Here’s a breakdown of **ProjectHack24 Challenge 2** into actionable steps:

**1. Understand the Challenge & Objectives**

* **Objective:** Develop a **predictive analytics system** for risk management using historical risk data.
* **Outcome:** Enable proactive risk mitigation through **metrics, data visualization, and actionable insights**.

**2. Analyze the Dataset**

* Review the provided **historical risk register** to understand key attributes:
  + **Risk identification dates**
  + **Escalation timings**
  + **Mitigation actions**
  + **Resolution outcomes**
* Identify **trends, gaps, and anomalies** in risk patterns.

**3. Define Key Risk Metrics**

* Develop predictive metrics to **analyze patterns and forecast risks**:
  + **Risk Velocity:** How fast risks escalate.
  + **Resolution Rate:** Success rate of mitigations.
  + **Emergence Rate:** Frequency and triggers of new risks.
  + **Likelihood & Impact Drift:** Shifts in risk exposure.
  + **Risk Clustering:** Identifying interdependent risks.
* Evaluate additional exploratory metrics from provided documentation.

**4. Build the Predictive Model**

* Choose a suitable **Machine Learning (ML) model**:
  + **Regression Models** (to predict escalation likelihood)
  + **Time Series Analysis** (to track risk evolution)
  + **Clustering Algorithms** (for risk pattern identification)
* Train models using historical data to forecast future risks.

**5. Develop Visual Dashboards**

* Create dashboards for **stakeholder-friendly risk insights**:
  + **Heatmaps:** Highlight high-risk areas.
  + **Trendlines:** Show risk evolution over time.
  + **Interactive Visuals:** Allow exploration of key risk metrics.
* Use tools like **Power BI, Tableau, or Python Dash**.

**6. Generate Actionable Insights**

* Provide **recommendations for resource allocation and risk prioritization** based on data.
* Address pain points:
  + **Faster risk detection** → Predictive alerts.
  + **Mitigation effectiveness tracking** → Historical success analysis.
  + **Forecasting resource needs** → Risk clustering and likelihood predictions.

**7. Ensure Scalability**

* Structure the solution for **easy expansion** to new projects and datasets.
* Optimize performance for **large-scale risk tracking**.

**8. Finalize & Present the Solution**

* Summarize findings and present the **predictive system, metrics, and dashboards**.
* Demonstrate how the system improves **risk oversight and decision-making**.

Key Insights and Trends

### **Key Metrics and Insights from Your Data**

#### **1. General Statistics**

* **Total Risks Identified:** 17,349
* **Total Threats:** 16,337
* **Total Opportunities:** 1,011
* **Total Mitigations Applied:** 15,621
* **Unique Projects Monitored:** 101
* **Unique Organizations Involved:** 6

#### **2. Risk Type Distribution**

* **Threats:** 16,337 (majority of risks)
* **Opportunities:** 1,011
* **Miscellaneous/END Labels:** 1 (likely a data issue)

#### **3. Contingency Status Breakdown**

* **Project Contingency (Open):** 16,866 (Most risks remain open)
* **Management Contingency (Open):** 409
* **Financial Contingency (Open):** 69
* **Project Contingency (Closed):** 4 (Very few risks fully closed)
* **Possible Data Issue:** 1 record labeled "END END"

#### **4. Risk Impact Reduction**

* **Average Pre-Mitigation Impact:** **128.78**
* **Average Post-Mitigation Impact:** **76.55**
* **Impact Reduction Due to Mitigation:** **52.23** (approx. 40% decrease)

#### **Potential Insights & Trends**

* **High Number of Open Risks:** Over **97%** of risks remain open under "Project Contingency," suggesting possible delays in mitigation.
* **Opportunities Underutilized:** With **only 1,011 opportunities** recorded, this suggests that risk management is more focused on threats than leveraging opportunities.
* **Mitigation Efforts Show Positive Results:** The **52.23-point drop** in impact suggests that risk mitigation efforts are working, but there may still be room for improvement.

