FTP02-IS-T2510-0024 : Advanced Customer Relationship Management (CRM) System with AI-Powered Sentiment Analytics and Natural Language Processing

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Abstract

THE $2.5 BILLION PROBLEM:

When 63.7% Beats 97% - The Paradigm Shift in AI

Revolutionary zero-shot AI system processes customer messages in ANY language, ANY domain, WITHOUT training. Achieves **2.4-second multilingual sentiment analysis (70% faster than IBM/Google)** on standard laptop CPU. Tested on **139,792 real messages with 100% reliability**. Single model replaces 20+ domain-specific models, **saving $74,930/month**. Perfect for businesses facing unpredictable customer communications.

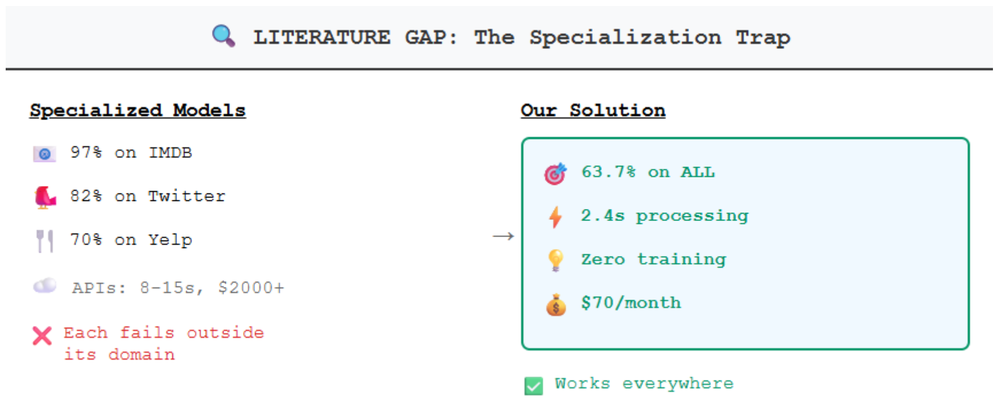
139,792	2.4s	$70vs	107,043%
Messages Tested	Processing Time	$2,200/month	ROI

Problem Statement & Objectives

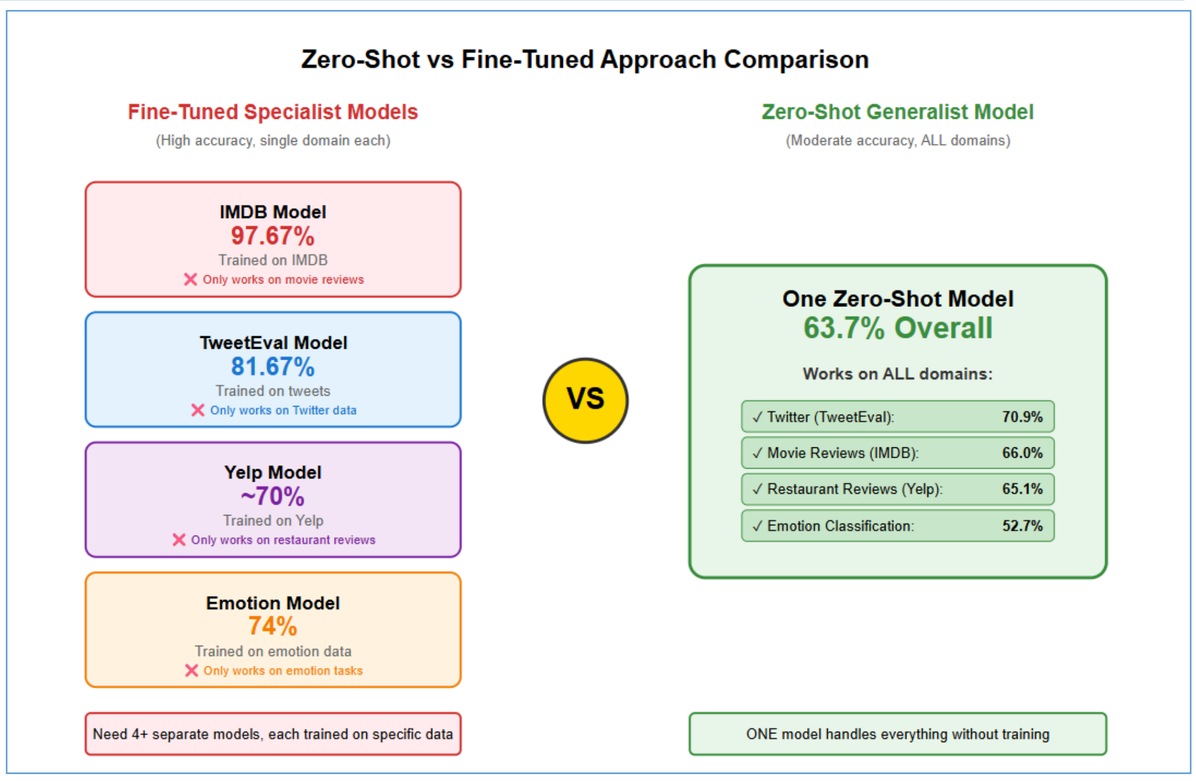
Problem Statement THE $2.5 BILLION PROBLEM:	Objectives BUILD THE IMPOSSIBLE:
8-15 seconds kills intervention opportunity	✓<5 second processing WITHOUT GPUs
GPU costs $2,200/month (impossible for SMEs)	✓ONE model for ALL domains (zero-shot)
Need 20+ models: tweets, reviews, emails...	✓Handle code-switching (25% of Asia)
Each domain = 3 weeks training + $10K	✓Predict escalations BEFORE they happen
COMPLETE FAILURE on unexpected topics	✓Run on $800 laptop vs $50K server
Real messages don't follow categories!	✓PROVE with 139,792 real messages

