

[ ![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\]\(../../applications/embedding-quantization/README.html#scalar-int8-quantization\)](#)

[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
    - \* Training data
    - \* 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](../data\_augmentation/README.html)
- \* [Motivation](../data\_augmentation/README.html#motivation)
  - \* [Extend to your own datasets](../data\_augmentation/README.html#extend-to-your-own-datasets)
  - \* [Methodology](../data\_augmentation/README.html#methodology)
    - \* [Scenario 1: Limited or small annotated datasets (few labeled sentence-pairs)](../data\_augmentation/README.html#scenario-1-limited-or-small-annotated-dataset-s-few-labeled-sentence-pairs)
    - \* [Scenario 2: No annotated datasets (Only unlabeled sentence-pairs)](../data\_augmentation/README.html#scenario-2-no-annotated-datasets-only-unlabeled-sentence-pairs)
  - \* [Training](../data\_augmentation/README.html#training)
  - \* [Citation](../data\_augmentation/README.html#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)

\* [Masked Language Model (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#batchhardtripletloss)

\*

[BatchSemiHardTripletLoss](../../docs/package\_reference/sentence\_transformer/losses.html#batchsemi-hardtripletloss)

\*

[ContrastiveLoss](../../docs/package\_reference/sentence\_transformer/losses.html#contrastiveloss)

\*

[OnlineContrastiveLoss](../../docs/package\_reference/sentence\_transformer/losses.html#onlinecontrastiveloss)

\*

[ContrastiveTensionLoss](../../docs/package\_reference/sentence\_transformer/losses.html#contrastivetensionloss)

\*

[ContrastiveTensionLossInBatchNegatives](../../docs/package\_reference/sentence\_transformer/losses.html#contrastivetensionlossinbatchnegatives)

\* [CoSENTLoss](../../docs/package\_reference/sentence\_transformer/losses.html#cosentloss)

\* [AngleLoss](../../docs/package\_reference/sentence\_transformer/losses.html#angleloss)

\*

[CosineSimilarityLoss](../../docs/package\_reference/sentence\_transformer/losses.html#cosinesimilarityloss)

\*

[DenoisingAutoEncoderLoss](../../docs/package\_reference/sentence\_transformer/losses.html#denoisingautoencoderloss)

osingautoencoderloss)

\*

[GISTEmbedLoss](../../docs/package\_reference/sentence\_transformer/losses.html#gistembedloss  
)

\*

[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#nanobe  
irevaluator)

\*

[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#rerankin  
gevaluator)

\*

[SentenceEvaluator](../../../../docs/package\_reference/sentence\_transformer/evaluation.html#sentenc  
eevaluator)

\*

[SequentialEvaluator](../../../../docs/package\_reference/sentence\_transformer/evaluation.html#sequen  
tiaevaluator)

\*

[TranslationEvaluator](../../../../docs/package\_reference/sentence\_transformer/evaluation.html#translat  
ionevaluator)

\*

[TripletEvaluator](../../../../docs/package\_reference/sentence\_transformer/evaluation.html#tripletevalua  
tor)

\* [Datasets](../../../../docs/package\_reference/sentence\_transformer/datasets.html)

\*

[ParallelSentencesDataset](../../../../docs/package\_reference/sentence\_transformer/datasets.html#par

allelsentencesdataset)

\*

[SentenceLabelDataset](../../docs/package\_reference/sentence\_transformer/datasets.html#sentence-label-dataset)

\*

[DenoisingAutoEncoderDataset](../../docs/package\_reference/sentence\_transformer/datasets.html#denoising-auto-encoder-dataset)

\*

[NoDuplicatesDataLoader](../../docs/package\_reference/sentence\_transformer/datasets.html#no-duplicates-data-loader)

\* [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)

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[`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\_tra

nsformers.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)

\* Semantic Textual Similarity

\*

[

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on

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

\* \* \*

# Semantic Textual Similarity

Semantic Textual Similarity (STS) assigns a score on the similarity of two texts. In this example, we use the

[sts](https://huggingface.co/datasets/sentence-transformers/sts) dataset as training data to fine-tune our model. See the following example scripts how to tune SentenceTransformer on STS data:

\*

\*\*[training\_stsbenchmark.py](https://github.com/UKPLab/sentence-transformers/tree/master/examples/training/sts/training\_stsbenchmark.py)\*\* \- This example shows how to create a SentenceTransformer model from scratch by using a pre-trained transformer model (e.g. [distilbert-base-uncased](https://huggingface.co/distilbert/distilbert-base-uncased)) together with a pooling layer.

