

## DAFTAR PUSTAKA

- Baita, A., W, B. S., & Sunyoto, A. (2016). Logo Retrieval Berdasarkan Ekstraksi Multifitur. *Magistra*, 98, 53–59.
- Darmawan, D. (2019). PENGENALAN POLA HURUF ALPHABET. *Journal of Chemical Information and Modeling*, 53(9), 1689–1699. <https://doi.org/10.1017/CBO9781107415324.004>
- Dasopang, M. (2017). Metode Perancangan Pengarangkat Lunak Mereduksi Noise Citra Digital Menggunakan Contraharmonic. *Jurnal Riset Komputer (JURIKOM)*, 2(6), 56–61. <https://ejurnal.stmik-budidarma.ac.id/index.php/jurikom/article/view/357>
- Dr. Wahidmurni, M. P. (2017). *PEMAPARAN METODE PENELITIAN KUANTITATIF*. 1–14.
- Faturrahman, I. (2018). Pengenalan Pola Huruf Hijaiyah Khat Kufi Dengan Metode Deteksi Tepi Sobel Berbasis Jaringan Syaraf Tiruan Backpropagation. *Jurnal Teknik Informatika*, 11(1), 37–46. <https://doi.org/10.15408/jti.v11i1.6262>
- Fitriani, L. (2012). *SENI KALIGRAFI: PERAN DAN KONTRIBUSINYA TERHADAP PERADABAN ISLAM*.
- Furqan, M., Kurniawan, R., & HP, K. (2020). Evaluasi Performa Support Vector Machine Classifier Terhadap Penyakit Mental. *Jsinbis*, 10(2), 203–210. <https://doi.org/10.21456/vol10iss2pp203-210>
- Furqan, M., Sriani, S., & Siregar, Y. K. (2020). Perbandingan Algoritma Contraharmonic Mean Filter dan Arithmetic Mean Filter untuk Mereduksi Exponential Noise. *JISKA (Jurnal Informatika Sunan Kalijaga)*, 5(2), 107–115. <https://doi.org/10.14421/jiska.2020.52-05>
- I Gede Pasek Suta Wijaya, & Bulkis Kanata. (2004). Pengenalan Citra Sidik Jari Berbasis Transformasi Wavelet dan Jaringan Syaraf Tiruan. *Jurnal Teknik Elektro*, 4(1), 46–52. <http://puslit2.petra.ac.id/ejournal/index.php/elk/article/view/15886>
- Ilmiah, J., & Exacta, F. (2011). *Identifikasi objek berdasarkan citra warna menggunakan matlab*. 4(2), 181–190.

- Ilmu, F., Universitas, B., Utara, S., Bulan, P., & Utara, S. (n.d.). *KALIGRAFI ARAB DIGITAL AYAT AL-QUR'AN DI DUNIA MAYA*. 19, 219–237.
- Kansha Isfaraini Huurun'ien, Agus Efendi, A. G. T. (2017). Jurnal Ilmiah Pendidikan Teknik Kejuruan ( JIPTEK ). *Jurnal Ilmiah Pendidikan Teknik Kejuruan*, X(2), <https://jurnal.uns.ac.id/jptk>.
- Mhd. Furqan, Sriani, L. S. H. (2020). Klasifikasi Daun Bugenvil Menggunakan Gray Level Co-Occurrence Matrix dan K- Nearest Neighbor. *Jurnal CoreIT*, 6(1), 22–29.
- Murdock, D. H., & Murdock, D. H. (2018). Flowcharts. *Auditor Essentials*, 235–239. <https://doi.org/10.1201/9781315178141-51>
- Nafi'iyah, N. (2017). Algoritma Kohonen dalam Mengubah Citra Graylevel Menjadi Citra Biner. *Jurnal Ilmiah Teknologi Informasi Asia*, 9(2), 49–55. <https://jurnal.stmikasia.ac.id/index.php/jitika/article/view/125>
- Nazariana, Sinurat, S., & Hutabarat, H. (2018). Analisa Tekstur Citra Biji Kemiri Menggunakan Metode Filter Gabor. *Informasi Dan Teknologi Ilmiah (INTI)*, 13(1), 50–54.
- Permata, E., Aribowo, D., & Maulana, A. (2014). Klasifikasi Parasit Malaria Plasmodium Vivax Pada Citra Sel Darah Merah Menggunakan Metode Support Vector Machine One Against All. *Seminar Nasional Teknologi Informasi Dan Multimedia 2014, STMIK AMIKOM Yogyakarta*, 13–18.
- Putri, A. R. (2017). Pengolahan Citra Dengan Menggunakan Web Cam Pada Kendaraan Bergerak Di Jalan Raya. *JUPI (Jurnal Ilmiah Penelitian Dan Pembelajaran Informatika)*, 1(01), 1–6. <https://doi.org/10.29100/jupi.v1i01.18>
- Saputra, H., & Arnia, F. (2016). Penggunaan Fitur Momen Zernike Untuk Pengenalan Karakter Jawi Cetak. *Karya Ilmiah Teknik Elektro*, 1(3), 15–20.
- Sriani, Triase, & Khairuna. (2017). Pendekomposisian Citra Digital Dengan Algoritma DWT. *Jurnal Ilmu Komputer Dan Informatika*, 01(01), 35–39.

