# AI Document Intelligence Introduction

Azure AI Document Intelligence (formerly known as Azure Form Recognizer) is a powerful AI service that enables you to extract information from various types of documents. This service uses machine learning models to analyze and extract key-value pairs, tables, and text from documents, turning unstructured data into structured information that can be used for various business processes.

Azure AI Document Intelligence is particularly useful in automating data entry, processing invoices, receipts, contracts, forms, and other documents where extracting data manually would be time-consuming and error-prone.

## Key Features of Azure AI Document Intelligence

1. **Prebuilt Models**: Azure AI Document Intelligence provides prebuilt models for common document types like invoices, receipts, identity documents, and business cards. These models are trained to recognize and extract relevant data fields with high accuracy.
2. **Custom Models**: For more specific or complex documents, you can create custom models by training them on your own labeled data. This allows you to tailor the extraction process to the unique structure and content of your documents.
3. **Form Recognition**: Extract key-value pairs, tables, and text from structured and semi-structured forms. The service can handle forms with varying layouts and structures, making it versatile for different document types.
4. **Table Extraction**: Automatically detect and extract tables from documents, preserving the structure and relationships between data cells. This is particularly useful for documents like financial statements and reports.
5. **Layout Understanding**: Analyze and extract text, tables, and structures from documents, regardless of the format or complexity. This feature helps in digitizing and organizing large volumes of unstructured data.
6. **Multi-Language Support**: Azure AI Document Intelligence supports multiple languages, allowing you to process documents from various regions and in different languages.
7. **Integration with Azure Services**: Easily integrate Azure AI Document Intelligence with other Azure services like Logic Apps, Power Automate, Azure Functions, and Azure Cognitive Search to build end-to-end document processing solutions.

### Common Use Cases

1. Invoice Processing: Automatically extract billing information, line items, and totals from invoices, reducing manual data entry and speeding up accounts payable processes.
2. Receipt Processing: Extract purchase details from receipts for expense reporting, financial analysis, and record-keeping.
3. Identity Document Extraction: Extract and verify data from identity documents like passports, driver's licenses, and national IDs, streamlining identity verification processes.
4. Contract Analysis: Extract key terms, dates, and conditions from contracts and agreements to automate contract management and compliance monitoring.
5. Form Automation: Automate the extraction of data from various types of forms, such as application forms, surveys, and feedback forms, to streamline data entry and analysis.

# Planning Azure AI Document Intelligence Resources

When planning to implement Azure AI Document Intelligence (formerly Azure Form Recognizer) in your organization, it's crucial to consider several factors to ensure the solution meets your business needs and scales effectively. Below is a step-by-step guide to help you plan the necessary resources for deploying Azure AI Document Intelligence.

### 1. Identify Use Cases and Requirements

Before provisioning any resources, you need to clearly define the use cases for Azure AI Document Intelligence in your organization.

- **Common Use Cases**:
    - Invoice and receipt processing.
    - Extracting data from contracts and agreements.
    - Automating data entry from forms.
    - Identity document extraction.
- **Requirements Gathering**:
    - Determine the types of documents you will be processing (e.g., invoices, forms, receipts).

    - Estimate the volume of documents you expect to process daily, weekly, or monthly.
    - Identify the key data points you need to extract from these documents (e.g., invoice numbers, totals, line items).
    - Consider the need for any custom models if your documents have unique structures.

## 2. Choose the Right Azure AI Document Intelligence Service Tier

Azure AI Document Intelligence offers different pricing tiers, each with its own capabilities and limits. Selecting the right tier depends on your processing needs.

- **Free Tier**:
    - Ideal for testing and small-scale deployments.
    - Limited to 500 pages per month.
- **Standard Tier**:
    - Suitable for production environments with higher processing volumes.
    - Charged based on the number of pages processed.
- **Considerations**:
    - **Scalability**: Ensure the tier you choose can handle your expected document volume.
    - **Cost**: Evaluate the cost implications based on your usage patterns.
    - **Features**: Check if the tier supports all the features you need, such as custom models or multi-language support.

