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Judul	: PENGEMBANGAN MODEL DETEKSI PENYAKIT GIGI BERBASIS VISI KOMPUTER DENGAN ARSITEKTUR MOBILENETV2 (CNN) PADA POLI GIGI KLINIK MITRA SEHAT KARAWANG
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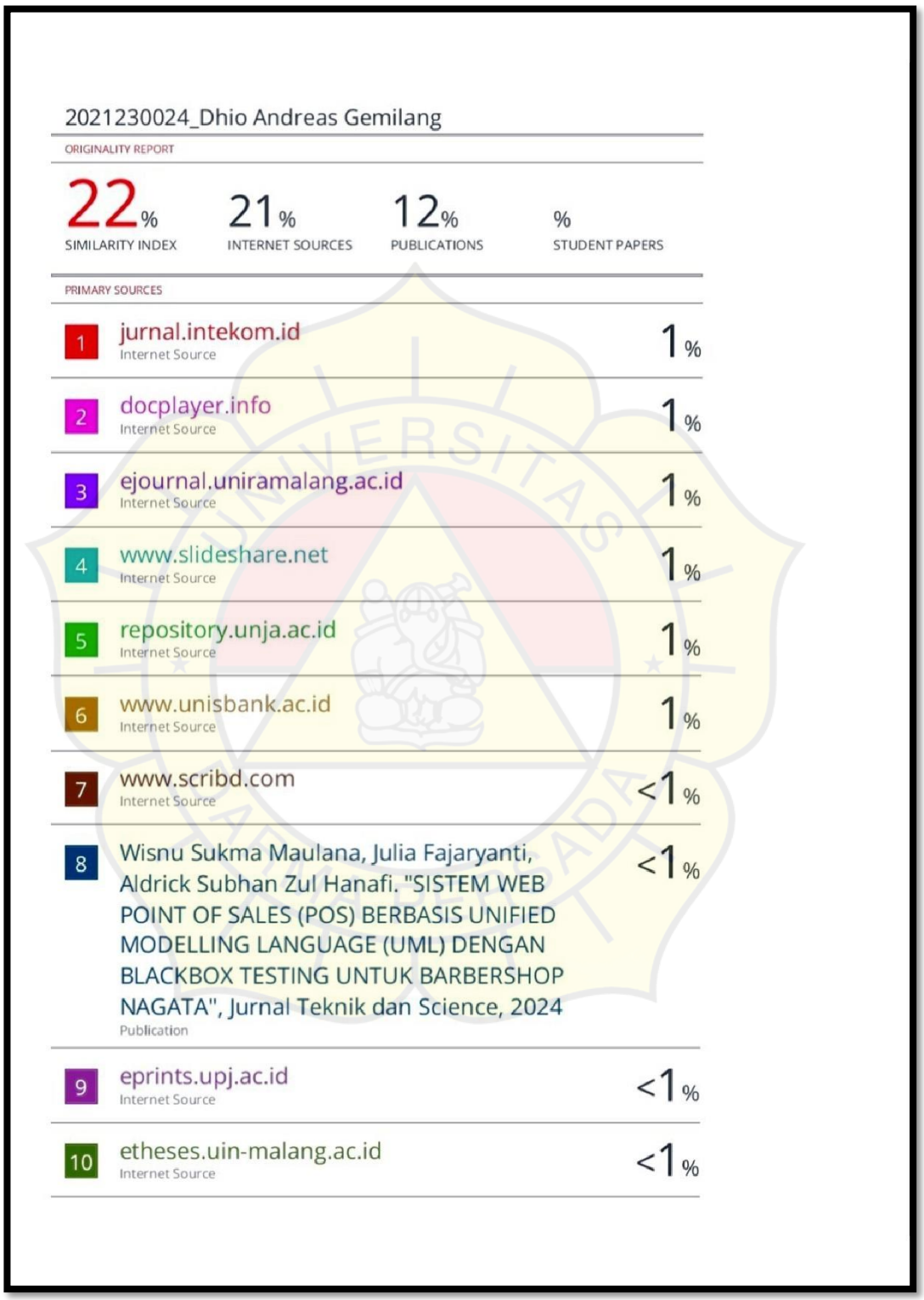

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Source Code App.py

```
1. import os
2. from flask import Flask, request, jsonify, render_template,
   redirect, url_for, session, flash
3. from flask_sqlalchemy import SQLAlchemy
4. from werkzeug.security import generate_password_hash,
   check_password_hash
5. from functools import wraps
6. import tensorflow as tf
7. from tensorflow.keras.preprocessing import image
8. import numpy as np
9. from PIL import Image
10.      from flask_cors import CORS
11.      import random
12.      import string
13.      from itsdangerous import URLSafeTimedSerializer
14.      from email.mime.text import MIMEText
15.      import smtplib
16.      from flask import request, redirect, url_for,
   render_template, flash
17.      from werkzeug.utils import secure_filename
18.      import os
19.      # --- Inisialisasi Flask & CORS
20.      app = Flask(__name__)
21.      CORS(app)
22.      # --- Konfigurasi APP
23.      app.config['SECRET_KEY'] = 'myverysecretkey12345'
24.      app.config['SQLALCHEMY_DATABASE_URI'] =
   'mysql+pymysql://root:@localhost:3306/deteksi_penyakit_gigi'
25.      app.config['SQLALCHEMY_TRACK_MODIFICATIONS'] = False
26.      db = SQLAlchemy(app)
27.      # --- Serializer untuk Token
28.      s = URLSafeTimedSerializer(app.config['SECRET_KEY'])
29.      # --- Konfigurasi Email
30.      app.config['MAIL_SERVER'] = 'smtp.gmail.com'
31.      app.config['MAIL_PORT'] = 587
32.      app.config['MAIL_USERNAME'] = 'your_email@gmail.com'
33.      app.config['MAIL_PASSWORD'] = 'your_app_password'
34.      app.config['MAIL_USE_TLS'] = True
35.      # --- Tambahan CORS header
36.      @app.after_request
37.      def add_cors_headers(response):
38.      response.headers['Access-Control-Allow-Origin'] = '*'
39.      response.headers['Access-Control-Allow-Headers'] =
   'Content-Type,Authorization'
40.      response.headers['Access-Control-Allow-Methods'] =
   'GET,PUT,POST,DELETE,OPTIONS'