## LISTING PROGRAM

### 1. main\_program.m

```
function varargout = main_program(varargin)
% MAIN_PROGRAM MATLAB code for main_program.fig
%   MAIN_PROGRAM, by itself, creates a new MAIN_PROGRAM or
raises the existing
%   singleton*.
%
%   H = MAIN_PROGRAM returns the handle to a new
MAIN_PROGRAM or the handle to
%   the existing singleton*.
%
%   MAIN_PROGRAM('CALLBACK',hObject,eventData,handles,...)
calls the local
%   function named CALLBACK in MAIN_PROGRAM.M with the given
input arguments.
%
%   MAIN_PROGRAM('Property','Value',...) creates a new
MAIN_PROGRAM or raises the
%   existing singleton*. Starting from the left, property value pairs are
%   applied to the GUI before main_program_OpeningFcn gets called. An
%   unrecognized property name or invalid value makes property
application
%   stop. All inputs are passed to main_program_OpeningFcn via varargin.
%
%   *See GUI Options on GUIDE's Tools menu. Choose "GUI allows
only one
%   instance to run (singleton)".
%
% See also: GUIDE, GUIDATA, GUIHANDLES
```

```

% Edit the above text to modify the response to help main_program

% Last Modified by GUIDE v2.5 19-Aug-2021 02:11:07

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',    mfilename, ...
    'gui_Singleton', gui_Singleton, ...
    'gui_OpeningFcn', @main_program_OpeningFcn, ...
    'gui_OutputFcn', @main_program_OutputFcn, ...
    'gui_LayoutFcn', [], ...
    'gui_Callback', []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT

% --- Executes just before main_program is made visible.
function main_program_OpeningFcn(hObject, eventdata, handles,
varargin)
% This function has no output args, see OutputFcn.
% hObject handle to figure
% eventdata reserved - to be defined in a future version of MATLAB

```

```

% handles  structure with handles and user data (see GUIDATA)
% varargin  command line arguments to main_program (see VARARGIN)

% Choose default command line output for main_program
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);
movegui(hObject,'center');

% UIWAIT makes main_program wait for user response (see UIRESUME)
% uiwait(handles.figure1);

logo = imread('logo.png');
axes(handles.axes3);
imshow(logo);

% --- Outputs from this function are returned to the command line.
function varargout = main_program_OutputFcn(hObject, eventdata,
handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject   handle to figure
% eventdata reserved - to be defined in a future version of MATLAB
% handles   structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;

% --- Executes on button press in pushbutton1.
function pushbutton1_Callback(hObject, eventdata, handles)

```

```

% hObject handle to pushbutton1 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% menampilkan menu browse file
[file, path] = uigetfile('*.*');

% jika ada file yang dipilih maka menjalankan perintah di bawahnya
if ~isequal(file,0)
    % membaca file citra yang dipilih
    img = imread(fullfile(path, file));
    set(handles.edit2,'String',file);
    % menampilkan citra pada axes
    axes(handles.axes1)

    imshow(img)
    % menyimpan variabel Img pada lokasi handles (lokasi penyimpanan
MATLAB
    % agar dapat dipanggil pada pushbutton yang lain)
    handles.img = img;
    guidata(hObject, handles)

    % mereset button2
    set(handles.pushbutton2,'Enable','on')
    set(handles.pushbutton3,'Enable','off')
    set(handles.edit1,'String',[])
    set(handles.text2,'String',[])
    axes(handles.axes2)

    cla reset

    set(gca,'XTick',[])
    set(gca,'YTick',[])
else

```

```

    return
end

% --- Executes on button press in pushbutton2.
function pushbutton2_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% memanggil variabel Img yang ada pada lokasi handles
img = handles.img;
img = rgb2gray(img);
p = imbinarize(img);
p = logical(not(p));
[~, Centroid, Moments1, Moments2, Moments3, Moments4, Moments5,
Moments6] = Zernikmoment(img,p); % Call Zernikemoment fuction
data_uji = [Centroid,Moments1,Moments2,Moments3,Moments4,Moments5,Moments6];
axes(handles.axes2);
imshow(p);

% mereset button2
set(handles.pushbutton3,'Enable','on')
set(handles.edit1,'String',[])
% menyimpan variabel data_uji pada lokasi handles
handles.data_uji = data_uji;
guidata(hObject, handles)

% --- Executes on button press in pushbutton3.
function pushbutton3_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton3 (see GCBO)

