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Natural Language Processing in UiPath Communications Mining in Healthcare: Applications and Impact

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Abstract
Natural language processing in healthcare helps extract insights from unstructured data and eliminates manual work overload in analyzing, summarizing, and interpreting unstructured data. NLP recognizes characters in a document and comprehends what they mean. It can accurately segment the details and format the data into the Electronic Health Record (EHR) systems. This feature lets hospitals achieve improved clinical documentation, better patient care, efficient analysis of medical documents, and automation of repetitive administrative tasks. By integrating NLP with Robotic Process Automation (RPA), healthcare organizations can automate manual operations and improve the efficiency of processes that entail extracting and analyzing data from documents. This research paper presents how RPA and NLP can be integrated using UiPath Communications Mining. This study also mentions how to create data sets and analyze the end-to-end process to analyze the data in UiPath Communications Mining.

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1. Introduction

NLP diagnoses conditions, develops treatment plans, and optimizes patient experience. [1] Due to NLP's wide variety of applications, many hospital providers are implementing NLP to extract and analyze data to make sense of massive unstructured data in EHR systems and offer comprehensive patient care. According to a recent report, global NLP in the healthcare and life sciences market is expected to reach $3.7 billion by 2025, at a Compound Annual Growth Rate of 20.5%. Natural Language Processing is designed to understand and interpret human speech. The first step would be to pre-process the data by cleaning the dataset. This involves breaking the text into semantic units or tokens – a process known as tokenization. Tokenizing the data helps to clean the dataset so that NLP can interpret the data. In the next step, NLP algorithms are applied to interpret text. Some of the techniques in NLP are OCR (Optical Character Recognition), Named Entity Recognition (NER), Sentiment Analysis, Text Classification, and Topic Modelling. OCR is the method by which a computer reads handwritten or digital text and converts it into a digital format. It's like scanning a document and converting it into a digital PDF document. Clinical notes, medical history data, patient intake forms, discharge summaries, medical tests, and more are frequently digitized in the healthcare sector using OCR. NER segments the named entities into categories. Sentiment Analysis combines NLP and text analysis to ascertain the undertone or connotation. Text classification is also called categorization, which analyzes and assigns tags to the data. Certain at-risk patients can be identified using the Text Classification method. To find semantic structures, or "topics," collections of texts are grouped together using common words or phrases. This process is known as topic modeling, combining statistical modeling and natural language processing.

While NLP is crucial and optimizes process inefficiencies, achieving end-to-end process automation with NLP alone is impossible. If there's an email from the provider, "I'm following up on claim #45678 — it was denied, and we need clarification on the CO-45 code.", NLP can extract keywords and identify entities.

But NLP alone cannot route the email to the concerned team, query the claim in the system, or send an email reply. The end-to-end communication process can be automated using Communications Mining. Also, communications mining is a no-code platform, rendering implementation and maintenance relatively faster. In short, NLP helps to read and interpret the data, but Communications Mining helps to act on the analysis. Using this feature, Patient engagement can be enhanced, back-office functions can be streamlined, claim management and payer communications can be streamlined, clinical documentation can be improved, and ultimately, patient satisfaction can be improved. This research paper mentions how certain functions and operations can be improved with UiPath Communications Mining and presents some of the platform's core features.

2. Enhancing Patient Engagement

Patient engagement is one of the main factors for patient satisfaction. There would be different queries from patients, through patient portals or emails, to vendors or providers. Handling the communications effectively without cluttering and resolving the queries on time is crucial for patient satisfaction and experience. If the patient feels left out or is not provided with the required information, the patient is more likely to avoid revisiting the provider. There could also be cases where some information may be needed on an urgent basis. Delays in responding to such requests are prone to cause anxiety on top of the already existing condition of the patient. Hence, improving how providers and payers interact with patients outside of face-to-face interaction is important. There can be several triggers for communication, such as a query posted by the patient in the patient portal or an email sent by a patient. Using communications mining, NLP will be used to identify patients' requests and to gauge their sentiment. When a patient posts a query in the patient portal or sends an email, the bot will be triggered, identify the tone of the intent, detect the urgency from the underlying tone, extract the data from relevant systems, and respond to the email. For example, if a patient asks, "Is my claim for procedure x covered?" via email, the communications mining model interprets this message, RPA bot queries the information by looking at the policy coverage in the relevant system, drafts the response with required information, and send the email reply to the patient. This way, patients receive faster resolution to their queries while staff are freed from handling repetitive requests. Communications mining also powers intelligent virtual assistants and self-service portals. Patients can interact with chatbots or emails that understand natural language questions. One case is analyzing patient emails and answering frequently asked questions using a knowledge base, unburdening front desk staff. UiPath's NLP can assess sentiment and intent, alongside understanding undertone. For example, a message expressing frustration over a persistent delay in reimbursement will be classified as "claim status inquiry" and will be classified as high priority based on undertone, ensuring critical issues are addressed with priority and improving responsiveness, efficiency, and empathy in patient care. Once, urgency is classified, based on the label and extracted data (patient id, claim number, and service date), bots carry out more tasks such as logging into systems and checking policy coverage, retrieving claim status, scheduling appointments, generating personalized email responses, and logging actions in patient engagement platforms. For example, when an email reads "can you confirm if my procedure from March 10 is covered under my plan?", communications mining extracts procedure date, question intent, while RPA bot logs into backend system, verifies eligibility, and send a response – all actions together within few seconds without human intervention. The result is a significant improvement in both speed and quality of engagement.