## 3. Provisioning Azure Resources

To implement Azure AI Document Intelligence, you'll need to set up several Azure resources.

- **Azure AI Document Intelligence Resource**:
    - This is the core resource that powers the document processing capabilities.
    - **Steps to Create**:
        1. Go to the Azure Portal.
        2. Navigate to **Create a resource** > **AI + Machine Learning** > **Form Recognizer**.

3. Select the appropriate subscription and resource group.
4. Choose the pricing tier that matches your needs.
5. Create the resource.

- **Azure Storage Account**:
  - Used to store the documents you will process, as well as any output files or logs.
  - **Steps to Create**:
    1. Navigate to **Create a resource** > **Storage** > **Storage account**.
    2. Configure the account with appropriate redundancy and performance options based on your requirements.
- **Azure Cognitive Search** (Optional):
  - If you plan to integrate the extracted data into a searchable index, you may also provision an Azure Cognitive Search service.
  - **Steps to Create**:
    1. Navigate to **Create a resource** > **AI + Machine Learning** > **Cognitive Search**.
    2. Configure the search service with the necessary scaling options.

## 4. Consider Data Security and Compliance

Data security is crucial, especially when dealing with sensitive documents like invoices or identity documents.

- **Encryption**:
  - Ensure that all data at rest and in transit is encrypted.
  - Azure AI Document Intelligence automatically encrypts data, but you may need to manage encryption keys using Azure Key Vault.
- **Access Control**:
  - Use Azure Role-Based Access Control (RBAC) to restrict access to your Azure AI Document Intelligence and storage resources.
  - Implement least privilege access to ensure that only authorized users can view or process documents.
- **Compliance**:

- Check if your use case requires compliance with specific regulations (e.g., GDPR, HIPAA).
- Ensure that Azure resources are configured in a way that meets these compliance requirements.

## 5. Plan for Integration and Workflow Automation

After setting up the core resources, consider how Azure AI Document Intelligence will integrate with your existing systems and workflows.

- **Integration Points**:
  - **ERP/CRM Systems**: Integrate with your Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) systems to automatically update records based on extracted data.
  - **Power Automate/Logic Apps**: Use Azure Logic Apps or Microsoft Power Automate to automate document processing workflows. For example, you can automatically trigger document processing when a new file is uploaded to Azure Blob Storage.
- **Automation**:
  - Automate document ingestion and processing using Azure Functions or Logic Apps.
  - Set up notifications or alerts when processing is complete, or if errors occur.

## 6. Monitor and Optimize Performance

Once the solution is live, it's important to continuously monitor performance and optimize resource usage.

- **Azure Monitor**:
  - Use Azure Monitor to track the performance and usage of your Azure AI Document Intelligence resources.
  - Set up alerts for any anomalies or performance degradation.
- **Cost Management**:
  - Regularly review your usage and costs in Azure Cost Management.
  - Adjust resource configurations or usage patterns to optimize costs.
- **Scaling**:

- Monitor document processing volumes and scale your resources (e.g., storage, AI Document Intelligence tier) as needed.

# Choosing a Model Type in Azure AI Document Intelligence

When working with Azure AI Document Intelligence (formerly known as Azure Form Recognizer), selecting the right model type is crucial for accurately extracting information from your documents. Azure AI Document Intelligence offers several model types, each suited for different kinds of documents and use cases.

## 1. Prebuilt Models

**Prebuilt models** are ready-to-use models designed to handle common document types. These models are trained by Microsoft and require no additional training, making them ideal for quick deployment.

- **Supported Document Types**:
  - **Invoices**: Extract invoice numbers, dates, totals, line items, and vendor details.
  - **Receipts**: Extract purchase information, including merchant details, dates, totals, and line items.
  - **Business Cards**: Extract contact information such as name, company, email, phone number, and address.
  - **Identity Documents**: Extract information from passports, driver's licenses, and other identity documents, including name, date of birth, document number, and expiration date.
- **Use Case**:
  - If your documents fall into one of these categories and follow a standard format, a prebuilt model is the easiest and fastest way to get started.

