A Hilbert matrix is defined as:

$a_{ij} = \frac{1}{i+j-1}$
where $i = 1, 2, 3..., m$
and $j = 1, 2, 3, ..., n$

Example:

$$H_{2\times 2} = \begin{pmatrix} 1 & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{3} \end{pmatrix}$$

In this post I have written a code that generates Hilbert matrices using C language.

CODE:

```
/*****************************
****HILBERT MATRIX GENERATOR****
*****************************/
#include<stdio.h>
/********
Function that generates a Hilbert matrix
Parameters:
no. of rows: m,
no. of coulmns: n,
a matrix of size mxn that would store the Hilbert matrix
********/
void Hilbert(int m, int n, double H[m][n]){
        int i,j;
        for(i=0;i<m;i++){
                for(j=0;j<n;j++){
                        H[i][j]=(double)1.0/((i+1)+(j+1)-1.0);
                }
        }
}
/*******
Function that prints the elements of a matrix row-wise
Parameters: rows(m),columns(n),matrix[m][n]
*******/
void printMatrix(int m, int n, double matrix[m][n]){
        int i,j;
        for(i=0;i<m;i++){
                for(j=0;j<n;j++){
                        printf("%lf\t",matrix[i][j]);
                }
                printf("\n");
        }
}
int main(){
        int m,n,i,j;
        printf("Enter the size of the Hilbert matrix you want to generate:\nNo. of rows
(m): ");
        scanf("%d",&m);
        printf("\nNo. of columns (n): ");
        scanf("%d",&n);
        double H[m][n];
        Hilbert(m,n,H);
        printf("\nThe reequired Hilbert matrix is:\n");
        printMatrix(m,n,H);
}
```

OUTPUT:

```
Enter the size of the Hilbert matrix you want to generate:
No. of rows (m): 3

No. of columns (n): 5

The reequired Hilbert matrix is:
1.000000        0.500000        0.333333        0.250000        0.200000

0.500000        0.333333        0.250000        0.200000        0.166667

0.333333        0.250000        0.200000        0.166667        0.142857
```

```
Enter the size of the Hilbert matrix you want to generate:
No. of rows (m): 5

No. of columns (n): 5

The reequired Hilbert matrix is:
1.000000        0.500000        0.333333        0.250000        0.200000

0.500000        0.333333        0.250000        0.200000        0.166667

0.333333        0.250000        0.200000        0.166667        0.142857

0.250000        0.200000        0.166667        0.142857        0.125000

0.200000        0.166667        0.142857        0.125000        0.111111

--------------------------------
```

Android Apps:

I've also created a few Android apps that perform various matrix operations and can come in handy to those taking a course on Numerical Methods.
Download: https://play.google.com/store/apps/details?id=com.bragitoff.numericalmethods
Download: https://play.google.com/store/apps/details?id=com.bragitoff.matrixcalculator

References and resources:

https://en.wikipedia.org/wiki/Hilbert_matrix

http://mathworld.wolfram.com/HilbertMatrix.html
http://reference.wolfram.com/language/ref/HilbertMatrix.html