3. Streamlining Back-Office Workflows and Administrative Communication

In healthcare, a significant portion of operational inefficiencies are not from clinical complexity but from manual back-office processes such as daily administrative tasks, email triage, and unorganized communication across departments. This kind of process is plagued chiefly with process inefficiencies, unstructured message flows, and redundant data entry. RPA, combined with UiPath Communications, is an innovative solution that solves the challenges. Typical back-office teams handle humongous emails from providers or staff requesting patient information, system-generated alerts, or appeal letters, among other requests. The volume of requests leads to delayed cases and manual triage, a lack of standardization in responding to requests, a high error rate due to human burnout, and inefficient department coordination. Conventional approaches depend on simple rules-based systems, email filters, or human work queues. These, however, are fragile and cannot grow or change to accommodate complex language. UiPath Communications Mining transforms this landscape by deploying state-of-the-art NLP to understand and structure communication flows. Each incoming message (email, ticket, document) is classified using trained machine Learning models into categories such as eligibility check, documentation follow-up, denial reason, or provider contract update, among other categories. For example, the fields such as patient ID, claim number, payer ID, CPT codes, or service date will be extracted from the message. After assigning the classification and running intent on the message, confidence score, and urgency, highly confident messages will be processed by Bots. In contrast, medium confidence messages will be queued for human validation. Once Communications Mining categorizes the message, UiPath RPA bots will perform the next steps in an automated way. These steps include logging into applications, often legacy ones, to get or verify the information, retrieving the EOB (Explanation of Benefits), updating the EHR, and sending template responses. Although this type of back-office communication may seem less valuable than clinical workflows, improvising and making them efficient using Communications Mining drives hospital operational efficiency and performance.

4. Transforming Claims Management and Payer Communications

Claims management is usually a complex, human resources-intensive process that involves a lot of back-and-forth email communication or communication through digital portals. Manual, communication-intensive, and tedious process Communications Mining is invaluable in healthcare as it streamlines workflows for insurance payers. Insurance claims often generate back-and-forth communications: providers and patients enquire about the status of claims, payers send clarification requests or explanation of denial, and appeal letters may need to be submitted by vendors on behalf of providers or by providers themselves to submit a

case for payment. All this process is manual, fragmented, and time-consuming. UiPath communications mining offers to automate this entire process by responding to each message and acting on each case effectively from end to end. An example is a healthcare payer inundated with status requests for claims. Across digital channels and emails. Traditionally, staff had to manually sort each enquiry, look up the claim details, and collect the information- a process that is often slow, fragmented, and lacks a standard process. By implementing communications mining with RPA, the entire claim status workflow for the most common denial reasons can be automated. A noticeable improvement in customer experience and internal efficiency can be achieved. Also, turnaround times for answering claim status-related queries will be reduced, and staff will be freed from repetitive and manual processes that may not need human intelligence. Communications, Mining, and RPA Bots can tackle scenarios beyond claims management process, including interpretation of clinical documentation attached to claims, application of rules for policies, and initiation of multi-step workflows to resolve issues with minimal human intervention. For example, physician notes in free-text or operative notes are submitted to justify a claim in claims adjudication. AI-powered agents can understand the nuances of clinical documentation, extract key facts, and determine if they meet payment criteria. The benefits of using Communications Mining and RPA in claims management include a huge dip in pending requests and increased efficiency by reducing processing times.

5. About Communications Mining in UiPath

[2] GLUE score is a metric designed to assess the effectiveness of a Natural Language model. It's like a benchmark and is an average score across various NLP tasks, which measures the NLP model's ability to understand the language. NLP processing, a branch of Artificial Intelligence (AI) has seen massive advances in recent years. As can be seen in Fig 1: GLUE scores of NLP models , the NLP models' performance is either on par or above that of the average human, implying that the models' performance can be trusted with reliability. This enables businesses to understand every customer's wants, track and measure all service demand in real time, and automate every transactional request, freeing highly skilled employees from administrative work and improving the experience.

