

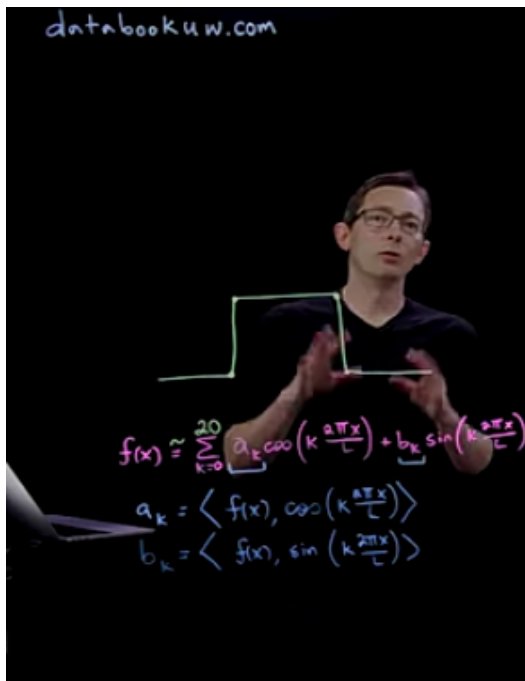
DAILY ASSESSMENT FORMAT

Date:	25/05/2020	Name:	Akshatha M Deshpande
Course:	DSP	USN:	4AL17EC006
Topic:	Fourier series and Fourier transform	Semester & Section:	6th Sem A sec
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FORENOON SESSION DETAILS

Image of session

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$$f(x) \approx \sum_{k=0}^{20} \left[a_k \cos\left(k \frac{2\pi x}{L}\right) + b_k \sin\left(k \frac{2\pi x}{L}\right) \right]$$

$$a_k = \left\langle f(x), \cos\left(k \frac{2\pi x}{L}\right) \right\rangle$$

$$b_k = \left\langle f(x), \sin\left(k \frac{2\pi x}{L}\right) \right\rangle$$

```

1 clear all, close all, clc
2 L = 10;
3 N = 1024;
4 dx = L/(N-1);
5 x = 0:dx:L;
6
7 f = zeros(size(x));
8 f(256:768) = 1;
9
10 AB = sum(f.*ones(size(x)))*dx*2/L;
11 fFS = AB/2;
12 for k=1:100
13     Ak = sum(f.*cos(2*pi*k*x/L))*dx*2/L;
14     Bk = sum(f.*sin(2*pi*k*x/L))*dx*2/L;
15     fFS = fFS + Ak*cos(2*pi*k*x/L) + Bk*sin(2*pi*k*x/L);
16 end
17
18 plot(x,f,'k','LineWidth',4), hold on
19 plot(x,fFS,'c-','LineWidth',3)
20 set(gcf,'Position',[1500 200 2500 1500])

```

Introduction to fourier series & fourier transform

In 1800's fourier transform was discovered.
It is a coordinate transform.

$$u(x, y, t)$$

rectangular slab

$$u_t = \alpha \nabla^2 u$$

↳ Function

$\nabla^2 \rightarrow$ This function has eigen values and eigen functions. Since x -axis & y -axis forms as a base for two D vector space in the same way these cosines forms as a base for function space.

$$f(t) = \frac{A_0}{2} + \sum_{k=1}^{\infty} (a_k \cos 2\pi k t + b_k \sin 2\pi k t)$$

Fourier Transform :-

In continuous fourier transform we multiply function with an analytic signal & we get one complex coefficient per frequency. $X(f) = \int_{-\infty}^{\infty} x(t) e^{-j2\pi f t} dt$ (efficient one).

If we correlate with cos or sin function then the result gives two real coefficients per frequency.

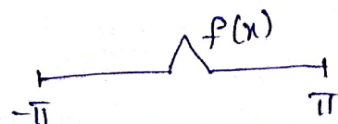
In discrete fourier transform :-

$$X_k = \sum_{n=0}^{N-1} x_n \cdot e^{-j2\pi k n / N}$$

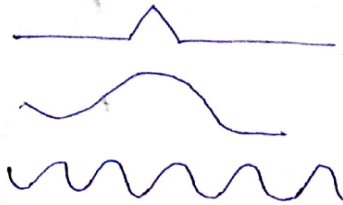
Here we use euler's formula,

$$e^{jx} = \cos x + j \sin x$$

For fourier series also.



