scipy.linalg.eigh_tridiagonal

scipy.linalg.**eigh_tridiagonal**(*d*, *e*, *eigvals_only=False*, *select='a'*, *select_range=None*, *check_finite=True*, *tol=0.0*, *lapack_driver='auto'*) [source] (https://github.com/scipy/scipy/blob/v1.5.4/scipy/linalg/decomp.py#L1189-L1347)

Solve eigenvalue problem for a real symmetric tridiagonal matrix.

Find eigenvalues *w* and optionally right eigenvectors *v* of `a`:

```
a v[:,i] = w[i] v[:,i]
v.H v    = identity
```

For a real symmetric matrix `a` with diagonal elements *d* and off-diagonal elements *e*.

Parameters: **d** : *ndarray, shape (ndim,)*

The diagonal elements of the array.

e : *ndarray, shape (ndim-1,)*

The off-diagonal elements of the array.

select : *{'a', 'v', 'i'}, optional*

Which eigenvalues to calculate

select	calculated
'a'	All eigenvalues
'v'	Eigenvalues in the interval (min, max]
'i'	Eigenvalues with indices min <= i <= max

select_range : *(min, max), optional*

Range of selected eigenvalues

check_finite : *bool, optional*

Whether to check that the input matrix contains only finite numbers. Disabling may give a performance gain, but may result in problems (crashes, non-termination) if the inputs do contain infinities or NaNs.

tol : *float*

The absolute tolerance to which each eigenvalue is required (only used when 'stebz' is the *lapack_driver*). An eigenvalue (or cluster) is considered to have converged if it lies in an interval of this width. If <= 0. (default), the value `eps*|a|` is used where eps is the machine precision, and `|a|` is the 1-norm of the matrix `a`.

lapack_driver : *str*

LAPACK function to use, can be ‘auto’, ‘stemr’, ‘stebz’, ‘sterf’, or ‘stev’. When ‘auto’ (default), it will use ‘stemr’ if `select='a'` and ‘stebz’ otherwise. When ‘stebz’ is used to find the eigenvalues and `eigvals_only=False`, then a second LAPACK call (to `?STEIN`) is used to find the corresponding eigenvectors. ‘sterf’ can only be used when `eigvals_only=True` and `select='a'`. ‘stev’ can only be used when `select='a'`.

Returns: **w : *(M,) ndarray***

The eigenvalues, in ascending order, each repeated according to its multiplicity.

v : *(M, M) ndarray*

The normalized eigenvector corresponding to the eigenvalue `w[i]` is the column `v[:,i]`.

Raises: **LinAlgError**

If eigenvalue computation does not converge.

See also:

eigvalsh_tridiagonal (scipy.linalg.eigvalsh_tridiagonal.html#scipy.linalg.eigvalsh_tridiagonal) eigenvalues of symmetric/Hermitian tridiagonal matrices

eig (scipy.linalg.eig.html#scipy.linalg.eig) eigenvalues and right eigenvectors for non-symmetric arrays

eigh (scipy.linalg.eigh.html#scipy.linalg.eigh) eigenvalues and right eigenvectors for symmetric/Hermitian arrays

eig_banded (scipy.linalg.eig_banded.html#scipy.linalg.eig_banded) eigenvalues and right eigenvectors for symmetric/Hermitian band matrices

Notes

This function makes use of LAPACK `S/DSTEMR` routines.

Examples

```
>>> from scipy.linalg import eigh_tridiagonal
>>> d = 3*np.ones(4)
>>> e = -1*np.ones(3)
>>> w, v = eigh_tridiagonal(d, e)
>>> A = np.diag(d) + np.diag(e, k=1) + np.diag(e, k=-1)
>>> np.allclose(A @ v - v @ np.diag(w), np.zeros((4, 4)))
True
```


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scipy.linalg.eigvals_banded (scipy.linalg.eigvals_banded.html)

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