


SESSION SPEAKER

JERRY XIAO (CQE, CQA, CSSBB, CRE)
RdQCC LLC

Developing GPT-Powered Application for
Risk Assessment

 11/7/2023 (2:15pm to 3:15pm)

 Hilton Boston Logan Airport Hotel



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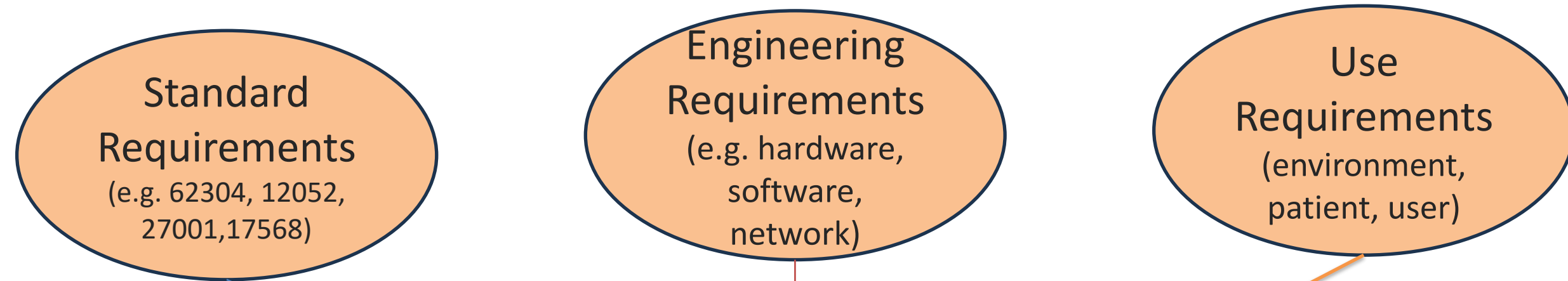


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Section 1: Understanding human-driven Risk Assessment

Humans Use Top-Down Approach



* Inappropriate communication protocol
* data breached

* Cable damaged
* Network latency
* Software corrupted

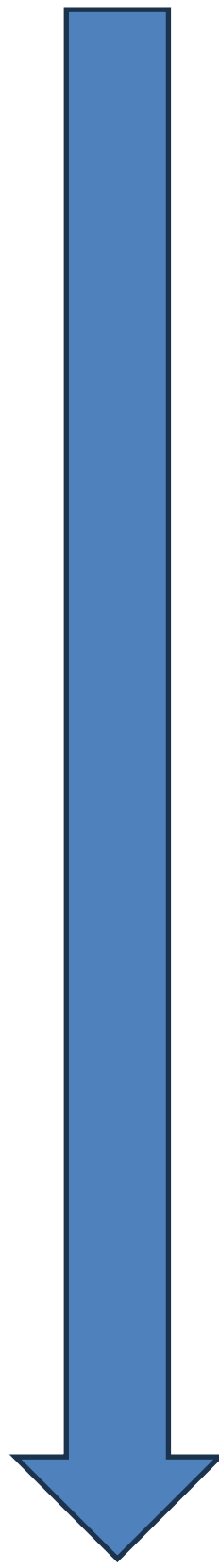
* Fail to link module
* User error

Data issue
Application security issue
Patient privacy violation
Compliance assessment

application network issue
Loss of communication
Hypoxia, organ damage
Upgrade bandwidth, backup

Use of device issue
Loss of operation
Delay in therapy
Training, usability studies

Failure Mode
Hazard
Hazardous Situation
Harm
Risk Mitigation



Human Cognitive Process

Cognitive psychology has revealed that:

- **Cognitive biases:** humans are subject to cognitive biases. By understanding these biases, each individual may deviate when conducting risk assessment.
- **Information processing Issue:** individuals may gather information differently, and risk mitigation can be inadequate due to technology availability.
- **Learning from experience:** experts often follow **distinct** cognitive processes when performing risk assessment compared to novices.
- **Mental models:** individuals often construct mental models or frameworks when dealing with complex risks.

Logical Thinking is a Hidden Strength of Humanity

- **Structured and systematic approach:** This helps us to explore risks comprehensively, avoid common cognitive biases, and ensure risk assessments are grounded in sound reasoning.
- **potential risk factors:** Consideration of uncertainties, hazards, consequences, likelihood, events, scenarios.
- **Cause-effect relationships:** This allows us to understand how one factor may lead to or influence another, and construct relationship chains.
- **Risk probabilities:** This is done based on available data and evidence, rather than relying solely on intuition.
- **Logical fallacy avoidance:** These include hurried generalization, false causality, confirmation bias, all of which can distort risk assessments.