SVD = Data driven.



Fourier Series:-

$$f(x) \approx \frac{A_0}{2} + \sum_{k=1}^{\infty} (A_k \cos(kx) + B_k \sin(kx))$$

A_k & B_k are fourier coefficients.

$$A_k = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos(kx) dx = \frac{1}{\|\cos(kx)\|^2} \langle f(x), \cos(kx) \rangle$$

$$B_k = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \sin(kx) dx = \frac{1}{\|\sin(kx)\|^2} \langle f(x), \sin(kx) \rangle$$

Inner products in Hilbert space:-

$$\langle f(x), g(x) \rangle = \int_a^b f(x) \bar{g}(x) dx$$

$$f = \begin{bmatrix} f_1 \\ f_2 \\ \vdots \\ f_n \end{bmatrix}, \quad g = \begin{bmatrix} g_1 \\ g_2 \\ \vdots \\ g_n \end{bmatrix}$$

Complex Fourier Series:-

$$f(x) = \sum_{k=-\infty}^{\infty} c_k e^{ikx}$$

$$= \sum_{k=-\infty}^{\infty} (\alpha_k + i\beta_k) (\cos(kx) + i\sin(kx))$$

$$c_k = \bar{c}_{-k} \text{ if } f(x) \text{ real.}$$

This defines ^{the} orthonormal basis of $f(x)$.

$$e^{ikx} = \cos(kx) + i\sin(kx) = \psi_k$$

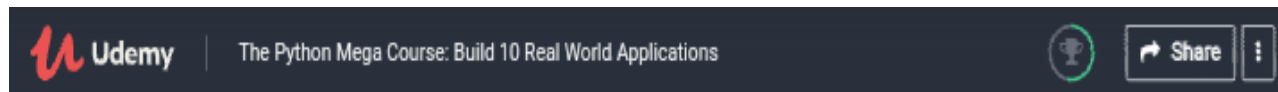
$$f(x) = \frac{1}{2\pi} \sum_{k=-\infty}^{\infty} \underbrace{\langle f(x), \psi_k \rangle}_{c_k} \underbrace{\psi_k}_{e^{ikx}}$$

Coding of fourier series was explained using Matlab, Python and octave.

Date:	25/05/2020	Name:	Akshatha M Deshpande
Course:	Python	USN:	4AL17EC006
Topic:	Fixing program errors, Application 3	Semester & Section:	6th Sem A sec

AFTERNOON SESSION DETAILS

Image of session



previous video, here is another example:

```
1 >>> lines = ["trees are good", "pool is fresh", "face is round"]
2 >>> website_list = ["face", "clock", "trend"]
3 >>> for line in lines:
4 ...     any(website in line for website in website_list)
5 ...
6 False
7 False
8 True
```

We start iterating over the items of `website_list` using a `for` loop. In the first iteration we would have:

```
any(website in 'trees are good' for website in
website_list)
```

Inside the parenthesis of `any()` there's another loop that iterates over `website_list`:

```
1 ("face" in "trees are good")
2 ("clock" in "trees are good")
3 ("trend" in "trees are good")
```

If `any` of the above is `True` you get the expression evaluated to `True`. In this case none of them is `True`, so you get `False`.

If you want to return `True` (if all of them are `True`), use

```
all() instead of any()
```

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

Fixing programming Errors :-

- * To fix the syntax errors
- * To fix the runtime errors.
- * How to fix difficult errors.
- * Questions on good programming.
- * Error handling

Application-3 :-

Build a website blocker

- * How the output of the website blocker will look like
- * Architecture of the Application.
- * This application is implemented in two parts.
- * Setting up the script.
- * Setting up the infinite loop.
- * First part implementation of the program.
- * Second part implementation of the program.
- * Using 'any()' function.
- * Scheduling techniques on windows, mac & linux
- * Scheduling techniques on a server.