41.      return response
42.      # --- Model Database
43.      class Pengguna(db.Model):
44.      __tablename__ = 'pengguna'
45.      id_pengguna = db.Column(db.Integer, primary_key=True)
46.      nama = db.Column(db.String(100), nullable=False)
47.      email = db.Column(db.String(100), unique=True,
   nullable=False)
```

```
48.       password = db.Column(db.String(255), nullable=False)
49.       role = db.Column(db.Enum('admin', 'user'),
   default='user')
50.       def set_password(self, raw_password):
51.       self.password = generate_password_hash(raw_password)
52.       def check_password(self, raw_password):
53.       return check_password_hash(self.password,
   raw_password)
54.       class HasilKlasifikasi(db.Model):
55.       __tablename__ = 'hasil_klasifikasi'
56.       id = db.Column(db.Integer, primary_key=True)
57.       nama = db.Column(db.String(100))
58.       filename = db.Column(db.String(255))
59.       prediksi = db.Column(db.String(50))
60.       confidence = db.Column(db.Float)
61.       waktu = db.Column(db.DateTime,
   server_default=db.func.now())
62.       class Dataset(db.Model):
63.       __tablename__ = 'dataset'
64.       id = db.Column(db.Integer, primary_key=True)
65.       label = db.Column(db.String(100), nullable=False)
66.       filename = db.Column(db.String(255), nullable=False)
67.       created_at = db.Column(db.DateTime,
   server_default=db.func.now())
68.       # --- Dekorator Login
69.       def login_required(role=None):
70.       def decorator(f):
71.       @wraps(f)
72.       def decorated_function(*args, **kwargs):
73.       if 'username' not in session:
74.       flash('Anda perlu login untuk mengakses halaman ini.',
   'warning')
75.       return redirect(url_for('login'))
76.       if role and session.get('role') != role:
77.       flash(f'Akses ditolak untuk role: {role}', 'danger')
78.       return redirect(url_for('dashboard_admin' if
   session.get('role') == 'admin' else 'dashboard_user'))
79.       return f(*args, **kwargs)
80.       return decorated_function
81.       return decorator
82.       # --- Load Model AI
83.       MODEL_PATH = 'best_model.h5'
84.       if not os.path.exists(MODEL_PATH):
85.       print(f"Error: File model '{MODEL_PATH}' tidak
   ditemukan.")
