



SPK Pemilihan Rekomendasi Laptop dengan menggabungkan Metode Fuzzy-TOPSIS + Adaptive Weighting + Sentiment Analysis

Apa Itu Triple Hybrid?

Triple Hybrid Approach adalah strategi novelty untuk proyek SPK Pemilihan Laptop yang menggabungkan **3 metode** dalam 1 sistem terintegrasi:

```
Fuzzy-TOPSIS (Uncertainty Handling)
+
Adaptive Weighting (Personalization)
+
Sentiment Analysis (Real-World Feedback)
=
SMART RECOMMENDATION SYSTEM
```

3 Masalah yang Diselesaikan

1 Ketidakpastian Penilaian → Fuzzy Logic

```
✗ Problem: "RAM 8GB = berapa? 7/10? 8/10?"
✓ Solution: "RAM 8GB = Sedang (60%) + Tinggi (40%)"
```

2 One-Size-Fits-All → Adaptive Weighting

```
✗ Problem: Mahasiswa CS ≠ Mahasiswa Bisnis
✓ Solution: Setiap user profile dapat bobot berbeda
```

3 Spec vs Reality Gap → Sentiment Analysis

✗ Problem: Spec bagus, tapi review buruk

✓ Solution: Tambah kriteria "User Satisfaction" dari reviews

Arsitektur Sistem

Input User Profile

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[1] User Clustering → Personalized Weights

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[2] Web Scraping → Sentiment Scores

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[3] Fuzzy Conversion → Handle Uncertainty

↓

TOPSIS Calculation

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Personalized Recommendations

Component Breakdown

Layer 1: Fuzzy-TOPSIS

Fungsi: Tangani ketidakpastian dalam penilaian

Traditional: Processor = 7.0 (pasti)

Fuzzy: Processor = "Bagus" (range 5-9)

Lebih natural

Robust terhadap variasi

Layer 2: Adaptive Weighting

Fungsi: Personalisasi bobot per user

Approach: Hybrid Template System

Step 1: User pilih jurusan

- └ Dropdown: "Computer Science", "Design", "Business", dll
- └ Auto-assign jurusan template weights
- └ Display bobot default

Step 2: User customize (optional)

- └ Sliders untuk adjust weight per kriteria
- └ Auto-normalization ensure total = 100%
- └ Real-time preview perubahan

Jurusan Templates:

- └ Computer Science: [10%, 30%, 25%, 15%, 5%, 5%, 5%, 5%]
- └ Design Grafis: [10%, 15%, 15%, 10%, 10%, 5%, 20%, 15%]
- └ Bisnis: [35%, 10%, 10%, 10%, 15%, 10%, 5%, 5%]
- └ Lainnya: [balanced distribution]

Feasible: Very High (1 minggu implementation)

Novelty: Good (7/10)

UX: Excellent (starts with template, user can customize)

Layer 3: Sentiment Analysis

Fungsi: Integrasi user reviews

Laptop A:

- Spec: Good (8/10)
- Reviews: Excellent (127 reviews, 4.5/5)
- Sentiment Score: 0.91

Laptop B:

- Spec: Excellent (9/10)
- Reviews: Bad (203 reviews, 2.3/5) ⚠
- Sentiment Score: 0.38

Detect hidden issues

Real-world validation

Contoh Praktis

Scenario: Budi - Mahasiswa CS

Input:

Budget: Rp 8 juta

Jurusan: Computer Science

Usage: Programming 8 jam/hari

System Process:

Step 1 - Adaptive Weighting:

Jurusan Selection → Budi = Computer Science

Template Weights: [Harga:10%, Processor:30%, RAM:25%, ...]

User can customize via sliders if needed

Step 2 - Sentiment Analysis:

Web scraping reviews:

- Laptop A: 0.825 (positive)
- Laptop B: 0.91 (very positive)
- Laptop C: 0.38 (negative) !