Section 2:

How to use NLP performs risk assessment

AI Uses Bottom-Up Approach

Risk Mitigation
 Harm
 Hazardous Situation
 Hazard
 Failure Mode

Compliance assessment
 Patient privacy violation
 Application security issue

Upgrade bandwidth
 Hypoxia
 Loss of communication
 application network issue

Training, usability studies
 Delay in therapy
 Loss of operation
 Use of device issue

Data issue
 * Inappropriate communication protocol
 * data breached

* Cable damaged
 * Network latency
 * Software corrupted

* Fail to link module
 * User error

most likely F. M.

second likely F.M.

third likely F. M.

Module A communicates with Module B

GPT-3.5: Trained on massive amounts of text data (hundreds of gigabytes of text from the internet)

Entities
 Action

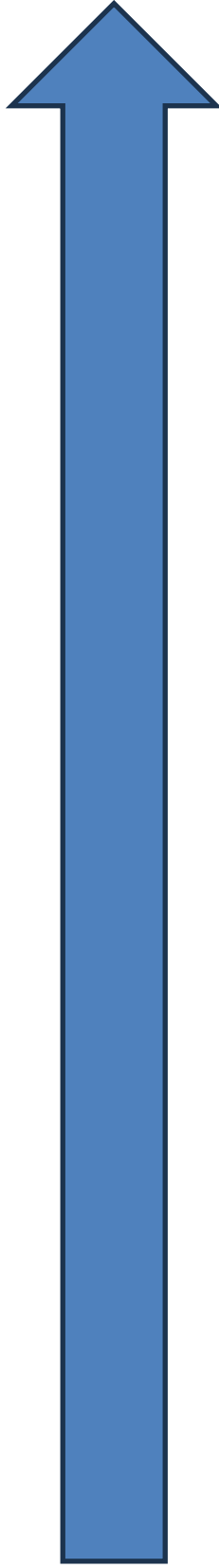
Subject
 Verb
 object

ambiguity

Relationship
 Direction, dependencies

Functional interaction

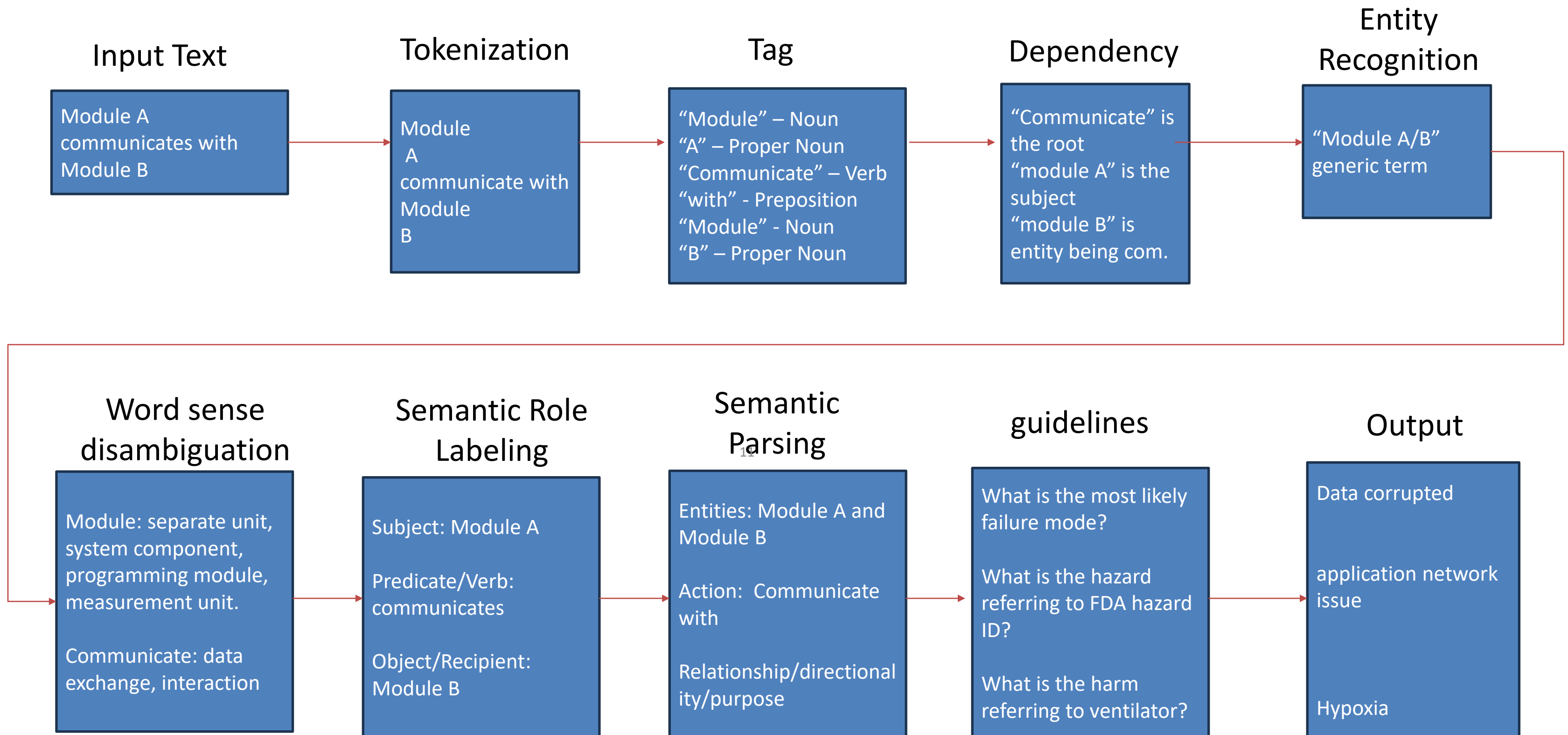
Operational scenarios



Core of AI: Technique of Semantic Analysis

- **Structured information:** understand the meaning and context of well-defined data such as user needs, product requirements.
- **Unstructured information:** explore and assess risks from documents, reports, event statements, customer complaints, and other textual sources.
- **Information extraction:** extract keywords, identify topic or themes, find similar risk terms within a document or conversation. (e.g. device overheating)
- **Contextual analysis:** analyze the surrounding¹⁰ text to understand the circumstances, causes, and potential consequences of each risk.(e.g. cause, harm)

Example: Semantic Analysis



Section 3:


How to incorporate ChatGPT to perform risk assessment

ChatGPT Capabilities


- **Information retrieval:** ChatGPT can access a vast database of knowledge and quickly retrieve relevant risk scenario.
- **Language comprehension:** ChatGPT can comprehend and interpret user queries, enable it to respond risk related concerns (e.g. failure mode).
