KEYWORDS	SOLUTION
Microsoft 6 guiding principles for responsible AI	Transparency, Accountability, Privacy and security, Fairness, Inclusiveness, Reliability and safety
Designing an AI system that empowers everyone, including people who have hearing, visual, and other impairments. System must not discriminate based on gender, race	Inclusiveness
Ensure that AI systems operate as they were originally designed, respond to unanticipated conditions, and resist harmful manipulation. Ensure consistent operation of systems like self-driving cars during unexcepted conditions Include resistance to harmful manipulation	Reliability and safety
Ensure reliability and safety	Implement a process of AI model validation as part of the software review process
AI should within framework of governance & organizational requirements that reflects defined legal & ethical standards. Implementing processes to ensure that decisions made in AI systems can be overridden by humans. AI system should not be final decision maker, an enterprise, or a person should be doing that.	Accountability
Provide consumers with information and controls over its data collection, use and storage of their data. Personal data must be visible only to approve	Privacy & Security
Ensure Privacy & Security	Establish a risk governance committee that includes members of the risk management team, and a privacy officer
AI System should NOT reflect biases from the data that are used to train the systems. Should provide same results for people living in rural & areas	Fairness

Explanation Provide AI's possibility and limitations Provide documentation to help developers debug code. Design and AI system to assess whether loans should be approved, the factors used to make the decision should explainable. Automated decision-making processes must be provided so that approved users can identify why a decision was made. Providing an explanation of the outcome of a credit loan explanation	Transparency
Ensure that the model meets the Microsoft transparency principle for responsible AI.	Enable Explain best model.
5 Key elements of Microsoft AI	ML, Computer Vision, Natural Language Processing, Conversational AI Anomaly Detection
Identifying transactions that are potentially fraudulent. Learning patterns that indicate that a network intrusion has occurred. Identifying suspicious sign-in by looking for deviation from usual patterns Finding abnormal clusters of patients Checking values entered into a system.	Anomaly detection
An automated chat to answer questions via use of knowledge base	Conversational AI
An automated chatbot to answer questions about refund and exchanges	Knowledge mining
Analyze world visually through live cameras, images and videos	Computer vision
Classify images based on their content	Image classification
Classify documents into predefined topics	Text classification

Determining whether a review is positive or negative Sentiment analysis, topic detection, language detection, key phrase extraction, and document categorization. Predict the sentiment of social media post Analyze text documents	Test Analytics service
Azure AI language service	Named entity recognition Language detection, Entity linking, Personal identifying information (PII) detection, Sentiment analysis and opinion mining, Summarization Key phrase extraction
Detect Text language Confidence score values range between 0 & 1 NaN, or Not a number = Unknow confidence score) = lowest confidence score 1 = highest confidence score	Language detection feature(part of Azure AI language service)
Extract key phrases/main concepts from text to identify the main concepts	Key phrase extraction(part of Azure AI language service)
Identify and categorize entities in unstructured text, such as people, places, dates, organizations and entities. Includes the entity inking functionally that returns links to external websites to disambiguate terms(entities) identified in a text.	Named Entity recognition(NER)(part of Azure AI language service)
Analyze text -> Determine user's intent -> return sentiment score (b/w 0 to 1) and labels for each sentence. Determining whether a review is positive or negative 0 = negative sentiment (not sad or bad or unhappy) 0.5 = neutral sentiment 1 = positive sentiment	Sentiment analysis(part of Azure AI language service)

