/cross_encoder/cross_encoder.html)

* [CrossEncoder](../../docs/package_reference/cross_encoder/cross_encoder.html#id1)

*

[Training

Inputs](../../docs/package_reference/cross_encoder/cross_encoder.html#training-inputs)

* [Evaluation](../../docs/package_reference/cross_encoder/evaluation.html)

*

[CEBinaryAccuracyEvaluator](../../docs/package_reference/cross_encoder/evaluation.html#cebinaryaccuracyevaluator)

*

[CEBinaryClassificationEvaluator](../../docs/package_reference/cross_encoder/evaluation.html#cebinaryclassificationevaluator)

*

[CECorrelationEvaluator](../../docs/package_reference/cross_encoder/evaluation.html#cecorrelationevaluator)

* [CEF1Evaluator](../../docs/package_reference/cross_encoder/evaluation.html#cef1evaluator)

*

[CESoftmaxAccuracyEvaluator](../../docs/package_reference/cross_encoder/evaluation.html#cesoftmaxaccuracyevaluator)

*

[CERerankingEvaluator](../../docs/package_reference/cross_encoder/evaluation.html#cererankingevaluator)

* [util](../../docs/package_reference/util.html)

* [Helper Functions](../../docs/package_reference/util.html#module-sentence_transformers.util)

*

[`community_detection()`](../../docs/package_reference/util.html#sentence_transformers.util.community_detection)

* [`http_get()`](../../docs/package_reference/util.html#sentence_transformers.util.http_get)

*

[`is_training_available()`](../../docs/package_reference/util.html#sentence_transformers.util.is_training_available)

*

[`mine_hard_negatives()`](../../docs/package_reference/util.html#sentence_transformers.util.mine_hard_negatives)

*

[`normalize_embeddings()`](../../docs/package_reference/util.html#sentence_transformers.util.normalize_embeddings)

*

[`paraphrase_mining()`](../../docs/package_reference/util.html#sentence_transformers.util.paraphrase_mining)

*

[`semantic_search()`](../../docs/package_reference/util.html#sentence_transformers.util.semantic_search)

*

[`truncate_embeddings()`](../../docs/package_reference/util.html#sentence_transformers.util.truncate_embeddings)

*

[Model

Optimization](../../docs/package_reference/util.html#module-sentence_transformers.backend)

*

[`export_dynamic_quantized_onnx_model()`](../../docs/package_reference/util.html#sentence_transformers.backend.export_dynamic_quantized_onnx_model)

*

[`export_optimized_onnx_model()`](../../docs/package_reference/util.html#sentence_transformers.backend.export_optimized_onnx_model)

*

[`export_static_quantized_openvino_model()`](../../docs/package_reference/util.html#sentence_transformers.backend.export_static_quantized_openvino_model)

* [Similarity Metrics](../../docs/package_reference/util.html#module-sentence_transformers.util)

* [`cos_sim()`](../../docs/package_reference/util.html#sentence_transformers.util.cos_sim)

* [`dot_score()`](../../docs/package_reference/util.html#sentence_transformers.util.dot_score)

*

[`euclidean_sim()`](../../docs/package_reference/util.html#sentence_transformers.util.euclidean_sim)

*

[`manhattan_sim()`](../../docs/package_reference/util.html#sentence_transformers.util.manhattan_sim)

*

[`pairwise_cos_sim()`](../../docs/package_reference/util.html#sentence_transformers.util.pairwise_cos_sim)

*

[`pairwise_dot_score()`](../../docs/package_reference/util.html#sentence_transformers.util.pairwise_dot_score)

*

[`pairwise_euclidean_sim()`](../../docs/package_reference/util.html#sentence_transformers.util.pairwise_euclidean_sim)

*

[`pairwise_manhattan_sim()`](../../docs/package_reference/util.html#sentence_transformers.util.pairwise_manhattan_sim)

__[Sentence Transformers](../../index.html)

* [(../../index.html)

* [Training Examples](../../docs/sentence_transformer/training/examples.html)

* Augmented SBERT

*

[

Edit

on

GitHub](https://github.com/UKPLab/sentence-transformers/blob/master/examples/training/data_augmentation/README.md)

* * *

Augmented SBERTif•

Motivationif•

Bi-encoders (a.k.a. sentence embeddings models) require substantial training data and fine-tuning over the target task to achieve competitive performances. However, in many scenarios, there is only little training data available.