- **Rapid data processing:** ChatGPT can process data at a rapid pace, making it suitable for conducting risk assessments in real-time.
- **Optimizing prompts:** ChatGPT allows user to optimize guidelines to enhance the quality of risk assessment output.
- **User Challenge:** how to formulate a well-structured and right prompt.

Example: ChaGPT is a valuable resource for Risk Assessment


JX what are the failure modes regarding 'module a communicates with module b'?

 The identification of specific failure modes for the statement "module A communicates with module B" depends on the context, the nature of the modules, and the intended communication. Here are some possible failure modes to consider:


1. **Communication Protocol Error:** The communication between module A and module B could fail due to errors or incompatibility in the communication protocol being used.
2. **Data Corruption:** Data being transmitted between the modules may become corrupted, leading to erroneous or incomplete information being exchanged.
3. **Network Latency:** Delays in data transmission between the modules could result in performance issues or failures to meet real-time requirements.
4. **Cable or Hardware Damage:** Physical damage to communication cables or hardware components could disrupt communication between the modules.
5. **Software Corruption:** If the software controlling the communication becomes corrupted, it could lead to communication failures.
6. **Security Breach:** Unauthorized access or security breaches could compromise the confidentiality and integrity of the communication.
7. **Power Failure:** If one or both modules lose power, communication may be disrupted.
8. **Configuration Errors:** Incorrect configuration settings on either module could lead to communication failures.

14  Rege

JX how to reduce risks caused by requirement failure from "module a communicates with module b"?

 Reducing the risks caused by requirement failure when "module A communicates with module B" involves careful planning, design, and testing. Here are steps to mitigate these risks:

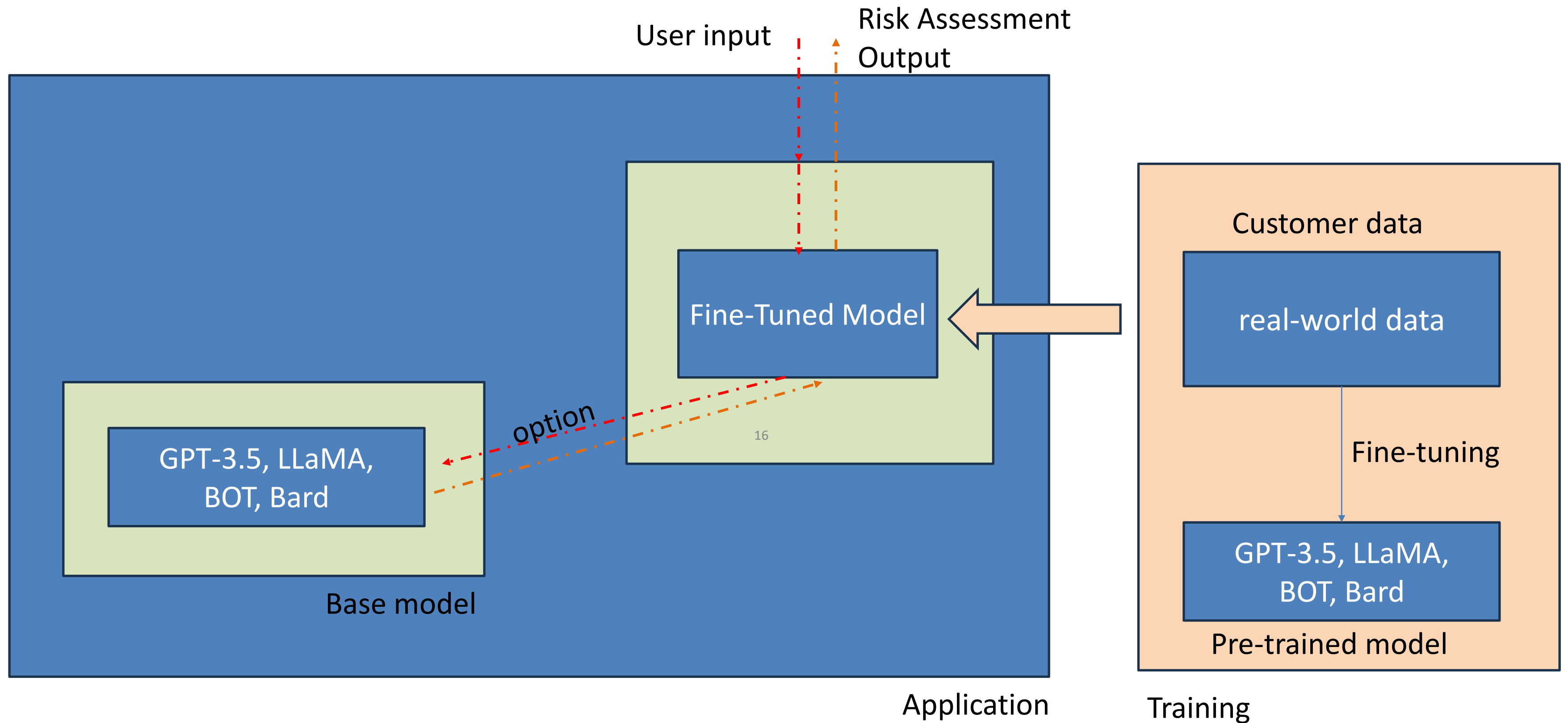
1. **Clear Requirements Definition:**
 - Ensure that the requirement "module A communicates with module B" is precisely defined with clear objectives, communication protocols, and expectations.
2. **Thorough Requirement Analysis:**
 - Conduct a thorough analysis of the communication requirement to identify potential risks and failure modes.
3. **Risk Assessment:**
 - Perform a risk assessment to evaluate the likelihood and impact of potential failures. Consider factors like data loss, security breaches, performance issues, and system downtime.
4. **Design Redundancy:**
 - Incorporate redundancy in the communication system to ensure that if one module fails, there is a backup or alternative method of communication.
5. **Error Handling and Recovery:**
 - Implement robust error handling mechanisms to detect and recover from

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Section 4:

How to build customized GPT-powered application to perform risk assessment

Diagram of Customized GPT-Powered Application



Benefits of Fine-Tuned Model

- **Task-specific performance:** GPT-3.5, like other pre-trained models, has a general understanding of language. Fine-tuned model allows to specialize on the risk knowledge and risk assessment tasks.
- **Control outputs:** fine-tuned model can control and guide the ChatGPT outputs to provide more relevant and appropriate responses.
- **Data privacy and security:** fine-tuned model is hosted on your own server to keep sensitive information and your visitation data within your organization.
- **Improved accuracy:** fine-tuned model can provide your unique Hazard Lists, Hazardous Situation Lists, and Harm Lists to achieve higher accuracy.

How to Create a Fine-Tuned Model

- The fine-tuned model is at the **core** of GPT-powered application.
- **Collect training data:** gather a comprehensive dataset that representative of real-world scenarios including requirements, post market data, risk documentations, field failure data, medical side events as possible.
- **Data pre-processing:** clean and standardize the text such as tokenization, lowercasing, punctuation removal, and stop-word removal.
- **Generate** a fine-tuned model: setup fine-tuning environment and configuration (e.g. epochs), access to powerful GPU resources.
- **Model validation:** ensure that all risk assessment satisfy your organization needs (e.g. accuracy, less biases).

Example of GPT-Powered Risk Assessment Application: www.risk-chat.com

Text Document Login

DETECT INPUT Failure_Mode

module a communicates with module b

fail to link module	■ ---	☆
fail to assign module	■ ---	☆
loss of communication	■ ---	☆
fail to transmit data	---	☆

35 / 5,000

Demo Feedback Hints

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unable to restart device	---	☆
fail to receive data	---	☆
unable to load device	---	☆
fail to transmit signal	---	☆

Questions and Answers

