DAFTAR ISI

LEMBAR PERSETUJUAN ..... **i**
LEMBAR PENGESAHAN ..... Error! Bookmark not defined.
LEMBAR PERNYATAAN ..... Error! Bookmark not defined.
KATA PENGANTAR ..... Error! Bookmark not defined.
ABSTRAK/ABSTRACT ..... Error! Bookmark not defined.
DAFTAR TABEL ..... **x**
DAFTAR GAMBAR ..... **xi**
DAFTAR LAMPIRAN ..... **xii**
BAB I PENDAHULUAN ..... Error! Bookmark not defined.
1.1 Latar Belakang ..... **Error! Bookmark not defined.**
1.2 Rumusan Masalah ..... **Error! Bookmark not defined.**
1.3 Tujuan Penelitian ..... **Error! Bookmark not defined.**
1.4 Manfaat ..... **Error! Bookmark not defined.**
BAB II TINJAUAN PUSTAKA ..... Error! Bookmark not defined.
2.1 Deteksi Kerusakan Jalan dan Infrastruktur .. **Error! Bookmark not defined.**
2.2 Pengolahan Citra Digital ..... **Error! Bookmark not defined.**
2.3 *Computer Vision* ..... **Error! Bookmark not defined.**
2.4 *Deep Learning* ..... **Error! Bookmark not defined.**
2.5 *Convolutional Neural Network* (CNN) ..... **Error! Bookmark not defined.**
2.6 *You Only Look Once* (YOLO) ..... **Error! Bookmark not defined.**
2.7 Evaluasi Model Deteksi Objek ..... **Error! Bookmark not defined.**
2.8 Penelitian Terkait ..... **Error! Bookmark not defined.**
BAB III METODE PENELITIAN ..... Error! Bookmark not defined.
3.1 Objek Penelitian ..... **Error! Bookmark not defined.**
3.2 Prosedur Penelitian ..... **Error! Bookmark not defined.**
3.2.1 Pengumpulan Dataset ..... **Error! Bookmark not defined.**
3.2.2 *Pre-processing* Data ..... **Error! Bookmark not defined.**
3.2.3 Pelatihan Model YOLOv11 ..... **Error! Bookmark not defined.**
3.2.4 Evaluasi Model ..... **Error! Bookmark not defined.**
3.2.5 Implementasi Sistem *Real-time* ..... **Error! Bookmark not defined.**

BAB IV HASIL DAN PEMBAHASAN ..... Error! Bookmark not defined.
4.1 Pengumpulan Dataset.....**Error! Bookmark not defined.**
4.1.1 Pengumpulan Dataset Primer.....**Error! Bookmark not defined.**
4.1.2 Pengumpulan Dataset Sekunder.....**Error! Bookmark not defined.**
4.2 *Pre-processing* Data.....**Error! Bookmark not defined.**
4.3 Hasil Pelatihan Model YOLOv11.....**Error! Bookmark not defined.**
4.3.1 Pengaturan *Hyperparameter* .....**Error! Bookmark not defined.**
4.3.2 Proses Training .....**Error! Bookmark not defined.**
4.4 Hasil Evaluasi Model .....**Error! Bookmark not defined.**
4.4.1 Hasil Pengukuran Kinerja Model.....**Error! Bookmark not defined.**
4.4.2 Analisis Grafik *Loss Training* dan *Validation* . **Error! Bookmark not defined.**
4.4.3 Analisis *Confusion Matrix* .....**Error! Bookmark not defined.**
4.5 Hasil Implementasi *Real-time* .....**Error! Bookmark not defined.**
4.5.1 Hasil Implementasi Pada Fitur *Upload Image* . **Error! Bookmark not defined.**
4.5.2 Hasil Implementasi Pada Fitur *Real-time* Kamera *Smartphone* **Error! Bookmark not defined.**
BAB V KESIMPULAN DAN SARAN ..... Error! Bookmark not defined.
5.1 Kesimpulan.....**Error! Bookmark not defined.**
5.2 Saran.....**Error! Bookmark not defined.**
DAFTAR PUSTAKA..... Error! Bookmark not defined.
LAMPIRAN..... Error! Bookmark not defined.
RIWAYAT PENULIS..... Error! Bookmark not defined.

