



120450016 - MASAYU FRANSTIKA
SAINS DATA - RB

PEMROGRAMAN BERBASIS FUNGSI

2022

Dosen Pengampu Mata kuliah :
Riksa Meidy Karim, M.Sc
Amalya Citra Pradana, M.Sc

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01 Jurnal Praktikum PBF Modul 1

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```
In [90]: tanggal = input('Tanggal Pinjam :')
durasi = int(input('Durasi Pinjam :'))

kategoris = {
    1:100,
    2:200,
    3:250,
    4:300,
    5:500,
}

In [91]: def dtl(s_tgl):
    return [int(k) for k in s_tgl.split('-')]

def is_cm(tgl_p,d,c):
    return tgl_p[2] + d > c

def thn_back(tgl_p,d,c):
    return tgl_p[0]+1 if (is_cm(tgl_p,d,c)and tgl_p[1]==12)else tgl_p[0]

def bln_back(tgl_p,d,c):
    return (tgl_p[1]% 12)+1 if is_cm(tgl_p,d,c) else (tgl_p[1]% 12)

def tgl_back(tgl_p,d,c):
    return tgl_p[2] + d - c if is_cm(tgl_p,d,c) else tgl_p[2]+d

def is_awal_abad(thn):
    return thn % 100 == 0

def kabisat(thn):
    return (is_awal_abad(thn)and thn % 400 == 0) or (not is_awal_abad(thn)and thn % 4 == 0)

def dec_c(t):
    return 30 + (t[1]%2 if t[1]<= 8 else abs( (t[1]% 2)-1)) if t[1]!= 2 else ( 29 if kabisat(t[0]) else 28)

def wkt_kembali(tgl_p,d):
    return [thn_back(tgl_p,d,dec_c(tgl_p)), bln_back(tgl_p,d,dec_c(tgl_p)), tgl_back(tgl_p,d,dec_c(tgl_p))]
```

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```
In [92]: #tanggal = '2020-01-02'
#durasi = 25
tgl_p = dtl(tanggal)
wkt_kembali(tgl_p,durasi)

Out[92]: [2020, 1, 27]

In [93]: sewaan_all = [ [1,5], [2,3], [3,0], [4,1], [5,2] ]

def calc_biaya_per_kategori(kategori,sewaan):
    return sewaan[1] * kategoris.get( sewaan[0] )

def calc_all_biaya(kategori,sewaan_all,durasi):
    return sum( [ calc_biaya_per_kategori(kategori,sewaan) for sewaan in sewaan_all])*durasi

In [94]: calc_all_biaya(kategoris,sewaan_all,durasi)

Out[94]: 60000
```

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02 Jurnal Praktikum PBF Modul 2

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NO 1

```
In [26]: n = int(input("Masukan panjang deret bilangan :"))  
def ulangi_016(n):  
    a = list(map(lambda n: 1*n, range(1,n+1))) #rumus bilangan skalar  
    return a  
  
print('bilangan skalar :', n)  
ulangi_016(n)
```

bilangan skalar : 9

```
Out[26]: [1, 2, 3, 4, 5, 6, 7, 8, 9]
```

NO2

```
In [27]: n = 5 #panjang deret  
deret = list(map(lambda x: ((-1)**(x+1)) * (1/(2**x)), range (1, n+1)))  
print (deret)
```

[0.5, -0.25, 0.125, -0.0625, 0.03125]

```
In [28]: b = range(0, n)  
  
def pola_deret(x):  
    return ((-1)**(x))*(1/(2**(x+1)))  
##Menggunakan rumus seperti di Tugas Pendahuluan namun pangkat ditambahkan 1 agar mendapatkan hasil positif dan r  
print (list(map(pola_deret, b)))
```

[0.5, -0.25, 0.125, -0.0625, 0.03125]

NO 3

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```
In [29]: from functools import reduce #import fungsi reduce
```

