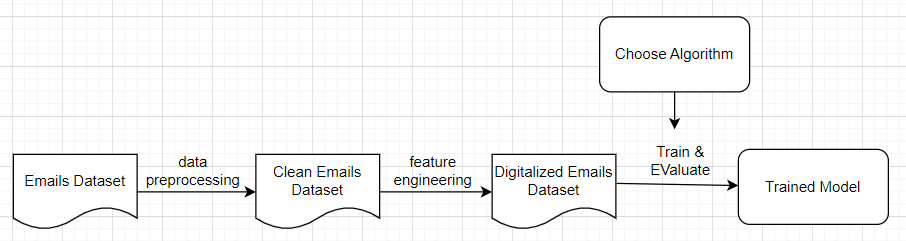
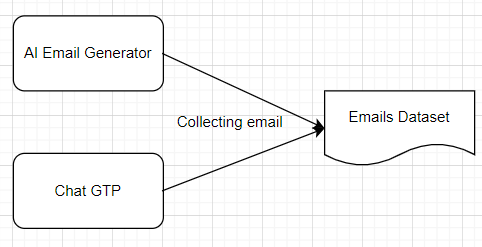
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**Email Classification for Helpdesk**

1. **Introduction**  
   Email plays a significant role in modern businesses, supporting quick and effective communication between customers and organizations. However, the increase in email volume poses challenges in effective communication and efficient management. The problem happens in all organizations manual email management and decision-making.  
     
   Our proposal introduces an Email Classification project focused on developing a machine learning model for email content classification. The main goal is to automate classifying email process, providing detailed insights into each email's nature to pose a decision-making whether it related to IT support, general inquiries, or specific IT issues.  
     
   Manual Email classification is not just a time-consuming task, it also incurs significant costs. Automating this process could save substantial time for helpdesk agents, allowing them to prioritize critical tasks. The long run efficiency promises bring benefits for organizational performance.  
     
   The Email Classification Project is an experimental initiative leveraging machine learning to autonomously categorize emails. Using email content as input, the model outputs the email type. This output, in turn, becomes a valuable input for decision systems, contributing to broader automation efforts within organizations.
2. **Motivation**  
   Creating a framework to automate email classification is tough because the nature of email content is varied and unstructured. Therefore, it cannot be processed as structured data.   
      
   Existing solutions are based on predefined rules to search through emails’ content to check some phrases of words and based on these words for clarifying the emails. These kinds of solutions are half AI solutions, and they are fragile solutions. Because emails’ content can be arbitrary and if there are any things changed in the email these programs need to be modified. This proposal aims to use machine learning to tackle practical email classification issues, contributing to business process automation.   
     
   A major challenge is the lack of suitable data, especially with sensitive business emails. The solution for it is to use Generative AI to create synthetic data for training and testing the model. This ensures the model learns from diverse scenarios, making it adaptable and robust in handling real-world email content.
3. **Methods**  
   
   1. **Preprocessing steps**: Lowercasing is the first step in NLP, it helps reduce the vocabulary size and consistency in the presentation of words. Filtering stop words, rare words and corpus-specific common words, these kinds of words don’t bring a significant meaning and some of them also contribute noise to the dataset. Filtering them helps improve the performance of the model.
   2. **Feature Engineering:** Text data is not ingestible into machine models, so the feature engineering technique is applied to convert text into numeric that can fix into the models. Tf-Idf (Term Frequency - Inverse Document Frequency) is a used to convert to vector of numeric. The target labels of email classification are also text so they must be encoded into numeric and encoding class technique is applied. After the readiness of the dataset, it is split into training and testing set. Training data is used to train the model and testing data to check its performance.
   3. **Choosing Algorithm:** The targets are multi kinds of email type. It is a multi-classifications task, MultinomialNB, MLPClassifier are two of many algorithms supporting classification tasks that are selected for this experiment and the better score output will be selected.
   4. **Train and Evaluate Model**: The performance of the model depends on many factors. Input data, Algorithms and Hyperparameters. At this phase, input data is ready so to select the right model, Algorithms and Hyperparameters are two factors need to be pairs selected. A technique that can be applied is Grid Search CV algorithm. It evaluates the best params with the right algorithm. To improve the performance of the output model Cross validation 10-folded is also applied while training the model. This technique ensures that all the data will be used for training and validation. Finally, metrics such as accuracy, precision, recall, F1-score, false positive rates and receiver operating characteristic (ROC) curves are used to measure the performance of the model.
4. **Data Collection**  
     
   Email collections for specific areas of business are not available and they are also impossible to collect because of sensitive information. To make this experiment work, Synthethic data solution is going to be applied. Email collection can be collected from Generative AI models are available on market such as ChatGTP or Elastic Email tool.
5. **Expected**  
   The output model can obtain the accuracy of 90%. That means 100 emails there might be 10 wrong emails the remains can be automatically processed. With this result can help not only improve the productivity of the business process, but also improve the productivity of all related people in an organization.