To solve this practical issue, we release an effective data-augmentation strategy known as **Augmented SBERT** where we utilize a high performing and slow cross-encoder (BERT) to label a larger set of input pairs to augment the training data for the bi-encoder (SBERT).

For more details, refer to our publication - [Augmented SBERT: Data Augmentation Method for Improving Bi-Encoders for Pairwise Sentence Scoring Tasks](<https://arxiv.org/abs/2010.08240>) which is a joint effort by Nandan Thakur, Nils Reimers and Johannes Daxenberger of UKP Lab, TU Darmstadt.

Chien Vu also wrote a nice blog article on this technique: [Advance BERT model via transferring knowledge from Cross-Encoders to Bi-Encoders](<https://towardsdatascience.com/advance-nlp-model-via-transferring-knowledge-from-cross-encoders-to-bi-encoders-3e0fc564f554>)

Extend to your own datasetsif•

****Scenario 1: Limited or small annotated datasets (few labeled sentence-pairs (1k-3k))****

If you have specialized datasets in your company or research which are small-sized or contain labeled few sentence-pairs. You can extend the idea of Augmented SBERT (in-domain) strategy by training a cross-encoder over your small gold dataset and use BM25 sampling to generate combinations not seen earlier. Use the cross-encoder to label these unlabeled pairs to create the silver dataset. Finally train a bi-encoder (i.e. SBERT) over your extended dataset (gold+silver) dataset as shown in

[train_sts_indomain_bm25.py](https://github.com/UKPLab/sentence-transformers/tree/master/examples/training/data_augmentation/train_sts_indomain_bm25.py).

****Scenario 2: No annotated datasets (Only unlabeled sentence-pairs)****

If you have specialized datasets in your company or research which only contain unlabeled sentence-pairs. You can extend the idea of Augmented SBERT (domain-transfer) strategy by training a cross-encoder over a source dataset which is annotated (for eg. QQP). Use this cross-encoder to label your specialised unlabeled dataset i.e. target dataset. Finally train a bi-encoder i.e. SBERT over your labeled target dataset as shown in

[train_sts_qqp_crossdomain.py](https://github.com/UKPLab/sentence-transformers/tree/master/examples/training/data_augmentation/train_sts_qqp_crossdomain.py).

Methodology

There are two major scenarios for the Augmented SBERT approach for pairwise-sentence regression or classification tasks.

Scenario 1: Limited or small annotated datasets (few labeled sentence-pairs)¶

We apply the Augmented SBERT (**In-domain**) strategy, it involves three steps

-

- * Step 1: Train a cross-encoder (BERT) over the small (gold or annotated) dataset
- * Step 2.1: Create pairs by recombination and reduce the pairs via BM25 or semantic search
- * Step 2.2: Weakly label new pairs with cross-encoder (BERT). These are silver pairs or (silver) dataset
- * Step 3: Finally, train a bi-encoder (SBERT) on the extended (gold + silver) training dataset

Scenario 2: No annotated datasets (Only unlabeled sentence-pairs)¶

We apply the Augmented SBERT (**Domain-Transfer**) strategy, it involves three steps -

- * Step 1: Train from scratch a cross-encoder (BERT) over a source dataset, for which we contain annotations
- * Step 2: Use this cross-encoder (BERT) to label your target dataset i.e. unlabeled sentence pairs

* Step 3: Finally, train a bi-encoder (SBERT) on the labeled target dataset

Training

The [examples/training/data_augmentation](https://github.com/UKPLab/sentence-transformers/blob/master/examples/training/data_augmentation/) folder contains simple training examples for each scenario explained below:

*

[train_sts_seed_optimization.py](https://github.com/UKPLab/sentence-transformers/tree/master/examples/training/data_augmentation/train_sts_seed_optimization.py)

* This script trains a bi-encoder (SBERT) model from scratch for STS benchmark dataset with seed-optimization.