```
In [30]: print(reduce(lambda x,y: x+y, deret,0)) #Reduce harus memiliki 2 argumen dilambda (akumulator dan elemen)
```

0.34375

NO 4

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Jurnal Praktikum PBF Modul 2

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```
In [32]: def append_n (dat, i, n): #untuk menambahkan n karakter pada i
    return reduce( lambda a, b:a+b , dat[i:i+n]) #digunakan untuk menghitung jumlah karakter yang sama pada seq

def remap(dat, seq): #untuk meremap semua fungsi seq
    return map( lambda x: append_n(dat,x,len(seq)), range(len(dat)- len(seq)+1))

def count_mer(dat, seq):
    return reduce ( lambda a,b: a + (1 if b==seq else 0), remap(dat,seq)) , 0 #digunakan untuk menabihitung jumlah
```

```
In [33]: append n(dat,1,3) #menghasilkan panjang seq sesuai dengan index
```

Out[33]: 'GTC'

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No 6

```
In [37]: import math

def aktivasi (x): #digunakan untuk menghitung fungsi aktivasi
    return 1/(1+math.exp(-x))

def WTi (w,i): #untuk mentranspose matrix
    return list (map(lambda w : w[i], w))

def WT(w): #untuk menampung perhitungan
    return list(map(lambda i : WTi(w,i), range(len(w[0]))))

def XW(x,w): #perhitungan untuk satu input
    return list(map(lambda w : reduce (lambda a,b:a+b, map(lambda xx,ww : xx * ww , x,w),0),WT(w)))

def input_to_hidden(x,w): #menjalankan fungsi aktivasi
    return list(map(lambda x : aktivasi(x),XW(x,w)))

def feed_forward(x,w,m):
    return input_to_hidden(input_to_hidden(x,w), m)
```

```
In [38]: x = [9,10,-4]
w = [[0.5, 0.4], [0.3, 0.7], [0.25, 0.9]]
m = [[0.34], [0.45]]
# bentuk W harus sama dengan M untuk menyesuaikan pola yang sudah dibuat

feed_forward(x,w,m) #menjalankan fungsi feed_forward
```

```
Out[38]: [0.6876336740661236]
```

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Pertemuan 9

Higher Order Function : Filter

- Buat program untuk menghitung deret bilangan prima dari 2 hingga N menggunakan HOF filter dan map

Contoh primes(100): 2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97

```
In [2]: #cara 1
factor = lambda n : list(filter(lambda i : n%i==0, range(1,n+1)))
primes = lambda n : filter (lambda i : len(factor(i))== 2, range (1,n+1))

print (*primes(100))

2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97

In [3]: #cara 2
L = lambda n : range(2,n)
factor = lambda n : list(filter(lambda i:n%i==0, L(n)))
primes = lambda n : filter (lambda i:len(factor(i))==0, range(2,n+1))

print (*primes(100))

2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97
```

- employee = {

```
'Nagao':35,
'Ishii':30,
'Kazutomo':20,
'Saito':25,
'Hidemi':29
```

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}

Terdapat dictionary employee berisi nama dan umur pegawai, lakukan filter untuk mengetahui pegawai yang berumur > 25 tahun !

```
In [4]: employee = {
    'Nagao':35,
    'Ishii':30,
    'Kazutomo':20,
    'Saito':25,
    'Hidemi':29
}

print(employee.items())

dict_items([('Nagao', 35), ('Ishii', 30), ('Kazutomo', 20), ('Saito', 25), ('Hidemi', 29)])

In [5]: print(list(employee.items())) #casting ke List
[('Nagao', 35), ('Ishii', 30), ('Kazutomo', 20), ('Saito', 25), ('Hidemi', 29)]

In [6]: print (*filter(lambda x:x[1]>25, employee.items()))
('Nagao', 35) ('Ishii', 30) ('Hidemi', 29)

In [7]: filter_bye_age = lambda age, employee: list(filter (lambda x:x[1]>25, employee.items() ))
print(*map(lambda d:d [0], filter_bye_age(25,employee)))
```

Nagao Ishii Hidemi

Pertemuan 10

Higher Order Function - Reduce

- Buat fungsi mencari jumlah bilangan genap dari list L!

Contoh: L = [2,1,9,10,3,90,15]

Output: 3

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```
In [9]: from functools import reduce as r
In [9]: L = [2,1,9,10,3,90,15]
r(lambda a,b:a + (1 if b % 2 == 0 else 0), L,0)
Out[9]: 3
```

2. Buat fungsi untuk menghitung n! Menggunakan reduce!