## 2. Custom Models

**Custom models** allow you to train the Azure AI Document Intelligence service on your own documents. This is useful when dealing with documents that have unique structures or layouts not covered by prebuilt models.

- **Training Requirements**:
    - **Labeled Data**: You need to provide labeled examples of your documents. This involves marking the key-value pairs, tables, and other elements you want to extract.
    - **Document Variability**: If your documents have varying layouts, it’s important to provide examples of each layout to improve the model's accuracy.
- **Use Case**:
    - Use custom models when working with industry-specific forms, proprietary documents, or any documents that do not conform to standard formats.
    - Example: A company processing claims forms that vary significantly from one client to another.

## 3. Layout Model

The **Layout model** is a more general-purpose model that extracts raw text, tables, and selection marks (like checkboxes) from documents. It doesn't require labeled data and can be used with a wide range of document types.

- **Capabilities**:
    - **Text Extraction**: Extracts all text from a document, including headers, footers, and body text.
    - **Table Extraction**: Automatically detects and extracts tables, preserving their structure.
    - **Selection Marks**: Detects and identifies selection marks (e.g., checked or unchecked boxes).
- **Use Case**:
    - Ideal for documents where you need to extract all text or analyze document layout, but don't require specific fields to be extracted.
    - Example: Digitizing printed forms or extracting content from structured reports.

## 4. Document Model (formerly Form Recognizer 3.0)

The **Document model** is a versatile, general-purpose model designed for extracting information from a wide range of documents. It builds on the capabilities of the Layout model but includes features for extracting structured information without needing to train a custom model.

- **Capabilities**:
    - **Key-Value Pair Extraction**: Automatically identifies and extracts key-value pairs from documents.
    - **Table Extraction**: Extracts tables and preserves their structure, similar to the Layout model.
    - **Text Extraction**: Extracts all text from a document, including any structured content like tables or forms.
- **Use Case**:
    - Use the Document model when you need a flexible, general-purpose extraction solution that doesn't require extensive customization.
    - Example: Processing a variety of document types, such as contracts, invoices, and reports, without the need for different models.

## Choosing the Right Model Type

When selecting a model type, consider the following factors:

- **Document Type**: Is your document type covered by a prebuilt model, or does it require a custom model due to unique layouts?
- **Customization Needs**: Do you need a model that can be tailored to specific fields in your documents?
- **Processing Scale**: Will you be processing a large volume of diverse documents, making a general-purpose model more suitable?
- **Development Resources**: Do you have the resources to label data and train custom models, or do you prefer using prebuilt or general-purpose models?

# Using Prebuilt Document Intelligence Models in Azure AI Document Intelligence

Azure AI Document Intelligence provides prebuilt models that are designed to extract information from common document types without the need for custom training. These models are ready-to-use, making them ideal for quick deployment in scenarios where you need to process standardized documents like invoices, receipts, business cards, and identity documents.

## 1. Overview of Prebuilt Models

The prebuilt models in Azure AI Document Intelligence are specifically designed to handle certain types of documents. These models have been trained on a wide variety of data to accurately extract key information.

- **Invoice Model**: Extracts details such as invoice number, date, total amount, line items, and vendor information.
- **Receipt Model**: Extracts merchant details, transaction dates, totals, and individual line items from receipts.
- **Business Card Model**: Extracts contact information, including names, companies, job titles, email addresses, and phone numbers.
- **Identity Document Model**: Extracts information from passports, driver's licenses, and other identity documents, including personal details and document numbers.

## 2. Steps to Use Prebuilt Document Intelligence Models

### Step 1: Provision the Azure AI Document Intelligence Resource

Before you can use the prebuilt models, you need to provision an Azure AI Document Intelligence resource in the Azure portal.

- **Create the Resource**:
    1. Sign in to the Azure Portal.
    2. Navigate to **Create a resource** > **AI + Machine Learning** > **Form Recognizer**.
    3. Select the appropriate subscription and resource group.
    4. Choose a pricing tier based on your expected usage.
    5. Create the resource.