* Seed optimization technique is inspired from [(Dodge et al., 2020)](https://arxiv.org/abs/2002.06305).

* For Seed opt., we train our bi-encoder for various seeds and evaluate using an early stopping algorithm.

* Finally, measure dev performance across the seeds to get the highest performing seeds.

*

[train_sts_indomain_nlpaug.py](https://github.com/UKPLab/sentence-transformers/tree/master/examples/training/data_augmentation/train_sts_indomain_nlpaug.py)

* This script trains a bi-encoder (SBERT) model from scratch for STS benchmark dataset using easy data augmentation.

* Data augmentation strategies are used from popular [nlpaug](https://github.com/makcedward/nlpaug) package.

* Augment single sentences with synonyms using (word2vec, BERT or WordNet). Forms our silver dataset.

* Train bi-encoder model on both original small training dataset and synonym based silver dataset.

*

[train_sts_indomain_bm25.py](https://github.com/UKPLab/sentence-transformers/tree/master/examples/training/data_augmentation/train_sts_indomain_bm25.py)

* Script initially trains a cross-encoder (BERT) model from scratch for small STS benchmark dataset.

* Recombine sentences from our small training dataset and form lots of sentence-pairs.

* Limit number of combinations with BM25 sampling using [Elasticsearch](https://www.elastic.co/).

* Retrieve top-k sentences given a sentence and label these pairs using the cross-encoder (silver dataset).

* Train a bi-encoder (SBERT) model on both gold + silver STSb dataset. (Augmented SBERT (In-domain) Strategy).

*

[train_sts_indomain_semantic.py](https://github.com/UKPLab/sentence-transformers/tree/master/examples/training/data_augmentation/train_sts_indomain_semantic.py)

* This script initially trains a cross-encoder (BERT) model from scratch for small STS benchmark dataset.

* We recombine sentences from our small training dataset and form lots of sentence-pairs.

* Limit number of combinations with Semantic Search sampling using pretrained SBERT model.

* Retrieve top-k sentences given a sentence and label these pairs using the cross-encoder (silver dataset).

* Train a bi-encoder (SBERT) model on both gold + silver STSb dataset. (Augmented SBERT (In-domain) Strategy).

*

[train_sts_qqp_crossdomain.py](https://github.com/UKPLab/sentence-transformers/tree/master/examples/training/data_augmentation/train_sts_qqp_crossdomain.py)

* This script initially trains a cross-encoder (BERT) model from scratch for STS benchmark dataset.

* Label the Quora Questions Pair (QQP) training dataset (Assume no labels present) using the cross-encoder.

* Train a bi-encoder (SBERT) model on the QQP dataset. (Augmented SBERT (Domain-Transfer Strategy)).

Citation

If you use the code for augmented sbert, feel free to cite our publication

[Augmented SBERT: Data Augmentation Method for Improving Bi-Encoders for Pairwise Sentence Scoring Tasks](<https://arxiv.org/abs/2010.08240>):

```
@article{thakur-2020-AugSBERT,  
  title = "Augmented SBERT: Data Augmentation Method for Improving Bi-Encoders for Pairwise  
Sentence Scoring Tasks",  
  author = "Thakur, Nandan and Reimers, Nils and Daxenberger, Johannes and Gurevych,  
Iryna",  
  journal= "arXiv preprint arXiv:2010.08240",  
  month = "10",  
  year = "2020",  
  url = "https://arxiv.org/abs/2010.08240",  
}
```

[Previous](../distillation/README.html "Model Distillation") [Next
(../prompts/README.html "Training with Prompts")

* * *

(C) Copyright 2025.

Built with [Sphinx](https://www.sphinx-doc.org/) using a
[theme](https://github.com/readthedocs/sphinx_rtd_theme) provided by [Read the
Docs](https://readthedocs.org).