Create knowledge base from document with frequent asked questions and typical answers	Previously Q & A maker service(part of Azure AI language service)
Host your own knowledge base Supports data from URL, webpage, pdf, doc, excel, txt/tsv format, manually entered data Can use chit-chat feature to add Q&A to knowledge base Doesn't support data from Azure SQL DB or XML format Can't directly use and image or an audio file to import a knowledge base	Q&A feature(part of Azure AI language service)
Converse with customers Can access knowledge based but can't create Can integrated with teams, slack, azure cognitive service	Azure Bot service (Part of Azure AI language service)
Business benefit of webchat bot to provide automated answers	Reduce workload for the customer service agents
Understand voice or text commands	Language Understand intelligent service (LUIS)
Key elements for language model training	Entities, intents and utterances
User's input that your model need to interpret	Utterances
Word or phases that is focus of utterance Word 'Light' in utterance "Turn the lights on"	Entities
Action or task that user want to execute "Turn ON"	Intents
Convert text or speech from one language to another	Translation in NLP on Azure
Speech synthesis Convert text to speech	Text2Speech(Part of Azure AI Speech service)
Translate speech in one language to text in another Transcribe audio from video files into text or for live presentations (closed captions/subtitles)	Speech2Text(Part of Azure AI Speech service)
Universal language model used by the speech to text API is optimized for	Conversational and dictation scenarios Acoustic, language and pronunciation scenarios require developing your own model.

Create & customize language models for specific industry terminology Supports text to text translation in more than 60 languages. Translate text only Can't translate speech	Azure AI translator service
Computer vision category Azure Services	Computer Vision, Custom Vision, Face Service, Form Recognizer
Create your own computer vision model, object detection model Image recognition service that lets you build deploy, and improve your own image identifier models. Need to provide your own data to train the model Process images from retail stores and identify the products of competitors using custom model.	Custom Vision
Classification types to choose when building classifier using Custom vision	Multilabel (Multiple tags per image) Multiclass(Single tag per image)
Mandatory field to choose when building classifier using custom vision	Specify domain
Supports the celebrities and landmarks specialized domain models. Does not support specialized domain models for animals, cars or plants Each phrase returned by an image description task include confidence score	Azure AI Vision service
Identify objects and their boundaries within image Returning a bounding box/coordinates with class name and probability score in an image Evaluate traffic monitoring images to quickly classify specific vehicle types, such as cars, bus, or cyclists.	Object Detection (part of Azure AI vision service)
Extract printed and handwritten text from images Digitalizing medical records	OCR(part of Azure AI vision service)
Analyze video stream from camera devices in real time	Spatial analysis (part of Azure AI vision service)

Classify pixels that belong to particular object and highlight them Identify flooded area	Semantic Segmentation
Determining whether a phot contains a person, but cant find similar faces Categorize images Detect objects Read and extract text from images Identify handwritten letters identifies landmarks predict next month's toy sales	Computer vision
Associating an image with metadata that summarizes the attributes of the image	Tagging
Extract information from images, to label it with tags or captions & create descriptive image summary	Image analysis
Detect face or items on face in images (detect operation) Find similar faces, may include other face(Find similar faces) One to one face match, two faces belong to same person or not, find specific person face (verification) Group faces based on similarity (group faces) Can return face attributes such as accessories(glasses, mask, headwear etc.) head Pose and occlusion Display content based on age group of audience in front of it	Face Service
Extract text, key/value pairs, and table data automatically from scanned documents Ability to extract subtotals and totals from a receipt	Form Recognizer
Form recognizer supported automated document processing models	Custom Model Pre-build receipt model (Default)
Recognize key elements from invoice, receipt Cant recognize image or translate languages	Azure AI Document Intelligence

Generate image based on user's initial prompt allowing iterative improvements based on users' preferences Has real-time feedback mechanism Reliance on textual inputs, sometimes lead to misinterpretation	Azure OpenAI service
Content recommendation system	Generate or predict text based on context of existing content
Provide plugins to end users with the ability to get help with common tasks from a generative AU model	Copilots
Compute target environments in azure ML for real-time inference	Azure Kubernetes Service
Main authoring tools on Azure ML studio home screen	Designer, Notebooks, Automated ML
Process of automating the time consuming, iterative tasks of machine learning model development. Implements machine learning solutions without the need for programming experience Create no of pipelines in parallel during model training Works by running multiple training iterations that are scored and ranked by the metrics you specify. Can train classification , regression, time-series, forecasting supervised ML models Doesn't automatically infer training data. Doesn't automatically index what label needs to be predicted. Can't visually connect datasets and modules on an interactive canvas Can't include custom python scripts in a training pipeline	Automated machine learning, Automated ML or AutoML service
Steps to stat training a machine learning model in machine learning designer	Create training pipeline -> Adding dataset -> Adding training modules -> Deploying model -> Create inference pipeline
General Modules under Azure ML designer	