86.       exit(1)
87.       try:
88.       model = tf.keras.models.load_model(MODEL_PATH)
89.       print("Model berhasil dimuat.")
90.       except Exception as e:
91.       print(f"ERROR saat memuat model: {e}")
92.       exit(1)
93.       CLASS_NAMES = ["Gigi Berkarang", "Gigi Berlubang",
   "Bukan Gigi"]
94.       IMG_HEIGHT = 224
95.       IMG_WIDTH = 224
```

```
96.      # --- Kirim Email Reset
97.      def send_reset_email(to_email, token):
98.      reset_url = url_for('reset_password', token=token,
   _external=True)
99.      subject = "Reset Password Akun Anda"
100.     body = f"Klik link berikut untuk reset
   password:\n\n{reset_url}\n\nJika Anda tidak meminta, abaikan
   saja."
101.     message = MIMEText(body)
102.     message['Subject'] = subject
103.     message['From'] = app.config['MAIL_USERNAME']
104.     message['To'] = to_email
105.     try:
106.     with smtplib.SMTP(app.config['MAIL_SERVER'],
   app.config['MAIL_PORT']) as server:
107.     server.starttls()
108.     server.login(app.config['MAIL_USERNAME'],
   app.config['MAIL_PASSWORD'])
109.     server.send_message(message)
110.     print(f"Email reset terkirim ke {to_email}")
111.     except Exception as e:
112.     print(f"[ERROR Kirim Email]: {e}")
113.     # --- ROUTES
114.     @app.route('/')
115.     def home():
116.     return redirect(url_for('login'))
117.     @app.route('/login', methods=['GET', 'POST'])
118.     def login():
119.     if 'username' in session:
120.     return redirect(url_for('dashboard_admin' if
   session.get('role') == 'admin' else 'dashboard_user'))
121.     if request.method == 'POST':
122.     email = request.form['username']
123.     password = request.form['password']
124.     user = Pengguna.query.filter_by(email=email).first()
125.     if user and user.check_password(password):
126.     session['username'] = user.nama
127.     session['role'] = user.role
128.     flash('Login berhasil.', 'success')
129.     return redirect(url_for('dashboard_admin' if user.role
   == 'admin' else 'dashboard_user'))
130.     else:
131.     flash('Email atau password salah.', 'danger')
132.     return render_template('login.html')
133.     @app.route('/register', methods=['GET', 'POST'])
134.     def register():
135.     if request.method == 'POST':
136.     try:
137.     nama = request.form['username']
138.     email = request.form['email']
139.     password = request.form['password']
140.     confirm_password = request.form['confirm_password']
```

```
141.     if not nama or not email or not password or not
   confirm_password:
142.     flash('Semua kolom wajib diisi.', 'danger')
143.     return render_template('register.html')
144.     if password != confirm_password:
145.     flash('Konfirmasi password tidak cocok.', 'danger')
146.     return render_template('register.html')
147.     existing =
   Pengguna.query.filter_by(email=email).first()
148.     if existing:
149.     flash('Email sudah terdaftar.', 'warning')
150.     return render_template('register.html')
151.     user = Pengguna(nama=nama, email=email, role='user')
152.     user.set_password(password)
153.     db.session.add(user)
154.     db.session.commit()
155.     flash('Registrasi berhasil. Silakan login.',
   'success')
156.     return redirect(url_for('login'))
157.     except Exception as e:
158.     print(f"ERROR REGISTER: {e}")
159.     flash('Terjadi kesalahan saat registrasi.', 'danger')
160.     return render_template('register.html')
161.     return render_template('register.html')
162.     @app.route('/profil')