```

```

% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% memanggil variabel data_uji yang ada pada lokasi handles
data_uji = handles.data_uji;

% load data_latih dan target_latih hasil pelatihan
load hasil_pelatihan
load hasil_penargetan

% pengujian menggunakan algoritma multisvm
output = multisvm(data_latih,target_latih,data_uji);

% mengubah nilai keluaran menjadi kelas keluaran
switch output
case 1
    jenis_kaligrafi = 'Kaligrafi Diwani';
case 2
    jenis_kaligrafi = 'Kaligrafi Diwani Jali';
case 3
    jenis_kaligrafi = 'Kaligrafi Naskhi';
case 4
    jenis_kaligrafi = 'Kaligrafi Tsuluts';
otherwise
    jenis_kaligrafi = 'Kaligrafi Tidak Dikenali';
end

% menampilkan hasil pengenalan jenis kaligrafi pada edit text
set(handles.edit1,'String',jenis_kaligrafi)

% --- Executes on button press in pushbutton4.

```



```
function pushbutton4_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton4 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
```

```
% mereset button2
set(handles.pushbutton2,'Enable','off')
set(handles.pushbutton3,'Enable','off')
set(handles.edit1,'String',[])
set(handles.edit2,'String',[])
set(handles.text2,'String',[])
```

```
axes(handles.axes1)
cla reset
set(gca,'XTick',[])
set(gca,'YTick',[])
axes(handles.axes2)
cla reset
set(gca,'XTick',[])
set(gca,'YTick',[])
```



UNIVERSITAS ISLAM NEGERI

SUMATERA UTARA MEDAN

```
function edit1_Callback(hObject, eventdata, handles)
% hObject handle to edit1 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit1 as text
% str2double(get(hObject,'String')) returns contents of edit1 as a double

% --- Executes during object creation, after setting all properties.
```

```

function edit1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

```



```

function edit2_Callback(hObject, eventdata, handles)
% hObject    handle to edit2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit2 as text
%       str2double(get(hObject,'String')) returns contents of edit2 as a double

```

```

% --- Executes during object creation, after setting all properties.
function edit2_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.

```

```

        if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
            set(hObject,'BackgroundColor','white');
        end

```

## 2. pelatihan.m

```

clc; clear; close all;

% membaca file citra dalam folder
image_folder = 'data_latih';
filenames = dir(fullfile(image_folder, '*.bmp'));
jumlah_data = numel(filenames);

% menginisialisasi variabel data_latih
data_latih = zeros(jumlah_data,7);

% proses ekstraksi fitur zernike moment
for k = 1:jumlah_data
    full_name= fullfile(image_folder, filenames(k).name);
    img = rgb2gray(imread(full_name));
    p = imbinarize(img);
    p = logical(not(p));
    [~, Centroid, Moments1, Moments2, Moments3, Moments4, Moments5,
Moments6] = Zernikmoment(img,p); % Call Zernikemoment fuction
    data_latih(k,:) =
[Centroid,Moments1,Moments2,Moments3,Moments4,Moments5,Moments6];
end

% penentuan nilai target untuk masing2 jenis kaligrafi
target_latih = zeros(1,jumlah_data);
target_latih(1:20) = 1; % diwani

```

```

target_latih(21:40) = 2; % diwani jali
target_latih(41:60) = 3; % naskhi
target_latih(61:80) = 4; % tsuluts

% pelatihan menggunakan algoritma multisvm
output = multisvm(data_latih,target_latih,data_latih);

% menghitung nilai akurasi pelatihan
[n,~] = find(target_latih==output');
jumlah_benar = sum(n);
akurasi = jumlah_benar/jumlah_data*100

% menyimpan variabel data_latih dan target_latih
save hasil_pelatihan data_latih
save hasil_penargetan target_latih

```

### 3. pengujian.m

```

clc; clear; close all;

% membaca file citra dalam folder
image_folder = 'data_uji';
filenames = dir(fullfile(image_folder, '*.bmp'));
jumlah_data = numel(filenames);

% menginisialisasi variabel data_uji
data_uji = zeros(jumlah_data,7);

% proses ekstraksi fitur zernike moment
for k = 1:jumlah_data
    full_name= fullfile(image_folder, filenames(k).name);
    img = rgb2gray(imread(full_name));

```

```

p = imbinarize(img);
p = logical(not(p));
[~, Centroid, Moments1, Moments2, Moments3, Moments4, Moments5,
Moments6] = Zernikmoment(img,p); % Call Zernikemoment fuction
data_uji(k,:) =
[Centroid,Moments1,Moments2,Moments3,Moments4,Moments5,Moments6];
end

