0	Difference between a scalar, vector and matrix
	in Numby 1 are:
	Numpy support for large, multi-dimensional array and matrices with high level mathematical function.
_	and matrices with him level mathematical function.
	The regimes will the state of
	Property Scalar Vector Matrix
	Dimension 0-0 1-0 2-0
	Shape () (n,) (m1n)
	Example 5 [1,2,3] [[1,2], [3,4]]
	0.411111
(2)	Creating evenly sound values within given remos
	(realing evenly spaced values within given range, we use linepace (start, stop, num).
	Erample,
-	in and in an
	import numpy as np. import numpy as np arr = np.linspace (0,10,5) arr = np.grange (10)
	print(arr) print(arr).
	print (arr).
	# 0 1 1 - 1
	# Output np. arange ([start,] stop, [0., 2.5, 5, 7.5, 10] [step,], dhype)
	Wtep, J, dhype)
(2)	0 1 1
0	Array Braadeasting:
	Broadcasting in numpy is a feature that allows anthmetic operation to be performed on
	allows anthmetic operation to be performed on
	arrays of different shapes. Instead of ochapring
	arrays of different shapes. Instead of ochapring explicitly, Numpy automatically "broadcasts" the smaller array to match the shape of lager
	smaller smaller array to moth the shape of lager
	array.

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	import numpy as inpid is expensed to some	don
	arr= np. array ([1,2,3]) #1-0 array	· Co
	result = arr +5 # Scalar 5 broad cast to 15,5,57	
	print (result)	11
(Example (Minus)	
4	1,2000 (3,9,8,1) = Jail	
→	Performing element-wise operations on Numby arrays;	
	Performing element-wise operations on Numby arrays:	317
	arrlz np.array ([1,2,3]) (1:) 100	
	art = np.array [1,2,37] 103 11 (1:) 10379	
	arr2 = np. array ([4,5,6]) (S:) H (S:) 1610	
	res1: arr1+ arr2 #arithmetic operation.	
	print(rest) . Eness to Enessions	
	rest = arr 2 - arr + (-) similarly can do *,/	
	Then, Micing in Lumpy	
	# with universal function 40 20 paner trager	
	c=np. add(atb) I. b. 2, HD (I c. S. J.)) wip. gree me	
	d = np.subtract(a,b)	
· V	e= np.multiply (a,b)	
	fano divide tarb) and the (1: 3) of the	
	property of the Column 1 2 5 p. 1.	
	h= np. sqrt(a) [3.2] # (52:1 2:10) shing	
	Creis?	
1		

	Date Page
(ho5)	Purpose of np.newaxis in Numpy. Rough.
-	0- 123
	fistly Slicing in Python 2-1789
	Sequence Estart: Stop: Step]
_	Example (1:2,1
	liest'= [1,2,3,4,5] (C5)
	# Basic Slicing bracket Open bracket
	print (lisst[1:4]) # [2,3,4]
	print (: 4) # [o1, 2, 3]
	print (:: 2) # [1,3,5]
	Hnegative slicing
	print [-4:-1] # [2,3,4].
	a 1 - 900 29 - and it (-) civilarly can do the
	Then, Slicing in Numby
	import numpy as np
	arr = np.arr ([[1,2,3], [4,5,6], [7,8,9]])
	d= mo. I tractions
	# basic slicing
	print (ato,:]) # [1,4,7] # Row 0, [1,2,3]
	print(a[:,1] # Column1, [2,5,8]
	print (a[1:3, 1:3]) # [[5,6]
	[8,9]]
III and the second	

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Date_	1
Pa	ge

np-new axis increases the dementionality of men 1 ba
np-newaxis increases the demensionality of array by 1+ changes the shape without changing the data.
CELTIFICATION CONTROLLED TO THE GOLD OF THE CONTROLLED
Example: import numpy as imposing = 1 +02
8 a = np. array ([1, 2, 3,]) # shape (3,)
b=a[:, np.newaxis] # shape (3,1) new co)
C= a [np.newaxis;] # shape (1,3), new row
here (3,) indicates, I-D array has 3- elements.
here (3,) indicates, I-D array has 3- elements. # (3,1) indicates array has rows I column.
(1,3) indicates array bias I row 3 column.
Mp. array
Basically new axis is also reshaping the matrix
[[] [] [] [] [] [] [] [] [] [
b= [[1]
Convert and exprence ild-efferments and sequests fire
[3]] 2-D. Sanda
hitally, a was just 1-D array.
acts stemme due to copy, in I will collect input already
We can do the same rusing rechape.
b=a[:, np.newaxis]
surray shallow copies the date it its willer to
b= a-reshape(-1,1) . suit perie m
Jos sing took what was proper and so some of
(c) (10) 10 10 10 10 10 10 10 10 10 10 10 10 10

(Ono 6)	Sorting a Numby along a specifix axis:
	b=np.array([[8,49], [4,2,8], [5,6,7]])
	sort_b = np.sort(b, axi&=1)
2	Output - EE311, 9
70000 Co	F 2 . 4 8]
.5.000	E2,48J E567J
	thomas of work of Lecturities () and the
(Inot)	Difference between np. array and np. as array function
	Mp. array Mp. asarray
Creates a	Always, unless copy = false Only if. The input is not
Copy	an array
_	LLE SILL S
hpyt	Converts any sequence-like Converts any sequence like object.
Type	object object.
	paris and tay sour a mili
Performace	Slower due to copying faster when input already
	squas anay
	Lucius que il ad
-	asarray shallow copies the data if its data is
-	already on array time.
-	copy (like base index of data).
-	copy with sust much of sundy-

Clython Python Implementation Dava Python Python Advantages of using Numby over python's buil-in lisk for numerical operations are: are and to bern (17 Numpy is implemented in C Proof: (A PHIN - MODE &) 3 VDZ - GIT import numpy as no time import arr = np. arange (1-000000) start = time. fine() array · arr = arr #7 print ("Numpy time:", time time () - start - Return elements chosen from two ... Hon trangerodil No 1st= list (range(1.000_000)) Start = time-time() 1st -= 1 x 52 ofor a xin west.] print (" dist Time: ", time-time () = start) 4: value to return when condition tal Memory Efficiency and is still ports of instituted is Numpy arrays store elements in configuous memory blocks and require less memory compared to Python lists

9) de Save and Load Numby arrays. 40/from dist # Save an array to binary file
a=np.array(11,2,3,41) np. save (data . npy , a) # douding b= np.load ('data.npy') np.where(): - Return elements chosen from two arrays (or a condition) based on a condition np.where (condition, xy). in x: value to return; when condition The y: value to return when condition False Up Condition: An array like or boolean condition 9 It is and y are array. Their shape should noth The shape of Condition. import numpy as np arr = np.array ([1,6,8,8,5]) result=np.where (arr > 5, 10,0] Houtput Co 10 0 10 0