```
In [10]: from functools import reduce
n = 6
print(reduce(lambda x,y : x*y, range(1, n+1)))
720
In [11]: facto = lambda n : r (lambda a,b : a*b if b >1 else 1, range(1, n+1),1)
In [12]: for i in range (6+1):
         print(str(i)+"!", facto(i))
0! 1
1! 1
2! 2
3! 6
4! 24
5! 120
6! 720
```

3. Hitung euclidian distance dari dua vektor berikut menggunakan higher order function!

X = [2,5,6,7,10]

Y = [-2,9,2,-1,10]

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```
In [13]: X = [2,5,6,7,10]
Y = [-2,9,2,-1,10]
euclid = lambda X,Y : r (lambda a,c:a+c, map( lambda x,y : (x-y)**2 ,X,Y))** 0.5
euclid(X,Y)
Out[13]: 10.583005244258363
```

4. Terdapat dictionary employee berisi nama dan umur pegawai, lakukan reduce untuk mengetahui berapa jumlah pegawai yang berumur > 25 tahun !

```
In [14]: employee = {
    'Nagao':35,
    'Ishii':30,
    'Kazutomo':20,
    'Saito':25,
    'Hidemi':29
}
cnt_emp = lambda lim, employee : r ( lambda a,b : a+1 if b [1]> lim else a, employee.items(),0)
cnt_emp(25,employee)
Out[14]: 3
```

5. Buatlah deret fibonacci menggunakan higher order function!

```
In [15]: fibo = lambda n : r (lambda a,b : a if b [0]<=1 else a +[ a[b[0]-1]+a[b[0]-2]+ a[b[0]-3]], enumerate ( [0,1] + list( range (1,n))),[0,1]) if n >0 else [0]
```

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03 Latihan - Latihan

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```
In [16]: for i in range (6):
    print('fibonacci',i, '->', fibo(i))

fibonacci 0 -> [0]
fibonacci 1 -> [0, 1]
fibonacci 2 -> [0, 1, 2]
fibonacci 3 -> [0, 1, 2, 5]
fibonacci 4 -> [0, 1, 2, 5, 12]
fibonacci 5 -> [0, 1, 2, 5, 12, 29]
```

Pertemuan 11

Recursion in FP

Buat sebuah program untuk membuat deret fibonacci dari 0 hingga N dengan menggunakan fungsi non-rekursif dan rekursif!

Bandingkan keduanya jika nilai N = 500, Manakah yang lebih baik? Jelaskan!

```
In [88]: fibo = lambda n : r (lambda a,b : a if b [0]<=1 else a +[ a[b[0]-1]+a[b[0]-1]+ a[b[0]-2]], 
                           enumerate ( [0,1] + list( range (1,n))),[0,1]) if n >0 else [0]

In [89]: for i in range (3):
    print('fibonacci',i, '->', fibo(i))

fibonacci 0 -> [0]
fibonacci 1 -> [0, 1]
fibonacci 2 -> [0, 1, 2]
```

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```
In [90]: fibo(500)

Out[90]: [0,
 1,
 2,
 5,
 12,
 29,
 70,
 169,
 408,
 985,
 2378,
 5741,
 13860,
 33461,
 80782,
 195025,
 470832,
 1136689,
 2744210,
```

Pertemuan 12

Purity and Immutability

1. Ubah fungsi menjadi pure function!

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```
In [17]: def fungsiku (L):
    cL = L.copy()
    def check_genap(l):
        return l % 2 == 0

    for i in range (len(L)):
        if check_genap(L[i]):
            L[i] = L[i]/2
        else :
            L[i] = L[i]*n + 1
    return L
```

```
In [18]: n = 3
L = [5,6,7,8]
print(fungsiku(L))

[16, 3.0, 22, 4.0]
```

```
In [19]: print(L)

[16, 3.0, 22, 4.0]
```

2. Ubah fungsiku2 menjadi pure function!