DAFTAR TABEL

Tabel 2. 1 Tabel Penelitian Terkait .....**Error! Bookmark not defined.**
Tabel 4. 1 Hasil Evaluasi Model YOLOv11 .....**Error! Bookmark not defined.**
Tabel 4. 2 Hasil Confusion Matrix.....**Error! Bookmark not defined.**
Tabel 4. 3 Hasil Pengujian Fitur *Real-time* Kamera *Smartphone***Error! Bookmark not defined.**

DAFTAR GAMBAR

Gambar 2. 1 Deteksi Jalan Berlubang Menggunakan Deteksi Objek..... **Error! Bookmark not defined.**
Gambar 2. 2 Diagram alur pengolahan citra digital..... **Error! Bookmark not defined.**
Gambar 2. 3 Alur kerja *Computer Vision* .....**Error! Bookmark not defined.**
Gambar 2. 4 Diagram arsitektur YOLOv11.....**Error! Bookmark not defined.**
Gambar 3. 1 Contoh Jalan Berlubang 17
Gambar 3. 2 Contoh Jalan Tidak Berlubang..... 17
Gambar 3. 3 Alur Prosedur Penelitian 18
Gambar 3. 4 Contoh Dataset Primer Jalan Berlubang 19
Gambar 3. 5 Contoh Dataset Sekunder Jalan Berlubang 20
Gambar 3. 6 Contoh Deteksi Jalan Berlubang Dengan YOLO 23
Gambar 4. 1 Contoh Anotasi Dataset Primer.....**Error! Bookmark not defined.**
Gambar 4. 2 Contoh Anotasi Dataset Sekunder.....**Error! Bookmark not defined.**
Gambar 4. 4 Proses Anotasi Bounding Box di Roboflow ... **Error! Bookmark not defined.**
Gambar 4. 3 Proses *Resize* 28
Gambar 4. 5 Pembagian *Dataset*.....**Error! Bookmark not defined.**
Gambar 4. 6 *Pseudocode Hyperparameter* Pelatihan YOLOv11..... 31
Gambar 4. 7 Proses Training Model 32
Gambar 4. 8 Grafik *Loss Training* dan *Validation* Model YOLOv11..... 34
Gambar 4. 9 Confusion Matrix Hasil Evaluasi Model YOLOv11 ..... **Error! Bookmark not defined.**
Gambar 4. 10 Hasil Implementasi Fitur *Upload Image* pada Jalan Berlubang 38
Gambar 4. 11 Hasil Implementasi Fitur *Upload Image* pada Citra Jalan Normal .....**Error! Bookmark not defined.**

Gambar 4. 12 Hasil Implementasi Fitur *real-time* Kamera *Smartphone* ..... **Error! Bookmark not defined.**

DAFTAR LAMPIRAN

Lampiran 1. Lembar Bimbingan Tugas Akhir ..... **Error! Bookmark not defined.**
Lampiran 2. Lembar Persetujuan Publikasi ..... **Error! Bookmark not defined.**
Lampiran 3. *Letter Of Acceptance* (LOA) ..... **Error! Bookmark not defined.**
Lampiran 4. Halaman Website Publikasi Artikel . **Error! Bookmark not defined.**
Lampiran 5. Artikel Ilmiah ..... **Error! Bookmark not defined.**
Lampiran 6. Turnitin ..... **Error! Bookmark not defined.**
Lampiran 7. Tampilan Web ..... **Error! Bookmark not defined.**
Lampiran 8. Kode Program ..... **Error! Bookmark not defined.**