163.     @login_required()
164.     def profil():
165.     user =
   Pengguna.query.filter_by(nama=session.get('username')).first
   ()
166.     return render_template('profil.html', user=user)
167.     @app.route('/profil/edit', methods=['GET', 'POST'])
168.     @login_required()
169.     def edit_profil():
170.     nama_lama = session.get('username')
171.     user =
   Pengguna.query.filter_by(nama=nama_lama).first()
172.     if not user:
173.     flash('User tidak ditemukan.', 'danger')
174.     return redirect(url_for('profil'))
175.     if request.method == 'POST':
176.     new_email = request.form['email']
177.     new_password = request.form['password']
178.     if not new_email:
179.     flash('Email tidak boleh kosong.', 'danger')
180.     return render_template('edit_profil.html', user=user)
181.     user.email = new_email
182.     if new_password:
183.     user.set_password(new_password)
184.     db.session.commit()
185.     flash('Profil berhasil diperbarui.', 'success')
186.     return redirect(url_for('profil'))
187.     return render_template('edit_profil.html', user=user)
188.     @app.route('/logout')
189.     @login_required()
190.     def logout():
```

```
191.     session.clear()
192.     flash('Anda telah logout.', 'info')
193.     return redirect(url_for('login'))
194.     @app.route('/lupa_akun', methods=['GET', 'POST'])
195.     def lupa_akun():
196.     if request.method == 'POST':
197.     email = request.form['email']
198.     user = Pengguna.query.filter_by(email=email).first()
199.     if user:
200.     # Buat password baru secara acak
201.     new_password =
   ''.join(random.choices(string.ascii_letters + string.digits,
   k=8))
202.     user.set_password(new_password)
203.     db.session.commit()
204.     flash(f'Password baru Anda: {new_password}',
   'success')
205.     else:
206.     flash('Email tidak ditemukan.', 'danger')
207.     return render_template('lupa_akun.html')
208.     @app.route('/reset_password/<token>', methods=['GET',
   'POST'])
209.     def reset_password(token):
210.     return render_template('reset_password.html')
211.     @app.route('/predict', methods=['POST'])
212.     @login_required()
213.     def predict():
214.     if 'file' not in request.files:
215.     return jsonify({"error": "Tidak ada file yang
   diupload."}), 400
216.     file = request.files['file']
217.     if file.filename == '':
218.     return jsonify({"error": "Tidak ada file yang
   dipilih."}), 400
219.     try:
220.     # --- Siapkan gambar
221.     img = Image.open(file.stream).convert('RGB')
222.     img = img.resize((IMG_HEIGHT, IMG_WIDTH))
223.     img_array = image.img_to_array(img)
224.     img_array = np.expand_dims(img_array, axis=0) / 255.0
225.     # --- Prediksi menggunakan model
226.     predictions = model.predict(img_array)
227.     scores = tf.nn.softmax(predictions[0])
228.     predicted_class_index = np.argmax(scores)
229.     predicted_class_name =
   CLASS_NAMES[predicted_class_index]
230.     confidence = float(np.max(scores))
231.     print(f"[DEBUG Predict] Class: {predicted_class_name},
   Confidence: {confidence}")
232.     # --- Threshold minimum
233.     MIN_CONFIDENCE = 0.5
234.     # --- Tolak jika bukan gigi atau confidence rendah
235.     if predicted_class_name == "Bukan Gigi" or confidence
   < MIN_CONFIDENCE:
236.     return jsonify({
237.     "prediction": "Tidak Dikenali",
```

```
238.     "confidence": confidence,
239.     "message": "Gambar yang Anda upload bukan gambar gigi
   yang dapat dikenali. Silakan coba gambar lain."