Provides a drag-and drop visual canvas to build, test and deploy ml models Drag-drop and connecting modules, components and datasets on a visual canvas. Enables you to save your progress as a pipeline draft Cant drag and drop a pipeline into designer canvas Don't enables you to include custom JS functions	Azure ML Designer
Consume inference pipeline from azure ML designer	Need REST endpoint and primary auth key for your service
Deploy inference pipeline from Azure ML designer	Deploy as a real-time endpoint, that must be deployed to an azure Kubernetes service cluster
Computer resources in azure ml studio	Compute instances Computer clusters. Kubernetes clusters Attached computers
Computer instances	To run the pipeline
Compute clusters used for	Batch inference
Supervised ML	Regression Model Classification Model Time-series forecasting
prediction of a numeric target, not class(category) predict the sea level in meters for the next 10 years. Predict the number of gift cards that will be sold next month predicting how many hours of overtime a delivery person will work based on the number of order received predict how many minutes late a flight will arrive based on the amount of snowfall at an airport used to predict the sale price of auctioned items predicting how many vehicles will travel across a bridge on a given day predict next month's toy sales.	Regression Model

Answers multiple-choice questions predict a predefined class or category to which an input value belongs a banking system that predicts whether a loan will be repaid predict whether a student will complete a university course early detection of the different brain hemorrhage types in the images before the images are reviewed by a person predicting whether a person will develop mild, moderate, or severe allergy symptoms based on pollen count based on deep learning techniques	Classification model
Unsupervised ML Similar/similarities clusters unlabeled data into groups based on some common properties group instances of data into clusters that contain similar characteristics Organizing documents into groups based on similarities of the text contained in the documents grouping similar patients based on symptoms and diagnostics test results segment customers into different groups to support a marketing department use to identify groups of people who have similar purchasing habits identify computer model that always have failure	Clustering model
ML project Lifecycle	define the task -> collect the data-> train-> deploy

statistical analysis	Transformation visualization modeling Removing stop words is the first step in the statistical analysis of terms used in a text in the context of NLP. Counting the occurrences of each word takes place after stop words are removed. Creating a vectorized model is not part of statistical analysis. It is used to capture the sematic relationship between words. Encoding words as numeric features is not part of statistical analysis. It is frequently used in sentiment analysis.
set of input examples that will be used to train a model	Training dataset
Verify that all the training data was used to train the model	Validation dataset
Column you want to predict model output value or class	label
process of tagging training data with known values	labelling
relevant data values that influence the prediction of a mode inputs you give the model to predict the label	features
data preparation/transformation steps	Feature selection finding & removing data outlines imputer/clean missing values (remove missing value rows) normalize numeric features
narrow down the features that are important for the label prediction picking temperature and pressure to train a weather model	Feature selection finding & removing data outlines imputer/clean missing values (remove missing value rows) normalize numeric features
method of creating new features based on existing ones from raw data splitting a date into month, day and year fields	feature engineering
bring numeric features to common scale	normalization
hyperparameters	Defines higher level features of models provided as inputs cant be directly learned from data using model training processes

Split data for training and evaluation	Randomly split the data into rows for training and rows for evaluation use the split rows option if you want to divide the data into two parts. You can specify the percentage of data to put in each split, but by default, the data is divided 50-50
confusion matrix/error matrix	tabulated view of predicted and actual values for each class
how many times the model predicted true, but the actual label was true	TP
how many times the model predicted false, but the actual label was false	TN
how many times the model predicted false, but the actual label was true	FN
how many times the model predicted false, but the actual label was false	FP
size of confusion matrix	no of possible classes
Examine the values of confusion matrix use different dataset that training dataset to evaluate	Model evaluation
metrics that you can use to evaluate a regression model	R-squared (R2) / co-efficient of determination, RMS-loss/ root mean squared error(RMSE)/ root mean squared deviation(RMSD) mean absolute error(MAE) relative absolute error(RAE) relative square error(RSE)
produces score that measures how close the predictions are to the actual outcomes, thus a lower score is better	Mean absolute error(MAE)
Summarizes the error in the model By squaring the difference , the metric disregard the difference between over-prediction and under-prediction	Root mean squared error(RMSE)
relative absolute difference between expected and actual values Relative because the mean difference is divided by the arithmetic mean	Relative absolute error(RAE)
Normalizes the total squared error of the predicted values by dividing by the total squared error of the actual values	Relative squared error(RSE)