### Step 2: Prepare Your Document

Ensure your document is in one of the supported formats (PDF, JPEG, PNG, TIFF) and is accessible either locally or via a URL.

- **Example Document Types**:
    - A PDF invoice containing line items and vendor details.
    - A JPEG image of a receipt from a retail store.

**Step 3: Call the Prebuilt Model API**

You can use Azure AI Document Intelligence's REST API or SDKs to process documents using the prebuilt models.

- **Using the REST API**:
    - Construct an API request to the specific prebuilt model's endpoint.
    - Provide the document (either as a URL or by uploading the file).

**Example API Call (Python)**:

```
import requests

# API endpoint

endpoint = "https://<your-resource-name>.cognitiveservices.azure.com/"

apim_key = "<your-key>"

model_id = "prebuilt-invoice"  # Use 'prebuilt-receipt', 'prebuilt-businessCard', etc. as needed

url = f"{endpoint}/formrecognizer/documentModels/{model_id}:analyze"


headers = {

   'Content-Type': 'application/json',

   'Ocp-Apim-Subscription-Key': apim_key,

}


data = {

   "urlSource": "<document-url>"  # or use "data" if sending a file

}
```

```
response = requests.post(url, json=data, headers=headers)

result = response.json()

print(result)  # View extracted information
```

**Step 4: Extract and Use the Data**

Once the API processes the document, it will return the extracted data in a structured format, typically as JSON. You can parse this data to retrieve the specific information you need.

- **Extracted Data Example**

**JSON:**


```
{
  "status": "succeeded",
  "analyzeResult": {
    "documentResults": [
      {
        "fields": {
          "InvoiceId": {
            "valueType": "string",
            "valueString": "INV-001",
            "confidence": 0.99
          },
          "InvoiceDate": {
            "valueType": "date",
            "valueDate": "2024-01-15",
            "confidence": 0.95
          },
          "Total": {
            "valueType": "number",
            "valueNumber": 1234.56,
            "confidence": 0.98
```

```
            },
            "VendorName": {
              "valueType": "string",
              "valueString": "ACME Corp",
              "confidence": 0.97
            }
            // Additional fields...
          }
        }
      ]
    }
}
```


**Step 5: Integrate with Your Applications**

The extracted data can be integrated into your business processes. For example:

- **Automate Invoice Processing**: Automatically input extracted invoice data into your accounting system.
- **Expense Management**: Extract and categorize receipt details for expense reports.
- **Contact Management**: Add extracted business card information directly to your CRM.

## 3. Benefits of Using Prebuilt Models

- **Speed**: Prebuilt models allow you to start processing documents immediately without needing to train custom models.
- **Accuracy**: These models are trained on large datasets and provide high accuracy for the supported document types.
- **Ease of Use**: The prebuilt models are accessible via simple API calls, making them easy to integrate into your applications.

# Training Custom Models in Azure AI Document Intelligence

Training custom models in Azure AI Document Intelligence allows you to extract specific information from documents that may have unique or non-standard formats. Custom models are particularly useful when dealing with documents that don't fit into the predefined categories handled by prebuilt models.

## 1. Overview of Custom Models

Custom models in Azure AI Document Intelligence can be trained to recognize and extract fields and data points that are specific to your documents. This is done by providing labeled examples of your documents, which the service uses to learn how to identify the required information.

## 2. Steps to Train a Custom Model

### Step 1: Provision the Azure AI Document Intelligence Resource

Before you can train a custom model, you need to provision an Azure AI Document Intelligence resource.

- **Provision the Resource**:
    1. Sign in to the Azure Portal.
    2. Navigate to **Create a resource** > **AI + Machine Learning** > **Form Recognizer**.
    3. Select the appropriate subscription and resource group.
    4. Choose a pricing tier based on your expected usage.
    5. Create the resource.

### Step 2: Collect and Label Training Data

To train a custom model, you need to collect a set of documents that represent the types of forms or documents you want to process. These documents need to be labeled to show the model what information to extract.