```
In [20]: def fungsiku2 (L,n):
    cL = L.copy()
    def check_faktor(l):
        return l % n == 0
    for i in range (len(L)):
        if check_faktor(L[i]):
            L[i] = L[i]/2
        else :
            L[i] = L[i]*n + 1
    return L
```

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```
In [21]: n = 3
L = [5,6,7,8]
print(list(fungsiku2(L,n)))
print(L)

[16, 3.0, 22, 25]
[16, 3.0, 22, 25]
```

3. Apakah isi dalam tupel tup ada yang dapat diubah?

```
tup = ([3, 4, 5], 'myname')
```

```
In [22]: tup = ([3, 4, 5], 'myname')
print('tuple 1 :', tup)

tup[0]= "9"
print('tuple 2 :', tup)
```

```
tuple 1 : ([3, 4, 5], 'myname')
```

```
-----  
TypeError                                 Traceback (most recent call last)
~\AppData\Local\Temp\ipykernel_2284\3784570710.py in <module>
      2 print('tuple 1 :', tup)
      3
----> 4 tup[0]= "9"
      5 print('tuple 2 :', tup)
```

```
TypeError: 'tuple' object does not support item assignment
```

Tuple bersifat immutable, artinya isi tuple tidak bisa kita ubah dan hapus. Namun, dapat kita isi dengan berbagai macam nilai dan objek. Jadi isi pada tuple tup tidak dapat diubah, namun list nya dapat di ubah

Pertemuan 13

Function Building Function

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1. Addku = lambda x: x + 10

Powku = lambda x: x**2

Kurku = lambda x: x - 2 * x

a. Buatlah fungsi komposisi menggunakan 3 fungsi diatas yang melakukan hal sebagai berikut:

1. Menjumlahkan input dengan nilai 10
2. Mengurangi input dengan 2 kali input nya
3. Mengeluarkan nilai kuadrat dari input nya

B. Buatlah fungsi invers nya!

```
In [23]: addku = lambda x: x+10
powku = lambda x: x**2
kurku = lambda x: x-2*x

f_komp = lambda f,g: lambda x: f(g(x))

my_f_kom = f_komp(kurku,f_komp(powku,addku))

my_f_kom(10)
```

Out[23]: -400

```
In [24]: #invers
inv_addku = lambda x: x-10
inv_powku = lambda x: x**0.5
inv_kurku = lambda x: -1 * x

my_f_kom_inv = f_komp(inv_addku,f_komp(inv_powku,inv_kurku))
my_f_kom_inv(-400)
```

Out[24]: 10.0

2. Universitas di Lampung ITARE, ingin memiliki sistem penentuan golongan UKT dan jumlah biaya UKT yang dibayarkan oleh Mahasiswa berdasarkan Kriteria berikut:

a. Jumlah tanggungan

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b. Jumlah token listrik selama 3 bulan terakhir

c. Gaji Orang tua / Penanggung jawab

d. Penerima program KIP-K atau bukan

```
In [10]: mycompose = lambda * funcs: r(lambda f,g: lambda x: f(g(x)), reversed(funcs), lambda x: x)
```

```
In [11]: #Ketentuan Jumlah Tanggungan
def skor1(jtg):
    return 1 if jtg >=5 else 5-jtg
```

```
In [12]: #Ketentuan token Listrik
def skor2(x):
    def rata(X):
        return sum(X) / len(X)

    def l1_cond_1(X):
        return [X, [X>10000] ]

    def l1_cond_2(X):
        return [X[0] , X[1] + [ X[0] >= 50000] ]

    def to_score2(X):
        return r( lambda a,b: a+ (1 if b==True else 0), X[1], 1 )

    compose_cond = mycompose(rata,l1_cond_1,l1_cond_2,to_score2)
    return compose_cond(x)

skor2([5000,5000,50000])
```

Out[12]: 1

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03

Latihan - Latihan

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```
In [13]: #Ketentuan gaji
def con_1(X):
    return [X[0], 1, X[2], [X[0] > X[2] [X[1]]] ]

def con_2_to_n(X):
    return [X[0], X[1] + 1, X[2], X[3] + [X[0] > X[2] [X[1]]] ]

def to_score(X):
    return r( lambda a,b: a+ (1 if b==True else 0), X[-1], 2 )

def prep(gj):
    return [gj, 0, list( map( lambda x: x+1000000 , list(range(10,3,-2)) + [3] ) )]

def skor3(gaji):
    commpy = mycompose( prep.con_1, *(con_2_to_n for i in range(4)) , to_score )
    return commpy(gaji)