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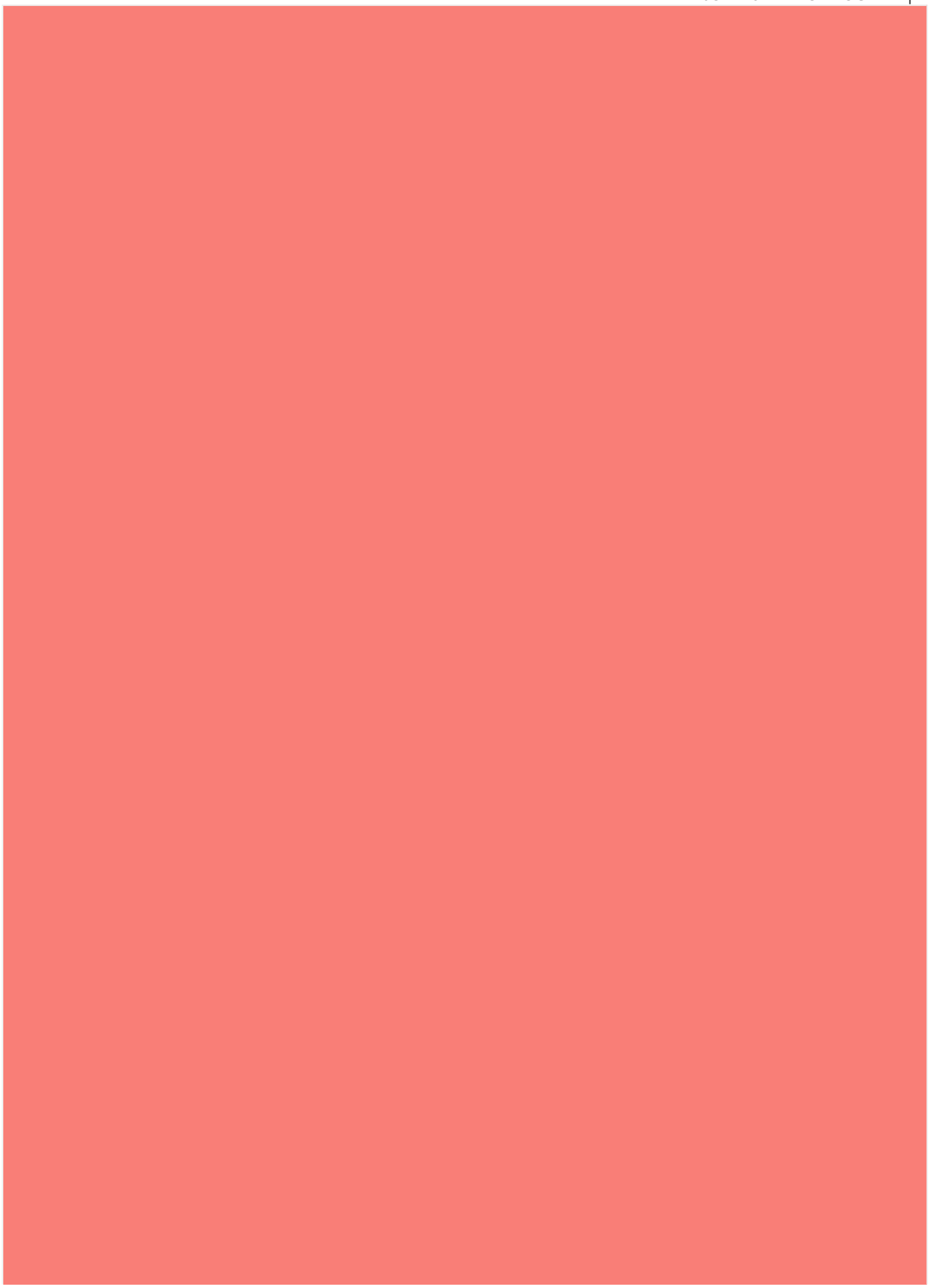