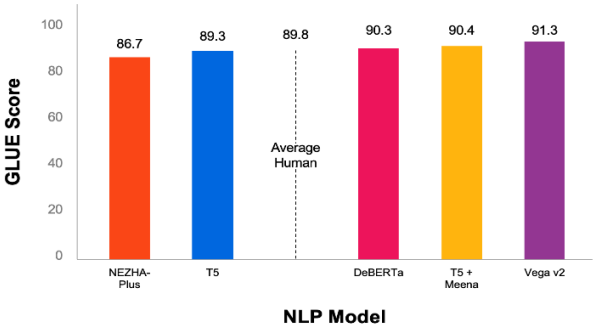

Fig 1: GLUE scores of NLP models

Pre-built connectors are available for data ingestion. There are multiple channels from which communications can flow, including shared inboxes, workflow tickets, and survey responses. The data ingestion into the platform can be done using pre-built connectors, API integrations, or historical data uploading via CSV or API. The data ingested from various systems is then sent for analysis and comprehension. After the data is uploaded, the platform starts the discovery process. Using unsupervised learning, data will be clustered into groups with similar themes and concepts. Next, data can be trained using a variety of training models. These training modes are designed to maximize the impact of training actions and minimize the time spent training. Meanwhile, the platform's zero-code interface means that a Model Trainer can be any business user working in the communication channel, and data scientists aren't required. With every training data point, the model improves performance by incorporating real-time feedback loops. The result is structured label and general field predictions, each with its own confidence scores.

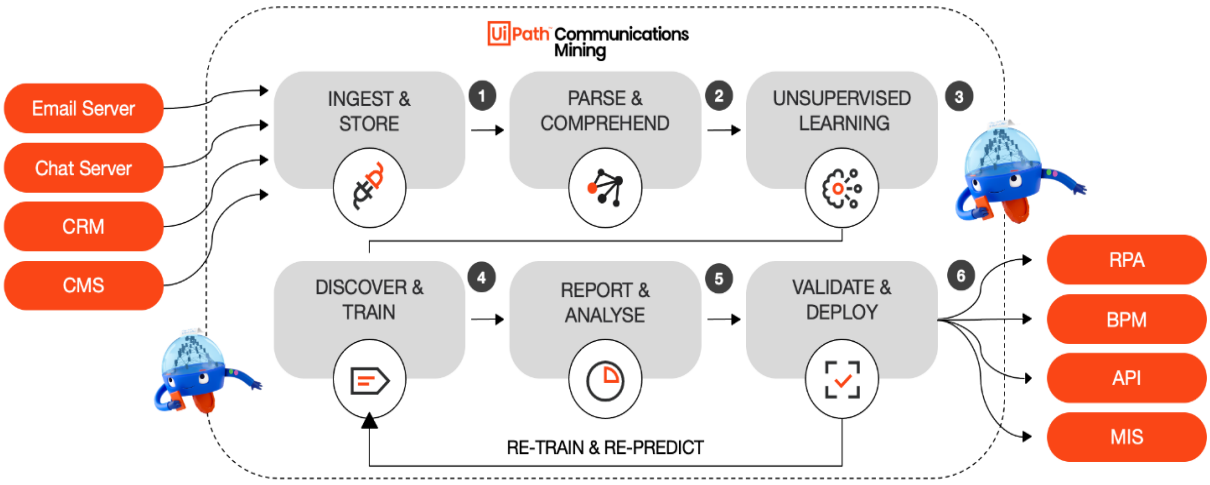

Fig 2: Overview of Communications Ming Platform

[3] The platform's data is stored hierarchically and consists of three components: data sources, data sets, and projects. Access to each of these can be controlled with restricted access by the admin. Data sources are collections of similar types of data. For example: emails from a shared mailbox, survey responses, or individual data sets with up to ten

different data sources. Data sets comprise 1 - 20 data sources (of similar type with similar intended purposes) and the 'model' you create when you train the platform to understand the data in those sources. Each dataset and data source belongs to a particular project, which is designed when they're created. To create a data source in the GUI, navigate to the sources page in the admin console, select the new source button, fill in the information: source project, source name, source title, source description, sensitive properties, language, and select create source. To upload a .csv file into a data source, click on the upload icon, which will be available in the top right corner. There is an option to enable sentiment analysis using a toggle button, letting us identify the tone or connotation of the messages. Identification of tone is useful to address angry or frustrated messages first, prioritizing urgent tickets. To enable sentiment, navigate to dataset settings, go to the project, and open the dataset you want to use, toggle ON the enable sentiment analysis button, and retrain the model.

