

VECTOR_NORMALIZE (Transact-SQL)

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Applies to:  Azure SQL Database  Azure SQL Managed Instance

Note

This function is in preview and is subject to change. Preview features are not meant for production use and are subject to additional terms of use.

The function `VECTOR_NORMALIZE` takes a vector as an input and returns the normalized vector, which is a vector scaled to have a length of 1 in a given `norm type` .

This standardization is crucial in various artificial intelligence applications where vectors represent different forms of data, such as visual content, textual information, or audio signals. By normalizing vectors, we ensure uniformity in their scale, which is particularly useful for operations that rely on measuring vector distances or for grouping and distinguishing data points.

While Azure OpenAI's models provide normalized vectors, there are other models and frameworks where vectors are not automatically normalized. For example, in the Gensim library, which is commonly used for natural language processing tasks, vectors are not always normalized by default. Users often need to normalize the vectors manually or use specific functions provided by the library to ensure that the vectors are of unit length.

In general, when working with machine learning models or vector embeddings, it's important to check the documentation or the output of the model to determine whether the vectors are normalized. If normalization is required for your application, you may need to implement it as a separate step if the model does not provide normalized vectors by default.

Syntax

Calculates the normalized vector using a specified norm type

```
syntaxsql
```

```
VECTOR_NORMIMIZE ( vector_column, norm_type )
```

For example, if you want a normalized vector using the Euclidean norm (which is the most common norm type), you can use:

```
syntaxsql
```

```
VECTOR_NORMIMIZE ( vector_column, 'norm2' )
```

Arguments

vector_column

An expression that evaluates to a vector. This column must be of the new vector data type

norm_type

A string with the name of the norm type to use to calculate the norm of the given vector. The following norm types are supported:

- `norm1` - The 1-norm, which is the sum of the absolute values of the vector components.
- `norm2` - The 2-norm, also known as the Euclidean Norm which is the square root of the sum of the squares of the vector components.
- `norminf` - The infinity norm, which is the maximum of the absolute values of the vector components.

Return value

The result is a vector with the same direction as the input vector but with a length of 1.

If the input is NULL, the returned result will also be NULL.

An error is returned if *norm_type* isn't a valid norm type and if the *vector_column* is not of the vector data type

Examples

Example 1

Normalize a vector:

SQL

```
CREATE TABLE dbo.vectors
(
    id INT PRIMARY KEY,
    v VECTOR(3) NOT NULL
);

INSERT INTO dbo.vectors (id, v) VALUES (1, CAST(N'[0.1, 2, 30]' AS VECTOR(3)));
INSERT INTO dbo.vectors (id, v) VALUES (2, CONVERT(VECTOR(3), '[0.1, 2, 30]'));

SELECT id, vector_normalize(v, 'norm2') AS normalized_vector FROM dbo.vectors;
-- returns the normalized vector for each vector in the table
```

Example 2

SQL

```
DECLARE @v VECTOR(3) = CAST(N'[1, 2, 3]' AS VECTOR(3));

SELECT vector_normalize(@v, 'norm1'); -- returns a normalized vector
SELECT vector_normalize(@v, 'norminf'); -- returns a normalized vector
```

See also

[Vector Functions \(Transact SQL\)](#)

[Vector Data Type](#)

[Intelligent applications with Azure SQL Database](#)

[Azure SQL DB Vector Search Samples](#)

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