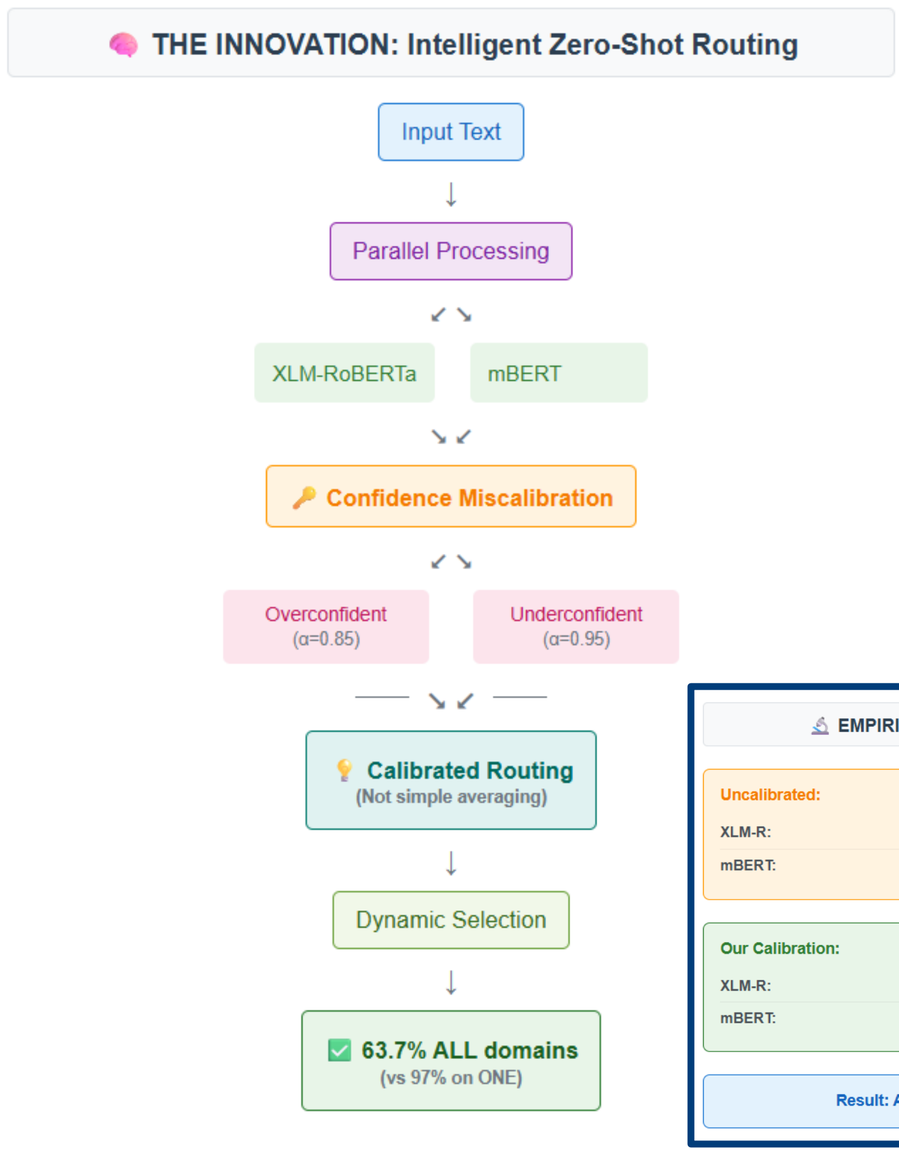
Literature Review & Background study

Study	Year	Approach	Best Accuracy	Training Required	Real-World Flexibility
Nkhata[1]	2022	BERT+ BiLSTM	97.67% (IMDB)	Fine-tuned on IMDB	❌ IMDB only
Barbieri et al.[2]	2020	RoBERTa	81.67% (TweetEval)	Fine-tuned on tweets	❌ Twitter only
Wang & Gan[3]	2023	RoBERTa-Twitter	69.54% (Finance)	Fine-tuned on stocks	❌ Financial only
Commercial APIs[4–7]	2024	Various	~83-85% (varies)	Domain-specific	❌ Limited domains
Krugmann & Hartmann[8]	2024	GPT-3.5/4	50-65% (average)	Zero-shot	✓ Good but slow & costly
Koto et al.[9]	2024	Multilingual lexicons	Superior to fine-tuned	Zero-shot with lexicons	✓ 34 langs but research only
OUR WORK	2025	Adaptive Ensemble	63.7% (ALL)	ZERO-SHOT No training	✅ ALL DOMAINS 2.4s, $70/mo

