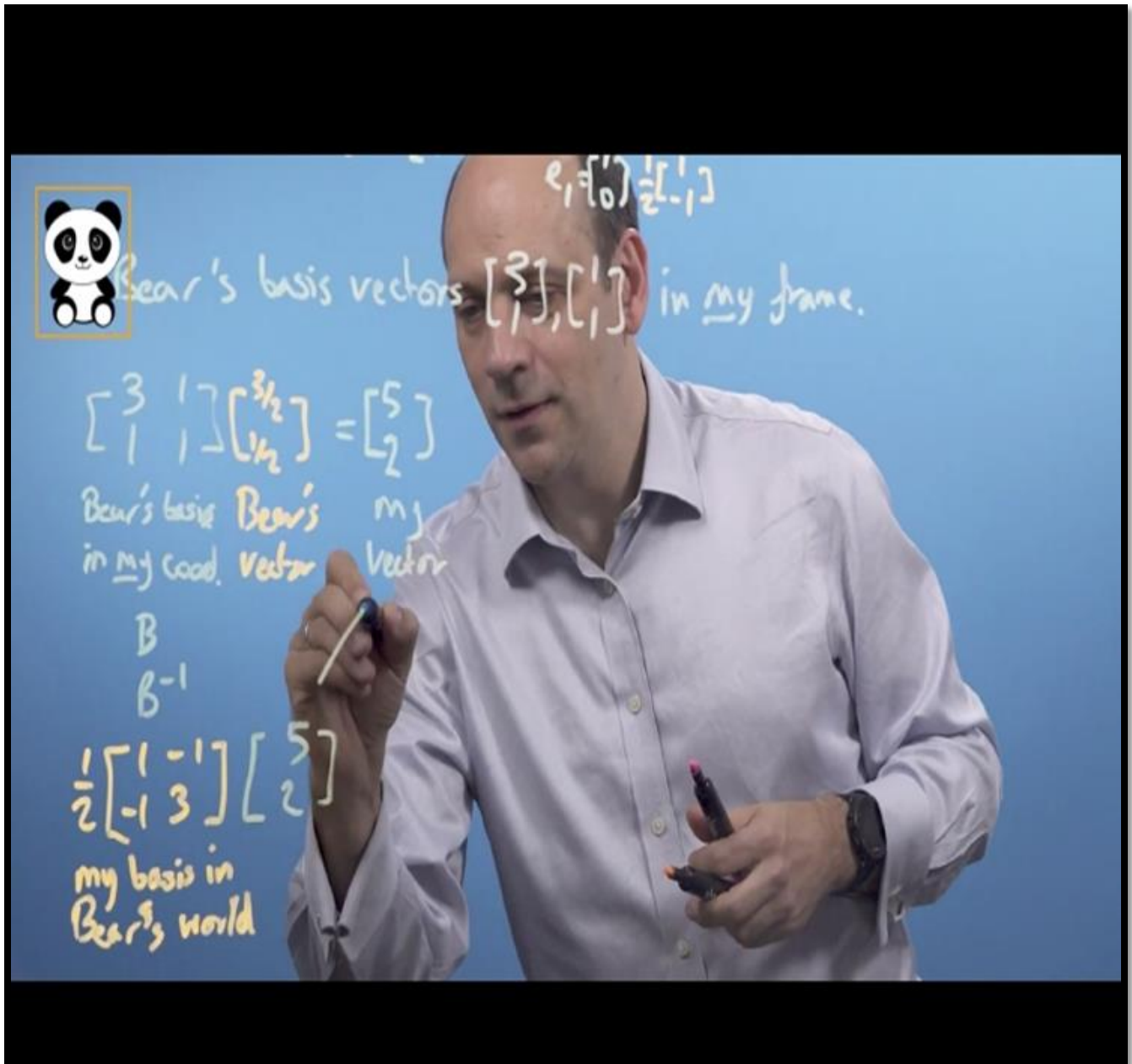


DAILY ASSESSMENT

Date:	17-July-2020	Name:	Swastik R Gowda
Course:	Coursera	USN:	4AL17EC091
Topic:	Machine Learning using Linear Algebra	Semester & Section:	6 th Sem 'B' Sec
Github Repository:	swastik-gowda		

FORENOON SESSION DETAILS

Image of session



Report – Report can be typed or hand written for up to two pages.

Eigenvalues and Eigenvectors:

- ❖ An eigenvector, corresponding to a real nonzero eigenvalue, points in a direction in which it is stretched by the transformation and the eigenvalue is the factor by which it is stretched. If the eigenvalue is negative, the direction is reversed. Loosely speaking, in a multidimensional vector space, the eigenvector is not rotated. However, in a one-dimensional vector space, the concept of rotation is meaningless.
- ❖ If T is a linear transformation from a vector space V over a field F into itself and v is a nonzero vector in V , then v is an eigenvector of T if $T(v)$ is a scalar multiple of v . This can be written as where λ is a scalar in F , known as the eigenvalue, characteristic value, or characteristic root associated with v .
- ❖ There is a direct correspondence between n -by- n square matrices and linear transformations from an n -dimensional vector space into itself, given any basis of the vector space. Hence, in a finite-dimensional vector space, it is equivalent to define eigenvalues and eigenvectors using either the language of matrices or the language of linear transformations.
- ❖ If V is finite-dimensional, the above equation is equivalent to where A is the matrix representation of T and u is the coordinate vector of v in essence, an eigenvector v of a linear transformation T is a nonzero vector that, when T is applied to it, does not change direction. Applying T to the eigenvector only scales the eigenvector by the scalar value λ , called an eigenvalue.
- ❖ This condition can be written as the equation referred to as the eigenvalue equation or Eigen equation. In general, λ may be any scalar. For example, λ may be negative, in which case the eigenvector reverses direction as part of the scaling, or it may be zero or complex.
- ❖ Linear transformations can take many different forms, mapping vectors in a variety of vector spaces, so the eigenvectors can also take many forms. For example, the linear transformation could be a differential operator like $\frac{d}{dx}$, in which case the eigenvectors are functions called Eigen functions that are scaled by that differential operator, such as e^{kx} .
- ❖ Alternatively, the linear transformation could take the form of an n by n matrix, in which case the eigenvectors are n by 1 matrix. If the linear transformation is expressed in the form of an n by n matrix A , then the eigenvalue equation above for a linear transformation can be rewritten as the matrix multiplication where the eigenvector v is an n by 1 matrix. For a matrix, eigenvalues and eigenvectors can be used to decompose the matrix, for example by diagonalizing it.

Eigenvalues and eigenvectors give rise to many closely related mathematical concepts, and the prefix Eigen- is applied liberally when naming them:

- ❖ The set of all eigenvectors of a linear transformation, each paired with its corresponding eigenvalue, is called the Eigen system of that transformation.
- ❖ The set of all eigenvectors of T corresponding to the same eigenvalue, together with the zero vectors, is called an Eigen space or characteristic space of T associated with that eigenvalue.
- ❖ If a set of eigenvectors of T forms a basis of the domain of T , then this basis is called an Eigen axis.