

PROPOSAL SKRIPSI

**PENERAPAN *LIGHT GRADIENT BOOSTING MACHINE* (LGBM)
UNTUK PERHITUNGAN METRIK *EXPECTED GOALS* (xG) DALAM
ANALISIS SEPAK BOLA**



Disusun oleh:

Fadhil Raihan Akbar
NIM. 11210930000101

**PROGRAM STUDI SISTEM INFORMASI
FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS ISLAM NEGERI SYARIF HIDAYATULLAH
JAKARTA
2025 M/1446 H**

DAFTAR ISI

| | |
|---|------------|
| DAFTAR ISI | i |
| DAFTAR GAMBAR | iii |
| DAFTAR TABEL | iv |
| BAB 1 PENDAHULUAN | 1 |
| 1.1 Latar Belakang | 1 |
| 1.2 Identifikasi Masalah | 9 |
| 1.3 Rumusan Masalah | 9 |
| 1.4 Batasan Masalah | 10 |
| 1.5 Tujuan Penelitian | 10 |
| 1.6 Manfaat Penelitian | 10 |
| 1.7 Metode Penelitian | 11 |
| 1.8 Sistematika Penulisan | 13 |
| BAB 2 TINJAUAN PUSTAKA | 15 |
| 2.1 Analisis Sepak Bola | 15 |
| 2.2 <i>Expected Goals (xG)</i> | 17 |
| 2.3 <i>Machine Learning</i> | 19 |
| 2.4 <i>Data Preprocessing</i> | 22 |
| 2.5 <i>Feature Engineering</i> | 23 |
| 2.6 <i>Gradient Boosting</i> | 24 |
| 2.7 <i>Light Gradient Boosting Machine</i> | 28 |
| 2.8 <i>Brier Score</i> | 32 |
| 2.9 <i>Receiver Operating Characteristic Area Under Curve (ROC AUC)</i> | 33 |
| 2.10 <i>Knowledge Discovery in Databases (KDD)</i> | 35 |
| 2.11 Python | 37 |
| 2.12 Pandas | 38 |
| 2.13 Scikit-learn | 38 |
| 2.14 Matplotlib | 39 |
| 2.15 Seaborn | 39 |
| BAB 3 METODE PENELITIAN | 40 |
| 3.1 Objek dan Data Penelitian | 40 |

| | | |
|----------------------------|-------------------------------------|-----------|
| 3.2 | Perangkat Pendukung Penelitian..... | 40 |
| 3.3 | Tahapan Penelitian | 40 |
| 3.4 | Waktu Pelaksanaan Penelitian..... | 41 |
| DAFTAR PUSTAKA..... | | 43 |

DAFTAR GAMBAR

| | |
|--|----|
| Gambar 1.1 Pendapatan Tahunan Pasar Sepak Bola di Indonesia | 2 |
| Gambar 1.2 Visualisasi <i>Shot-map</i> xG | 3 |
| Gambar 1.3 Grafik Performa Model LightGBM | 5 |
| Gambar 1.4 Grafik Performa Model Lain..... | 6 |
| Gambar 1.5 Logo StatsBomb..... | 6 |
| Gambar 2.1 Contoh Visualisasi pada Analisis Sepak Bola (Forcher et al., 2022) | 17 |
| Gambar 2.2 Visualisasi xG pada Pertandingan Langsung (Statsbomb, 2024)..... | 19 |
| Gambar 2.3 Contoh Implementasi <i>Machine Learning</i> (Jordan & Mitchell, 2015) | 20 |
| Gambar 2.4 Contoh Implementasi <i>Supervised Learning</i> (Mahadevkar et al., 2022) | 21 |
| Gambar 2.5 Ilustrasi <i>Level-wise Tree Growth</i> (LightGBM, 2024) | 29 |
| Gambar 2.6 Ilustrasi <i>Leaf-wise Tree Growth</i> (LightGBM, 2024)..... | 30 |
| Gambar 2.7 Contoh ROC AUC (Nahm, 2022) | 34 |
| Gambar 3.1 Tahapan Penelitian | 41 |

DAFTAR TABEL

| | |
|---|----|
| Tabel 3.1 Spesifikasi Hardware dan Software | 40 |
| Tabel 3.2 Waktu Pelaksanaan Penelitian..... | 41 |