- **Document Collection**:
    - Gather a representative set of documents (PDFs, JPEGs, PNGs, or TIFFs).
    - Ensure your documents include all the variations you expect in production.

- **Labeling the Documents**:
    - Use the **Form Recognizer Labeling Tool** provided by Microsoft to label your documents.
    - Label each field you want to extract, such as invoice numbers, dates, totals, names, etc.

**Using the Form Recognizer Labeling Tool**:

1. Download and install the Form Recognizer Labeling Tool.
2. Upload your sample documents.
3. Mark the regions in your documents that correspond to the fields you want to extract.
4. Save the labeled data, which will be used to train your custom model.

**Step 3: Train the Custom Model**

Once you have labeled your documents, you can start training your custom model using the Azure AI Document Intelligence service.

- **Upload Labeled Data**:
    - Store your labeled documents and their labels in an Azure Blob Storage container.
- **Initiate the Training**:
    - Use the Azure portal, SDK, or REST API to start training the custom model.

**Example API Call to Train a Custom Model (Python)**:

```
import requests
# API endpoint
endpoint = "https://<your-resource-name>.cognitiveservices.azure.com/"
apim_key = "<your-key>"
url = f"{endpoint}/formrecognizer/documentModels:build"

headers = {
    'Content-Type': 'application/json',
    'Ocp-Apim-Subscription-Key': apim_key,
```

```
}


data = {
   "modelId": "custom-invoice-model",
   "description": "Model to extract fields from custom invoices",
   "buildMode": "template",  # or "neural" depending on your needs
   "trainingData": {
      "source": "https://<your-storage-account>.blob.core.windows.net/<your-container-name>/",
      "filter": "*.pdf"
   }
}


response = requests.post(url, json=data, headers=headers)
result = response.json()
print(result)  # Output the training result
```

**Training Modes**:

- **Template Mode**: Best for structured documents where the layout is consistent.
- **Neural Mode**: More flexible, better for documents with varying layouts.

**Step 4: Test and Validate the Custom Model**

After training, it’s important to test your custom model to ensure it correctly extracts the desired fields.

- **Test the Model**:
    - Use new, unseen documents to test the model’s performance.
    - Check that the model extracts all required fields accurately.
- **Validate Accuracy**:
    - Compare the model's output against the expected results.

- Adjust the model by retraining if necessary, using more diverse or better-labeled data.

**Step 5: Deploy and Use the Custom Model**

Once your model is trained and validated, it can be deployed for production use.

- **Deploying the Model**:
  - The model is hosted within the Azure AI Document Intelligence service and can be accessed via API.
  - Use the model ID provided after training to call the model.

**Example API Call to Use the Custom Model (Python)**:

```
import requests
# API endpoint
endpoint = "https://<your-resource-name>.cognitiveservices.azure.com/"
apim_key = "<your-key>"
model_id = "custom-invoice-model"  # Your custom model ID
url = f"{endpoint}/formrecognizer/documentModels/{model_id}:analyze"

headers = {
    'Content-Type': 'application/json',
    'Ocp-Apim-Subscription-Key': apim_key,
}

data = {
    "urlSource": "<document-url>"  # or use "data" if sending a file
}

response = requests.post(url, json=data, headers=headers)
result = response.json()
print(result)  # View extracted information
```

**Integrate with Applications**:

- The output can be integrated into your existing systems, such as databases, ERP systems, or automation workflows.

## 3. Benefits of Training Custom Models

- **Customization**: Tailored to your specific document types, extracting exactly the fields you need.
- **Flexibility**: Suitable for documents that have unique layouts or formats not covered by prebuilt models.
- **Scalability**: Once trained, custom models can process large volumes of documents quickly and consistently.

# Azure Document Intelligence Studio: Overview and Usage

Azure Document Intelligence Studio is a user-friendly, web-based interface provided by Microsoft for interacting with the Azure AI Document Intelligence service. It allows users to easily analyze documents, train custom models, and manage document processing tasks without needing to write code. This tool is especially useful for users who want to explore the capabilities of Azure AI Document Intelligence or quickly prototype solutions.