[4] Labels, metadata, and general fields are essential to communications mining, and these three components work together to help the platform understand and automate unstructured communications like emails, chat messages, and tickets. Each plays a distinct role in how messages are processed, classified, and used for automation or analytics. Labels are used to understand the intent or meaning of the message, and during training, labels teach the model what kind of communication it encounters. Some examples of labels include claim denial appeal, appointment reschedule, billing error, and request medical records. These labels help UiPath Bot to classify and route the messages. Some of the types of actions include routing, automating responses, and triggering downstream workflows. General fields are entities and represent specific information within the message. Examples include claim number, patient name, service date, denial code, and diagnosis. Metadata refers to contextual data within the message. Those details include message source, time stamp, sender email, language, and confidence scores from the prediction. This data helps filter the message for analytics and drive operational insights. When communications mining analyzes a message, it simultaneously predicts a label, extracts fields, and captures metadata.

[5] The train feature in Communications mining is used to manually label messages and train underlying ML models to improve accuracy in understanding and classifying future communications. It's not purely unsupervised, primarily using supervised learning guided by human-labeled data. But it incorporates active learning by using the feedback loop, improving the training process. Communications Mining relies on user-defined taxonomies (intents + fields) and needs labeled examples to associate messages with business meaning. This is a crucial part of the supervised learning cycle, enabling AI to recognize more labels and confidently extract relevant information. The purpose of the training module is to enhance performance over time: The more representative messages are labeled, the better the model becomes at predicting. The train module also allows teaching new labels and fields, identifies and corrects misclassifications, and improves precision by active training. UiPath Communications Mining is a supervised learning framework designed for real-time, enterprise-grade communication classification, whereas many conventional NLP solutions employ unsupervised learning for language modeling or topic identification. It combines the accessibility of a no-code platform with the rigor of supervised natural language processing (NLP) by integrating human feedback through active learning, optimizing models with minimal labeled data, and producing structured outputs that power robotic process automation.

6. Impact on Patient Satisfaction and Outcomes

Implementing UiPath Communications Mining and AI in healthcare significantly enhances patient satisfaction and care efficiency. By automating the handling of unstructured communication, hospital providers can respond faster, reduce employee burnout, and ultimately improve patient experience. Patients often deal with time-sensitive concerns such as coverage checks or claim status enquiries. Using communications mining, bots can understand, classify, and take action on these queries in real time. Patients receive faster replies, leading to trust, less stress, and enhanced satisfaction. Through AI-powered automation, healthcare systems can offer around-the-clock support via chatbots, automated email replies, and systems that help users get information by accessing the options available on the User Interface. Patients do not need to spend long, often avoidable time, with the front office or through calls to get basic information or check on progress on reports whose results are yet to be released. This efficiency, better user experience, and interaction allow patients to get improved engagement, responsive, and quicker healthcare. Automation of some of the common administrative tasks, such as reminders, check-ins, and documentation follow-ups, can enable staff to shift their focus back to clinical priorities. This efficiency can also help doctors and nurses to focus more on complex patient needs, creating higher quality, one-on-one patient interactions, which patients notice and appreciate. Also, manual data entry and human-driven communication often introduce mistakes, from misrouted messages to incorrect claim updates. Automation reduces claim errors, billing miscommunications, appointment scheduling time, and time lapses in approvals and authorizations.

7. Conclusion

UiPath Communications Mining is proving to be a catalyst for digital transformation in healthcare, addressing long-standing pain points caused by unstructured communication. By combining NLP with AI, hospital providers can drive intelligence from every message and take swift action needed. This increases patient satisfaction as quicker responses and virtual assistance create favorable opinions regarding the hospital provider. UiPath Communications Mining transforms healthcare communication from a manual bottleneck into a streamlined, intelligent engine for responsiveness. By automating and optimizing how organizations handle unstructured messages: providers deliver faster, more accurate service, patients feel heard and empowered, and staff spend more time on actual care and less on administration. Ultimately, this leads to lower costs, faster processes, and better care experiences — all of which contribute to a more efficient, patient-centric healthcare system.

8. References

1. NLP in healthcare [Internet]. Hitachi Solutions. Available from: https://global.hitachi-solutions.com/blog/nlp-in-healthcare/ [cited 2025 Apr].

2. Communications Mining overview [Internet]. UiPath. Available from: https://docs.uipath.com/communications-mining/automation-cloud/latest/user-guide/communications-mining-overview [cited 2025 Apr].
3. Understanding the data structure and permissions [Internet]. UiPath. Available from: https://docs.uipath.com/communications-mining/automation-cloud/latest/user-guide/understanding-the-data-structure-and-permissions [cited 2025 Apr].
4. Understanding labels, entities, and metadata [Internet]. UiPath. Available from: https://docs.uipath.com/communications-mining/automation-cloud/latest/user-guide/understanding-labels-entities-and-metadata [cited 2025 Apr].
5. Train your dataset [Internet]. UiPath. Available from: https://docs.uipath.com/communications-mining/automation-cloud/latest/user-guide/train [cited 2025 Apr].