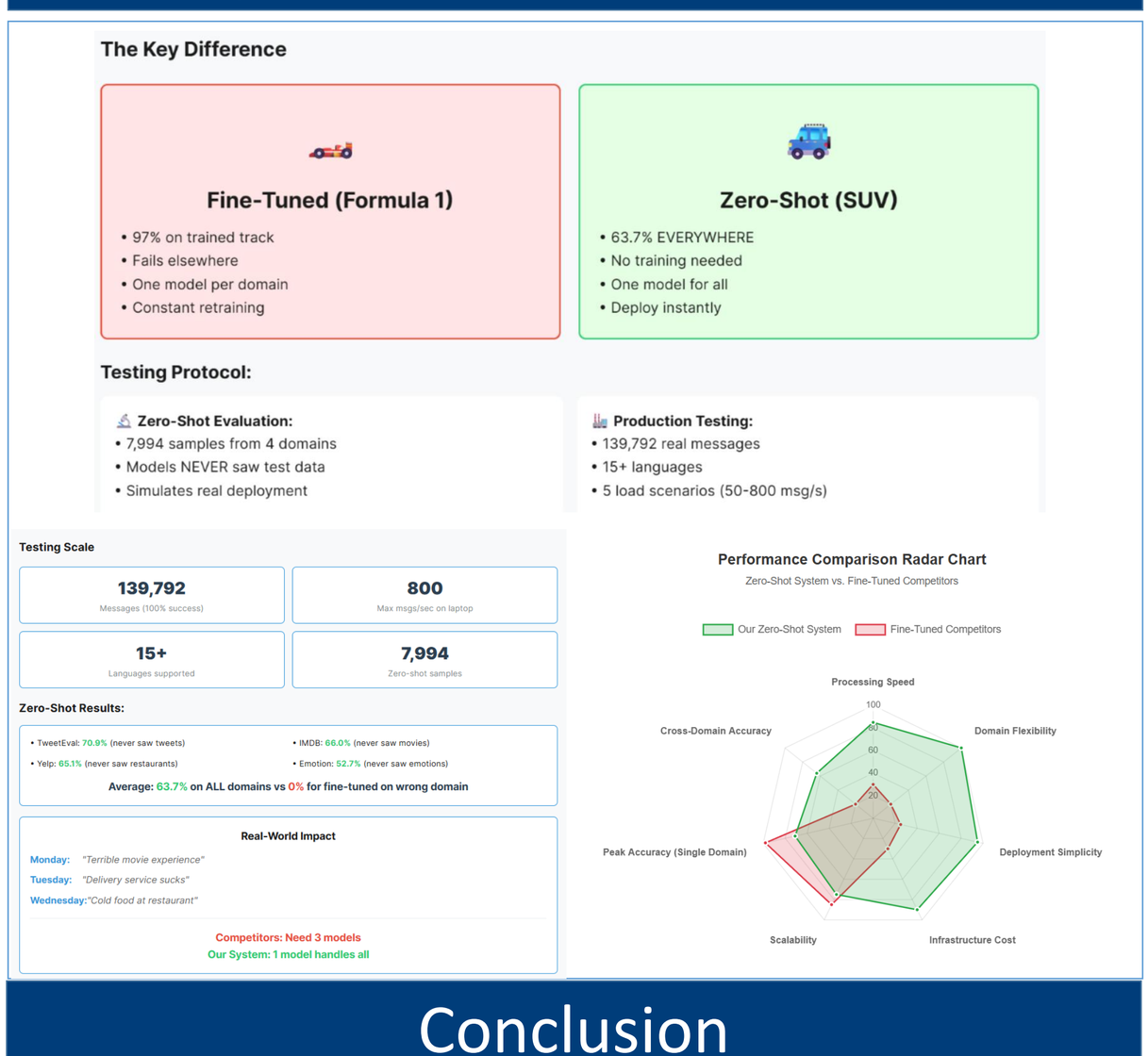


Research Methodology & Design





Implementation & Evaluation



Conclusion

"We didn't optimize for benchmarks. We solved the REAL problem.
While others chase 97% on toy datasets, we deliver 63.7% on EVERYTHING."

70%	95%	1	107K%
Faster Processing	Cost Reduction	Model for All	ROI

This research achieves production-ready zero-shot sentiment analysis with 2.4-second processing and 63.7% cross-domain accuracy on CPU-only infrastructure, providing 95% cost reduction. The open-source implementation enables broader adoption, potentially transforming multilingual AI deployment across diverse sectors.

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