## 1. Overview of Azure Document Intelligence Studio

Azure Document Intelligence Studio simplifies the process of extracting information from documents and training custom models by providing a graphical interface. It supports various tasks, including:

- **Document Analysis**: Upload documents and extract key information using prebuilt models.
- **Custom Model Training**: Label documents and train custom models for specific extraction needs.
- **Document Processing Management**: Manage and review processed documents, test models, and refine data extraction.

## 2. Key Features of Document Intelligence Studio

### Document Analysis

- **Prebuilt Model Use**: You can upload a document and quickly analyze it using prebuilt models for invoices, receipts, business cards, and more.
- **Interactive Results**: The Studio provides an interactive view of the document with extracted data highlighted. You can see exactly where the model found the information and how confident it is in its accuracy.

### Custom Model Training

- **Labeling Tool**: Azure Document Intelligence Studio includes a built-in labeling tool. You can manually annotate your documents to define the fields you want the model to learn to extract.
- **Model Training**: After labeling, you can initiate the training process directly within the Studio. The tool guides you through the steps, making it easy to train models even without deep technical knowledge.

**Testing and Validation**

- **Testing Models**: Once your custom model is trained, you can test it on new documents directly within the Studio. This allows you to evaluate the model's performance and make adjustments as needed.
- **Validation Feedback**: The Studio provides feedback on model accuracy and allows you to refine your labels or add more training data if necessary.

**Integration with Azure Services**

- **Seamless Integration**: Document Intelligence Studio is integrated with other Azure services, making it easy to deploy models and manage resources. You can link your models to Azure Blob Storage, connect to databases, or use the output in Azure Logic Apps for automation.
- **API Access**: Once you are satisfied with a model, you can access it via the Azure AI Document Intelligence API, integrating it into your broader business processes.

## 3. How to Use Azure Document Intelligence Studio

**Step 1: Access the Studio**

- **Navigate to the Studio**: Go to the Azure portal and search for "Azure Document Intelligence Studio" or directly visit the Azure AI Document Intelligence section.
- **Sign in**: Use your Azure credentials to sign in to the Studio.

**Step 2: Upload Documents**

- **Upload**: Start by uploading the documents you want to analyze or use for training. The Studio supports various file formats, including PDF, JPEG, PNG, and TIFF.
- **Document Types**: Choose whether to use prebuilt models or custom models depending on your document type and needs.

**Step 3: Analyze with Prebuilt Models**

- **Select a Prebuilt Model**: Choose the prebuilt model that matches your document type (e.g., invoice, receipt, business card).
- **View Results**: The Studio will display the extracted information, highlighting the relevant parts of the document. You can review and download the results.

**Step 4: Train Custom Models**

- **Label Documents**: Use the Studio’s labeling tool to mark up the fields you want to extract. This might include text, tables, or specific data points.
- **Train the Model**: Once you’ve labeled enough examples, initiate the training process. The Studio will guide you through this, showing progress and providing feedback.

- **Test and Refine**: After training, test the model on new documents to ensure it's extracting the correct information. If needed, you can go back and refine your labels or add more training data.

**Step 5: Deploy and Use Models**

- **Deploy**: Once satisfied with the model, deploy it for use in your applications. You can do this directly from the Studio.
- **Integrate via API**: Access your model via the Azure AI Document Intelligence API, allowing you to automate document processing within your existing workflows.

## 4. Benefits of Using Document Intelligence Studio

- **No-Code Environment**: Ideal for users who prefer a visual interface over coding. It reduces the technical barrier to using advanced AI services.
- **Quick Prototyping**: Allows you to rapidly prototype document processing solutions without setting up complex infrastructure.
- **Interactive Learning**: Provides immediate feedback and results, helping users understand the capabilities and limitations of AI document processing.
- **Scalability**: Once a model is trained and validated, it can be easily scaled and integrated into larger systems using Azure services.

## For reference purpose use below link:

https://learn.microsoft.com/en-us/azure/ai-services/document-intelligence/overview?view=doc-intel-4.0.0