```

```

% penentuan nilai target untuk masing2 jenis kaligrafi

```

```

target_uji = zeros(1,jumlah_data);

```

```

target_uji(1:5) = 1; % diwani

```

```

target_uji(6:10) = 2; % diwani jali

```

```

target_uji(11:15) = 3; % naskhi

```

```

target_uji(16:20) = 4; % tsuluts

```

```

% load data_latih dan target_latih hasil pelatihan

```

```

load hasil_pelatihan

```

```

load hasil_penargetan

```

```

% pengujian menggunakan algoritma multism

```

```

output = multism(data_latih,target_latih,data_uji);

```

```

% menghitung nilai akurasi pengujian

```

```

[n,~] = find(target_uji==output');

```

```

jumlah_benar = sum(n);

```

```

akurasi = jumlah_benar/jumlah_data*100

```

## DAFTAR RIWAYAT HIDUP



### DATA DIRI

Nama : Riswanda Ichsan Himawan Hasibuan  
Nim : 0701163049  
Tempat, Tanggal Lahir : Medan, 08 Agustus 1998  
Jenis Kelamin : Laki-Laki  
Alamat : Jl. Mesjid Lingkungan III Porta  
Kelurahan : Pulo Brayan Bengkel  
Kecamatan : Medan Timur  
Kota : Kota Medan  
Agama : Islam  
No. Hp : 085270075351  
Email : [riswandaichsan8@gmail.com](mailto:riswandaichsan8@gmail.com)

### NAMA ORANG TUA

Ayah : Morasati Hasibuan  
Ibu : Panca Riani


### PENDIDIKAN FORMAL

2004-2010 : SD YAYASAN WANITA KERETA API MEDAN  
2010-2013 : MTS PONPES DARUL ARAFAH RAYA  
2013-2016 : MADRASAH ALIYAH NEGERI 4 MEDAN  
2016-2021 : UNIVERSITAS ISLAM NEGERI SUMATERA UTARA

## KARTU BIMBINGAN SKRIPSI

**SEMESTER GASAL/GENAP TAHUN AKADEMIK 2020/2021**

|  |  |
|--|--|
| <b>Nama : Riswanda Ichsan Himawan Hasibuan</b>   | <b>Pembimbing I : Dr. Mhd Furqon, S.Si., M.Comp.Sc</b> |
| <b>NIM : 0701163049</b>  | <b>Pembimbing II : Sriani, S.Kom., M.Kom</b>           |
| <b>Prog. Studi : Ilmu Komputer</b>   | <b>SK Pembimbing :</b>                                 |
| <b>Judul Skripsi:</b><br><b>PENGENALAN POLA JENIS TULISAN KALIGRAFI MENGGUNAKAN METODE ZERNIKE MOMENT DAN SUPPORT VECTOR MACHINE</b> |  |

| PERTEMUAN | TANGGAL         | MATERI BIMBINGAN  | TANDA TANGAN PEMBIMBING   |   |
|-----------|-----------------|---|---|---|
|           |                 |   | I   | II  |
| I         | 12 Juli 2020    | Diskusi (Penulisan Format Rumusan Masalah, Batasan Masalah, Tujuan Penelitian dan Manfaat Penelitian)                                     |   |   |
| II        | 23 Juli 2020    | Revisi Bab I (Perbaiki Latar Belakang, Rumusan Masalah, Tujuan Penelitian dan Manfaat Penelitian)   |  |  |
| III       | 26 Juli 2020    | Acc Bab I Lanjut Bab II   |  |  |
| IV        | 10 Agustus 2020 | Revisi Bab II (Tambahkan Referensi, Konsistenkan Bab dan Sub Bab, Tambahkan Pembahasan Jenis Citra, dan Tambahkan Teori Pengolahan Citra) |  |  |
| V         | 15 Agustus 2020 | Acc Bab II Lanjut Bab III   |  |  |

|     |                   |   |   |  |
|-----|-------------------|---|---|--|
| VI  | 03 September 2020 | Revisi Bab III (Perbaiki Tempat dan Waktu Penelitian dan Perbaiki Diagram Sistem) |  |   |
| VII | 08 September 2020 | Acc Bab III Lanjut Seminar Proposal   |  |   |
| VII | 30 Agustus 2021   | Revisi Bab IV dan Bab V (Perbaiki Hasil Pengujian Sistem dan Kesimpulan)          |  |   |
| IX  | 01 September 2021 | Revisi Abstrak  |  |   |
| X   | 02 September 2021 | Acc Bab IV dan Bab V dan Abstrak Lanjut Sidang Munaqasyah                         |  |  |

Medan, 02 September 2021  
An. Dekan  
Ketua Jurusan/Program Studi



Ilka Zufria, M.Kom  
NIP. 198506042015031006