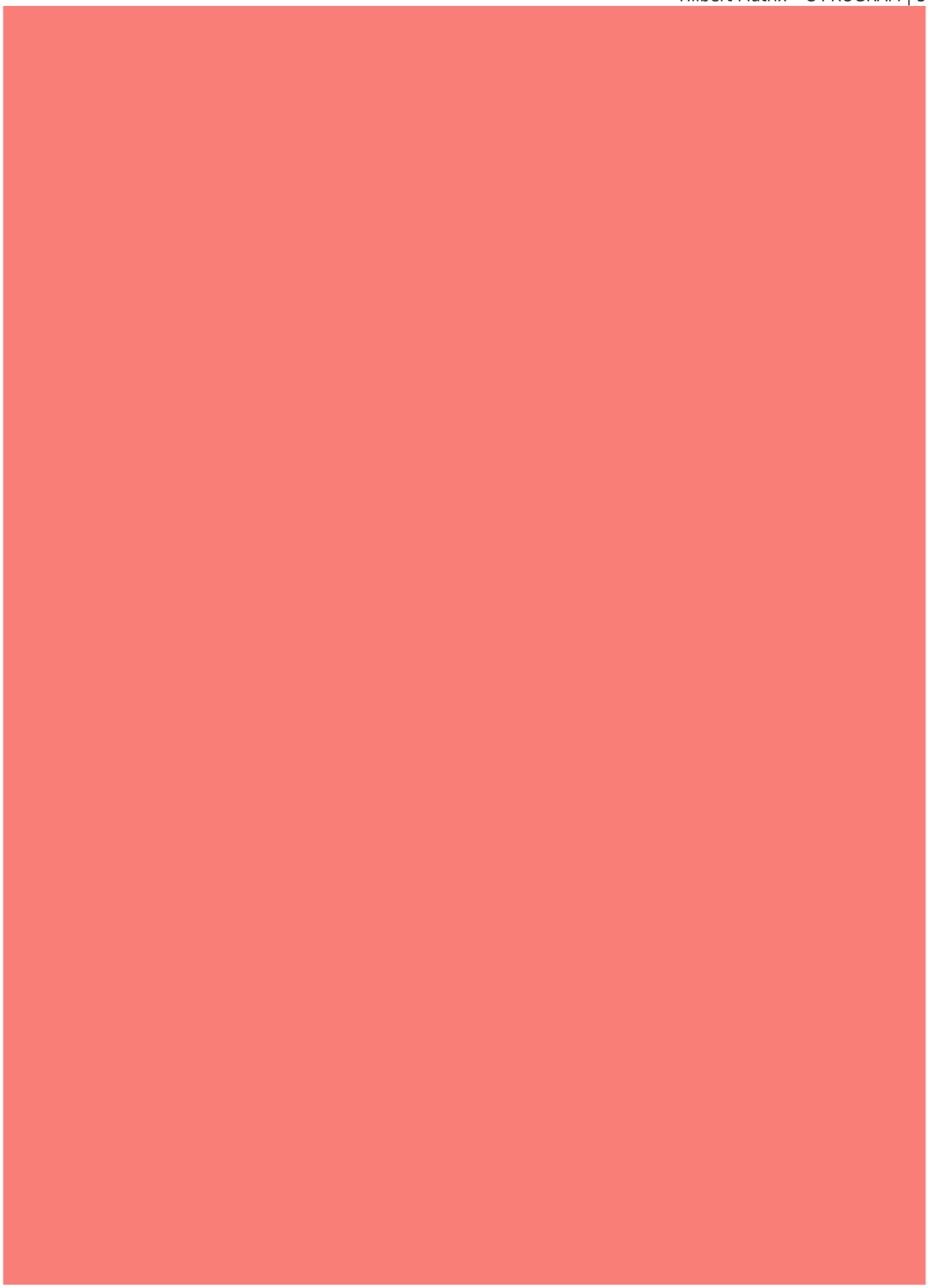

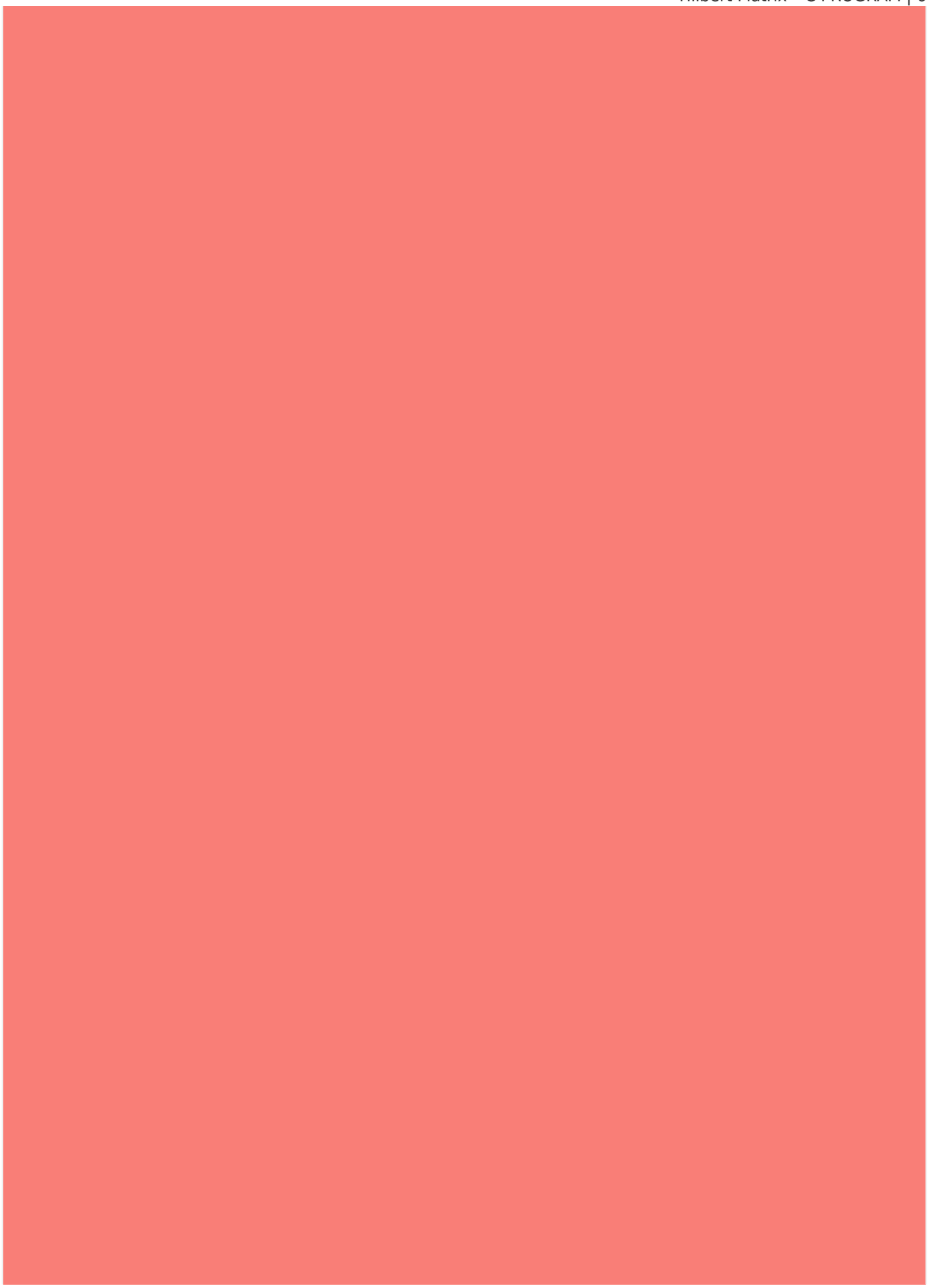

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