\*

\*\*[training\_stsbenchmark\_continue\_training.py](https://github.com/UKPLab/sentence-transformers/tree/master/examples/training/sts/training\_stsbenchmark\_continue\_training.py)\*\* \- This example shows how to continue training on STS data for a previously created & trained SentenceTransformer model (e.g. [all-mpnet-base-v2](https://huggingface.co/sentence-transformers/all-mpnet-base-v2)).

## ## Training data

In STS, we have sentence pairs annotated together with a score indicating the similarity. In the original STSbenchmark dataset, the scores range from 0 to 5. We have normalized these scores to range between 0 and 1 in [stsb](https://huggingface.co/datasets/sentence-transformers/stsb), as that is required for

[`CosineSimilarityLoss`](../../docs/package\_reference/sentence\_transformer/losses.html#sentence\_transformers.losses.CosineSimilarityLoss "sentence\_transformers.losses.CosineSimilarityLoss") as you can see in the [Loss Overview](../../docs/sentence\_transformer/loss\_overview.html).

Here is a simplified version of our training data:

```
from datasets import Dataset

sentence1_list = ["My first sentence", "Another pair"]
sentence2_list = ["My second sentence", "Unrelated sentence"]
labels_list = [0.8, 0.3]

train_dataset = Dataset.from_dict({
    "sentence1": sentence1_list,
    "sentence2": sentence2_list,
    "label": labels_list,
})
```

```
# => Dataset({
#   features: ['sentence1', 'sentence2', 'label'],
#   num_rows: 2
# })

print(train_dataset[0])

# => {'sentence1': 'My first sentence', 'sentence2': 'My second sentence', 'label': 0.8}

print(train_dataset[1])

# => {'sentence1': 'Another pair', 'sentence2': 'Unrelated sentence', 'label': 0.3}
```

In the aforementioned scripts, we directly load the

[stsb](https://huggingface.co/datasets/sentence-transformers/stsb) dataset:

```
from datasets import load_dataset

train_dataset = load_dataset("sentence-transformers/stsb", split="train")

# => Dataset({
#   features: ['sentence1', 'sentence2', 'score'],
#   num_rows: 5749
# })
```

## Loss Function

We use

[`CosineSimilarityLoss`](../../docs/package\_reference/sentence\_transformer/losses.html#sentence\_transformers.losses.CosineSimilarityLoss

"sentence\_transformers.losses.CosineSimilarityLoss") as our loss function.

[SBERT Siamese Network

Architecture](https://raw.githubusercontent.com/UKPLab/sentence-transformers/master/docs/img/SBERT\_Siamese\_Network.png)

For each sentence pair, we pass sentence A and sentence B through the BERT-based model, which yields the embeddings `_u_` and `_v_`. The similarity of these embeddings is computed using cosine similarity and the result is compared to the gold similarity score. Note that the two sentences are fed through the same model rather than two separate models. In particular, the cosine similarity for similar texts is maximized and the cosine similarity for dissimilar texts is minimized. This allows our model to be fine-tuned and to recognize the similarity of sentences.

For more details, see [Sentence-BERT: Sentence Embeddings using Siamese BERT-Networks](https://arxiv.org/abs/1908.10084).

[`CoSENTLoss`](../../docs/package\_reference/sentence\_transformer/losses.html#sentence\_transformers.losses.CoSENTLoss

"sentence\_transformers.losses.CoSENTLoss") and

[`AngleLoss`](../../docs/package\_reference/sentence\_transformer/losses.html#sentence\_transformers.losses.AngleLoss

"sentence\_transformers.losses.AngleLoss") are more modern variants of

[`CosineSimilarityLoss`](../../docs/package\_reference/sentence\_transformer/losses.html#sentence

`_transformers.losses.CosineSimilarityLoss`

"`sentence_transformers.losses.CosineSimilarityLoss`") that accept the same data format of a sentence pair with a similarity score ranging from 0.0 to 1.0.

Informal experiments indicate that these two produce stronger models than

[`CosineSimilarityLoss``]([../../docs/package\\_reference/sentence\\_transformer/losses.html#sentence\\_transformers.losses.CosineSimilarityLoss](https://www.readthedocs.org/en/latest/docs/package_reference/sentence_transformer/losses.html#sentence_transformers.losses.CosineSimilarityLoss)

"`sentence_transformers.losses.CosineSimilarityLoss`").

[ Previous]([../../docs/sentence\\_transformer/training/examples.html](https://www.readthedocs.org/en/latest/docs/sentence_transformer/training/examples.html)

"Training Examples") [Next ]([../nli/README.html](https://www.readthedocs.org/en/latest/nli/README.html) "Natural Language Inference")

\* \* \*

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