240.     })
241.     # --- Simpan hasil prediksi valid (HANYA Gigi
   Berlubang / Berkarang)
242.     hasil = HasilKlasifikasi(
243.     nama=session.get('username'),
244.     filename=file.filename,
245.     prediksi=predicted_class_name,
246.     confidence=confidence
247.     )
248.     db.session.add(hasil)
249.     db.session.commit()
250.     # --- Kirim respon JSON ke frontend
251.     return jsonify({
252.     "prediction": predicted_class_name,
253.     "confidence": confidence,
254.     "all_scores": {label: float(scores[i]) for i, label in
   enumerate(CLASS_NAMES)}
255.     })
256.     except Exception as e:
257.     print(f"[ERROR Predict]: {e}")
258.     return jsonify({"error": str(e)}), 500
259.     @app.route('/dashboard_user')
260.     @login_required(role='user')
261.     def dashboard_user():
262.     return render_template('dashboard_user.html')
263.     @app.route('/dashboard_admin')
264.     @login_required(role='admin')
265.     def dashboard_admin():
266.     from sqlalchemy import func
267.     data = (
268.     db.session.query(HasilKlasifikasi.prediksi,
   func.count(HasilKlasifikasi.id))
269.     .group_by(HasilKlasifikasi.prediksi)
270.     .all()
271.     )
272.     labels = [row[0] for row in data] or ['Kalkulus',
   'Karies']
273.     counts = [row[1] for row in data] or [0, 0]
274.     return render_template('dashboard_admin.html',
   chart_labels=labels, chart_data=counts)
275.     @app.route('/deteksi')
276.     @login_required(role='user')
277.     def deteksi():
278.     return render_template('deteksi.html')
279.     @app.route('/riwayat')
280.     @login_required(role='user')
281.     def riwayat():
282.     nama_user = session.get('username')
283.     data_riwayat =
   HasilKlasifikasi.query.filter_by(nama=nama_user).order_by(Ha
   silKlasifikasi.waktu.desc()).all()
284.     return render_template('riwayat.html',
   data=data_riwayat)
```

```
285.     @app.route('/riwayat_admin')
286.     @login_required(role='admin')
287.     def riwayat_admin():
288.     data =
   HasilKlasifikasi.query.order_by(HasilKlasifikasi.waktu.desc(
   )).all()
289.     return render_template('riwayat_admin.html',
   data=data)
290.     @app.route('/hapus_riwayat/<int:id>')
291.     @login_required(role='admin')
292.     def hapus_riwayat(id):
293.     data = HasilKlasifikasi.query.get_or_404(id)
294.     db.session.delete(data)
295.     db.session.commit()
296.     flash('Data berhasil dihapus.', 'success')
297.     return redirect(url_for('riwayat_admin'))
298.     @app.route('/kelola_pengguna')
299.     @login_required(role='admin')
300.     def kelola_pengguna():
301.     users = Pengguna.query.order_by(Pengguna.nama).all()
302.     return render_template('kelola_pengguna.html',
   users=users)
303.     @app.route('/admin_dataset', methods=['GET', 'POST'],
   endpoint='dataset_admin')
304.     @login_required()
305.     def admin_dataset():
306.     if request.method == 'POST':
307.     file = request.files.get('file')
308.     label = request.form.get('label')
309.     if file and label:
310.     filename = secure_filename(file.filename)
311.     save_path = os.path.join('static/uploads', filename)
312.     file.save(save_path)
313.     data = Dataset(label=label, filename=filename)
314.     db.session.add(data)
315.     db.session.commit()
316.     flash('Data berhasil diupload.')
317.     dataset =
   Dataset.query.order_by(Dataset.id.desc()).all()
318.     return render_template('admin_dataset.html',
   dataset=dataset)
319.     @app.route('/admin/upload_dataset', methods=['POST'])
320.     @login_required()
321.     def upload_dataset():
322.     if 'image' not in request.files or
   request.form.get('label') is None:
323.     flash('Lengkapi data upload!', 'danger')
324.     return redirect(url_for('dataset_admin'))
325.     file = request.files['image']
326.     label = request.form.get('label')
327.     if file.filename == '':
328.     flash('File tidak dipilih!', 'danger')
329.     return redirect(url_for('dataset_admin'))
```

```
    # Simpan file ke folder static/uploads/
    filename = secure_filename(file.filename)
    save_path = os.path.join('static/uploads', filename)
    file.save(save_path)
    # Simpan ke database
    new_data = Dataset(label=label, filename=filename)
    db.session.add(new_data)
    db.session.commit()
    flash('Gambar berhasil diupload!', 'success')
    return redirect(url_for('dataset_admin'))
    # --- MAIN
    if __name__ == '__main__':
    print("DEBUG: Memulai server Flask...")
    app.run(host='0.0.0.0', port=5000, debug=True)
```