In [14]: #Ketentuan KIP K
def skor4(X=True):
    return 1 if X else 5

In [15]: def combineskor(X):
    return X + [map( lambda f,x: f(x), X[1], X[0] )]

def boboti(X):
    return r( lambda a,b:a+b , map( lambda x,y:x*y , X[-1] , [0.2 , 0.3 , 0.2 , 0.3] ) )

def toUKT(X):
    return 750000 + X*500000
```

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```
In [18]: mhs = [3,
           [120000,75000,50000],
           5.5 * 10**6,
           False
          ]

datas = [mhs, [skor1,skor2,skor3,skor4]]
compose_fin = mycompose(combinескор, boboti, toUKT)
compose_fin(datas) /10**6
```

3. Turunan Polinom

```
In [22]: def splt(dat):
    return dat.replace(' ','').replace('-', '+-').split('+')
def chdepan(dat):
    return dat[1:] if dat[0]=='' else dat
def eqkan(dat):
    return map( lambda x: x if '^' in x else x+ '^1' if 'x' in x else x+ 'x^0' , dat)
def toarr2d(dat):
    return r( lambda a,b:a + [ [float(hurf) for hurf in b.split('x^')] ] ,dat,[] )
def sortdesc(dat):
    return sorted(dat,key=lambda x:x[1],reverse=True)
def culture(dat):
    return map( lambda x: [0,0] if x[1]==0 else [ x[1] * x[0] , x[1]-1 ] , dat)
def tostr(dat):
    return map( lambda x: '0' if x[0]==0 else str(x[0]) if x[1]==0 else str(x[0] + 'x' if x[1]==1 else str(x[0]))
def prettykan(dat):
    return r( lambda a,b: a+'+' + b if b!='0' else a ,dat,'')
def prettysign(dat):
    return dat.replace('+-',' -').replace('+',' +')

In [23]: dat = '-3x^5 + 2x^2 - 4x + 5'
fss = (splt,chdepan,eqkan,toarr2d,sortdesc,culture,tostr,prettykan,prettysign)
my_turunan = mycompose(*fss)
```

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03 Latihan - Latihan

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In [94]: `splt(dat)`

Out[94]: `['', '-3x^5 ', ' 2x^2 ', '- 4x ', ' 5']`

4. Buatlah fungsi untuk menghitung biaya yang harus dibayar customer pada suatu e-commerce menggunakan higher order function. Buatlah decorator untuk mengeluarkan harga sebelum pajak dan sesudah pajak (pajak = 11%) ! Gunakan decorator untuk menambahkan perhitungan waktu eksekusi!

```
In [ ]: from functools import reduce as r
keranjang = [
    {'Jumlah Barang': 5, 'Harga': 10},
    {'Jumlah Barang': 7, 'Harga': 20},
    {'Jumlah Barang': 20, 'Harga': 4.5}
]

def pajak_decorator(func):
    def inner(*args, **kwargs):
        res = func(*args, **kwargs)
        print ('Sub Total:', res)
        print ('Pajak:', res * 0.11)
        print ('Total:', res + res*0.11)
        return res
    return inner

import time

def calc_time_decorator(fu):
    def inner (*args, **kwargs):
        waktu_awal = time.time()
        res = fu(*args, **kwargs)
        waktu_akhir = time.time()
        print ('Waktu Eksekusi:', waktu_akhir-waktu_awal)
        return res
    return inner
```

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```
In [ ]: @calc_time_decorator
@pajak_decorator

def hitung_pembayaran_1(keranjang):
    return r(lambda a,b: a+ b['Jumlah Barang']*b['Harga']),keranjang,0) * 1000

hitung_pembayaran_1(keranjang)

Sub Total: 280000.0
Pajak: 30800.0
Total: 310800.0
Waktu Eksekusi: 0.0

Out[14]: 280000.0
```

```
In [ ]: @calc_time_decorator
@pajak_decorator

def hitung_pembayaran_2(keranjang):
    s = 0
    for k in keranjang :
        s = s + k ['Jumlah Barang'] * k ['Harga']
    return s * 1000

hitung_pembayaran_2(keranjang)

Sub Total: 50000
Pajak: 5500.0
Total: 55500.0
Waktu Eksekusi: 0.0

Out[15]: 50000
```

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