Step 3 - Fuzzy-TOPSIS:

Calculate with fuzzy ranges & personalized weights

Ranking:

1. Lenovo ThinkPad: 0.87
2. Asus VivoBook: 0.72
3. HP Pavilion: 0.68

Output:

Recommendation: Lenovo ThinkPad

- Score: 0.87/1.0
- Processor i7 (9/10) → Perfect for CS
- RAM 16GB (10/10) → Smooth multitasking
- Reviews: 4.5/5 (89 reviews)

Keunggulan

Feature	Benefit
3 Layer Novelty	Novelty score: 8.5/10
Personalization	Setiap user dapat rekomendasi sesuai profil
Real-World Data	Sentiment dari actual user reviews
Robust	Fuzzy handle uncertainty dengan baik
Publication Ready	Strong research contribution

Implementation Timeline

6 Minggu Roadmap

Week 1-2: Foundation

- └ Baseline SAW + TOPSIS
- └ Data collection (15-20 laptops)
- └ Basic UI (Streamlit)

Week 3: Fuzzy Layer

- └ Fuzzy membership functions
- └ Fuzzy-TOPSIS implementation
- └ Comparison: Classical vs Fuzzy

Week 4: Adaptive Layer

- └ Define jurusan-based weight templates
- └ Build template selection UI (dropdown)
- └ Implement weight customization sliders
- └ Auto-normalization logic

```
<!-- └ User survey (50-100 responden) -->  
<!-- └ K-Means clustering -->  
<!-- └ Cluster weights assignment -->
```

Week 5: Sentiment Layer

- └ Web scraping (Tokopedia/Shopee)
- └ NLP sentiment analysis
- └ Integration as 9th criterion

Week 6: Integration & Validation

- └ Combine all layers
 - └ Comparative analysis
 - └ User testing
 - └ Documentation
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Academic Value

Research Contributions

1. **Methodological Innovation**
 - Novel integration Fuzzy + Clustering + NLP
2. **Practical Application**
 - Real-world recommendation system
3. **Empirical Validation**
 - Comparative study: Crisp vs Fuzzy vs Hybrid

Possible Title

"Adaptive Fuzzy-TOPSIS Integrated with Sentiment Analysis for Personalized Laptop Selection"

Tech Stack

Core:

- └ Python 3.8+
- └ NumPy, Pandas (data processing)
- └ scikit-learn (clustering)

Fuzzy Logic:

- └ scikit-fuzzy

Web Scraping:

- └ BeautifulSoup4
- └ Selenium
- └ requests

NLP & Sentiment:

- └ TextBlob (basic)
- └ transformers (IndoBERT)
- └ nltk

UI:

- └ Streamlit (recommended)
- └ Flask/FastAPI (alternative)

Quick Decision: Should You Use This?

YES, if:

- Timeline 6-8 minggu
- Tim 2-3 orang
- Skill: Python + basic ML
- Goal: Publikasi / Nilai A+

Consider Simpler, if:

- Timeline <4 minggu → Fuzzy only
 - Solo project → Pick 2 layers
 - Limited skills → Focus quality over quantity
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Detailed Documentation

Untuk penjelasan lengkap setiap component:

- `/docs/academic/01_fuzzy_topsis.md` - Fuzzy Logic details
 - `/docs/academic/03_adaptive_weighting.md` - Clustering approach
 - `/docs/academic/04_sentiment_enhanced_mcdm.md` - NLP integration
 - `/docs/academic/00_overview_novelty_strategies.md` - All strategies comparison
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Next Steps

1. **Review dokumentasi lengkap** di `/docs/academic/`
 2. **Diskusi tim:** Pilih approach yang sesuai timeline
 3. **Prototype baseline:** Start dengan classical TOPSIS
 4. **Incremental development:** Add layers progressively
 5. **Validation:** Test & compare setiap layer
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Complexity: Medium-High (☆☆☆☆)

Novelty Score: 8.5/10

Timeline: 6-8 weeks

Publication Potential: ☆☆☆☆☆

Status: Ready for Implementation