Represents the predictive power of the model as a value between 0 and 1 Zero means the model is random (explains nothing); 1 means there is a perfect fit. Represents model performance. However, caution should be used in interpreting R2 values, as low values can be entirely norm and Hight values can be suspect.	Coefficient of determination
Shows the relationship between a predicted value and its correlating true value for a regression problem closer to the y = x line the predicted values are the better the accuracy of a predictive model.	Predicted vs true chart
evaluate a classification model	F1 Score / Balanced F0score/ F-measure, Accuracy Precision Recall(Sensitivity)/True positive rate, Receiver operator characteristic (ROC). Area under the curve(AUC)
Goodness of a classification model as the proportion of true results to total cases. Not always the primary metric used to measure a models' performance Calculated probability of a correct image classification.	Accuracy
proportion of true results over all positive results. Precision = TP/(TP+FP)	Precision
Fraction of the total amount of relevant instance that were actually retrieved. Recall = TP/(TP+FN)	Recall(Sensitivity)/True positive rate
Weighted average of precision and recall between 0 and 1, where the ideal F1 Score value is 1. 2TP/(2TP + FP + FN)	F1 Score

Measures the area under the curve plotted with TP on the Y axis and FP on the x axis measures the quality of the model's prediction irrespective of what classification threshold is chosen ideal value = 1 for binary classification model AUC=0.5 means random predictions. Below 0.5 means model performance worse than random	AUC
Clustering model evolution metrics	Combined evolution number of points Avg distance to cluster center Avg distance to other center.
Custom vision evaluation metrics	Precision Recall Avg precision (AP)
Combined metric of both precision and recall	Avg precision (AP)
Capture's semantic relationships between words by assigning them to locations in n-dimension space	Vectorization
Normalized words before counting them	Lemmatization, also known as stemming
Counts how often a word appears in a text	Frequency analysis
frequency analysis to include multiterm phrases	N-grams
Characteristic of Generative AI	Often rely on foundation model GPT (Generative Pretrained transformers) Create new data instances similar to training data often learn from unlabeled data, sometime require labeled data
Return Reponses, such as natural language, images, or code, based on natural language input	Generative AI
used to set the context for the model by describing expectations used to identify constraints and styles for the responses of a generative AI model let model knows how to respond to prompts	System messages

mitigation techniques in a generative AI solution can be applied at each of four layers	Model Safety System meta prompt and grounding user experience
Enable you to suppress harmful content at the safety system layer	Content filters
Apply context filters to suppress prompts and responses for a responsible generative AI	Safety system
Plan a responsible generative AI solution at NIST AI Risk management framework	Identify potential harms measure the presence of these harms in the outputs generated by your solution. Mitigate the harms at multiple layers in your solution to minimize their presence and impact, and ensure transparent communication about potential risks to users. Operate the solution responsibly by defining and following a deployment and operational readiness plan.
documents the expected use of the system and helps identify potential harms	AI impact assessment
can take a prompt, a base image, or both create something new edit an image create both realistic and artistic images change the layout or style of an image and create variations of a provided image	Image generative ai models
Image creation, edition and image, and creating variations of an image. Generate images from natural language doesn't provide image description	DALL-E
understand and generate natural language and code but not images	GPT 4 and gpt 3.5
convert text into numerical vector form to facility text similarity	Embeddings
transcribe and translate speech to text	whisper

Converts text into numerical vectors for analysis used to search, classify and compare sources of text for similarity	Embeddings(Azure Open AI model)