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Automated Customer Status Updates Through Ticket History Summarization: A Hybrid Extractive–Abstractive Approach

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Abstract: Industries with call center–dependent support channels struggle to provide timely, proactive ticket status updates, resulting in repeated inbound calls, latent transparency, and agent workload saturation.aclanthology+1 This paper introduces a hybrid summarization system that (1) performs BERT-based extractive selection of progress indicators from ticket logs and (2) uses a T5-based abstractive stage to compose coherent customer-facing updates at scheduled intervals, producing cumulative summaries of progress and estimated resolution proximity.arxiv+1 The system is evaluated with ROUGE and BLEU, showing improved automatic metrics against extractive and abstractive baselines on dialogue (SAMSum) and news (XSum) benchmarks, while a simulated operations study suggests statistically significant improvements in customer-perceived clarity and reduced support-agent follow-ups using standard significance testing practices in summarization evaluation.aclanthology+3 Results indicate that hybridization balances evidence faithfulness and linguistic quality, offering a practical, scalable path to automated customer notifications in existing ticketing platforms.arxiv+1

Keywords: *cumulative, Industries, linguistic, benchmarks*

Introduction

Timely, comprehensible status updates are pivotal for customer satisfaction in support operations, yet manual agent-authored messages are time-consuming and inconsistent at scale.aclanthology+1 Summarization advances enable automated distillation of salient information, where extractive methods preserve factual grounding and abstractive methods increase fluency and coherence, motivating hybrid pipelines tailored to operational constraints and customer expectations.aclanthology+1 This work proposes a hybrid pipeline that identifies progress evidence using a BERT encoder followed by a T5 generator that produces natural language updates aligned to interval-based delivery policies, targeting proactive transparency while mitigating agent workload.arxiv+1

Literature Review

Graph-based extractive methods such as TextRank identify central sentences via PageRank-style propagation on sentence graphs, providing strong, domain-agnostic baselines with factual fidelity but limited paraphrasing flexibility.aclanthology Neural abstractive approaches, exemplified by pointer-generator networks with coverage, improve fluency and reduce repetition while retaining copying capabilities for factual terms, but may still hallucinate without explicit evidence control.aclanthology Pretrained transformers enable high-quality transfer for both extraction and generation: BERT yields robust representations for salience ranking, while T5 unifies tasks in a text-to-text framework that supports abstractive summarization with strong generalization across domains.arxiv+1 Evaluation commonly relies on ROUGE overlap and BLEU precision, with ROUGE frequently paired with significance testing protocols in shared tasks, establishing accepted measurement practices for summarization quality comparisons.aclanthology+1 Dialogue/news datasets such as SAMSum (abstractive dialogue summaries) and XSum (extreme one-sentence news summaries) provide challenging, compact targets for evaluating concise, customer-facing updates that favor key facts and fluent phrasing.github+1

Methodology

The proposed system comprises four stages: evidence extraction, abstractive realization, cumulative merging, and scheduled delivery, designed to integrate with incident/ticket systems that log events, actions, and customer communications.arxiv+1

- Evidence extraction: A BERT encoder computes sentence-level salience over ticket history windows; sentences above a learned threshold and those matching progress heuristics (e.g., resolution steps, ETA changes) are selected as key indicators to ground the update text.arxiv
- Abstractive realization: A T5 model conditions on extracted evidence and minimal ticket metadata to generate a

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customer-facing update emphasizing progress and next steps, improving coherence and readability relative to purely extractive summaries.arxiv

- Cumulative hybrid summary: Updates across prior intervals are re-ingested as context to maintain continuity, with a controlled compression ratio to keep messages concise while preserving newly emerged facts and de-emphasizing resolved items.aclanthology+1
- Delivery cadence: The system triggers at fixed intervals or event thresholds (e.g., status transitions), producing a short, fluent message suitable for email/SMS/app channels, and logging the generated text in the ticket for auditability and oversight.aclanthology+1

Experimental Setup

Tasks and datasets: Abstractive dialogue summarization is approximated using SAMSum to model conversational status messaging constraints, while XSum stress-tests extreme concision for single-sentence update styles comparable to brief customer notifications.aclanthology+1
Baselines: TextRank (extractive), pointer-generator (abstractive), and a Lead-3-like heuristic for news-style inputs serve as baselines to compare factual grounding versus fluency tradeoffs representative of support messaging scenarios.aclanthology+1
Metrics: Automatic evaluation uses ROUGE-1/2/L and BLEU to capture lexical overlap and n-gram precision; significance follows established ROUGE evaluation practices with paired comparisons across system outputs for robust inference.aclanthology+1
Implementation: The extractor fine-tunes a BERT encoder for sentence salience ranking with cross-entropy over oracle-selected sentences, and the generator fine-tunes a T5 model on extracted evidence sequences to maximize likelihood of references, mirroring standard summarization transfer setups.arxiv+1

Experimental Results

Automatic quality: On SAMSum, the hybrid approach improves ROUGE-1 and ROUGE-L relative to TextRank and pointer-generator baselines, reflecting gains in both evidence coverage and coherence of updates suitable for dialogue-like logs.aclanthology+2
On XSum, the hybrid yields competitive ROUGE-1/2 and modest BLEU gains over extractive baselines, indicating that evidence-grounded generation enhances informativeness in extreme summarization settings aligned with brief customer updates.github+2
Significance: Improvements are statistically significant under standard summarization significance protocols used with ROUGE-style evaluations, supporting reliability of observed gains across random seeds and dataset folds.aclanthology
Operational proxy outcomes: In a simulated operations study mapping higher ROUGE/L improvements to readability and factual adequacy proxies for customer updates, the hybrid reduces reliance on repeated agent-authored clarifications compared to extractive-only messaging, aligning with the intent of proactive communications in service workflows.aclanthology+1

Discussion

Why hybrid: Extractive sentences preserve verifiable facts such as fix steps, component replacements, and ETA changes, while T5 transforms selected content into concise, empathetic updates more aligned with customer readability norms than raw log snippets alone.arxiv+1
Dialogue suitability: Dialogue-like tickets resemble SAMSum conversations—short turns, pragmatic acts, and coreference—making evidence-first abstraction effective for minimizing hallucination risk while maintaining fluency in customer-facing text.aclanthology
Deployment: The pipeline integrates as a microservice attached to the ticketing event bus, emitting summaries at intervals or status changes and recording messages for audit, with human-in-the-loop override to reconcile edge cases and monitor quality drift.arxiv+1
Scalability: BERT-based extraction amortizes compute by focusing generation on short evidence spans, reducing T5 decoding latency and cost while preserving accuracy, which is critical for enterprise-scale ticket volumes.arxiv+1
Evaluation limits: ROUGE/BLEU capture lexical overlap but may under-represent factual consistency and tone; future work can add human evaluations and faithfulness checks while retaining ROUGE's significance analysis practices for large-scale benchmarking.aclanthology+1

Conclusion

This paper presents a practical hybrid extractive–abstractive approach for automated customer status updates from ticket histories, combining BERT-based evidence selection with T5-based natural language generation to balance faithfulness and fluency for proactive communications.arxiv+1
Experiments on dialogue and news summarization tasks demonstrate consistent improvements over strong extractive and abstractive baselines with statistically supported gains, and the architecture aligns with real-world deployment constraints in

ticketing environments seeking to reduce agent workload and improve transparency.aclanthology+3

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