### **Triggers, Common Causes, and Risk Stages Analysis**

#### **1. Common Risk Causes (Categories)**

The most frequent risk categories (potential triggers) are:

* **Business Strategy and Objectives** – 2,595 risks (likely due to misalignment in planning).
* **Project Management** – 2,277 risks (issues with execution, deadlines, and scope creep).
* **Supply Chain** – 2,133 risks (possible disruptions, vendor dependencies).
* **System Integration, Verification & Validation** – 1,961 risks (technical issues in testing and deployment).
* **System Engineering & Development** – 1,543 risks (issues in design and implementation).
* **Contractual/Legal** – 1,263 risks (compliance and contract disputes).

*Note:* There are duplicates or inconsistent naming in categories (e.g., "Supply Chain" appears twice). This suggests data standardization might be needed.

#### **2. Risk Trends**

* **Stable Risks:** 7,872 risks remain constant.
* **Worsening Risks:** 646 risks show an increasing threat.
* **Improving Risks:** 833 risks are reducing in severity.
* **Unknown Trends ("--")**: 7,997 risks have no assigned trend, indicating potential missing data.

#### **3. When Risks Are Most Prolific**

* The **peak years for risk emergence** were:
  + **2017** – 4,764 risks recorded.
  + **2016** – 4,148 risks.
  + **2018** – 2,641 risks.
  + **2015** – 1,796 risks.
  + **2014** – 1,294 risks.
* Risks have **declined significantly after 2019**, with **only 4 recorded in 2023**, indicating either better risk management or incomplete recent data.

#### **Key Takeaways**

* **Project-related and supply chain risks dominate** – likely due to execution delays and external dependencies.
* **A large number of risks remain stable or worsening**, suggesting mitigation efforts may not be fully effective.
* **Risk frequency peaked between 2016-2018** but has dropped significantly after 2019.
* **Legal and contractual risks are lower than operational risks**, implying that regulatory issues might not be a major driver.

Risk Scoring

* **H1** → Pre-mitigation probability **≥ 0.50**.
* **H2** → Pre-mitigation probability **between 0.35 and 0.50**.
* **H3** → Pre-mitigation probability **below 0.35**.

**'--' (Missing Data)** → Has similar probability trends to 'Stable' (~0.38 Pre, ~0.25 Post), meaning it likely represents an **uncategorized or default stable risk**.

### **📝 Judge Questions & Answers for Project Hack Presentation**

#### **1️⃣ How has your solution been designed to maximise the user experience for different types of users?**

Our solution is built with **usability at its core**, ensuring that **different types of users**—whether senior decision-makers, risk analysts, or project managers—can easily access and interpret risk insights.

✅ **Interactive Power BI Dashboard:** A **visual-first approach** with easy-to-read charts, slicers, and filters tailored for quick decision-making.

✅ **Drill-Down Capabilities:** Users can **filter by project, risk type, or time period**, allowing them to focus on **highly relevant risks**.

✅ **Automated Data Processing:** Python scripts clean, transform, and prepare risk data **in real-time**, ensuring users **always see the latest insights** without manual intervention.

✅ **Simple Navigation:** A structured layout where **KPIs, risk trends, and mitigation impacts** are **clearly segmented** for an intuitive experience.

💡 **User Experience Focus:**

* **Executives & Stakeholders:** See high-level risk trends & major concerns at a glance.
* **Risk Analysts:** Dive deeper into granular data, historical trends, and category-specific risks.
* **Project Managers:** Use real-time insights to take **proactive actions** to mitigate risks.

#### **2️⃣ How easy is it to derive insights?**

We designed our solution to make **data-driven decision-making effortless** by ensuring that insights are **clear, accessible, and action-oriented**.

🔹 **One-Click Filtering:** Users can instantly filter data **by risk type, project, and time period** to derive insights relevant to their needs.

🔹 **Automated Risk Categorization:** Risks are automatically grouped **by severity, trend, and financial impact**, making it easy to identify priorities.

🔹 **Comparative Risk Analysis:** Users can quickly compare **pre- and post-mitigation impact**, **cost changes**, and **risk evolution over time**.

🔹 **Dynamic Heatmaps:** A **risk heatmap visually highlights** which areas need the most attention, making complex data instantly digestible.

🚀 **Bottom Line:** Whether users need **a quick high-level snapshot** or a **deep dive into specific risks**, our design ensures **immediate clarity**.

#### **3️⃣ How does your solution enable users to predict the types of risks they are likely to encounter?**

Our solution integrates **historical risk trends and predictive modeling** to help users anticipate future risks **before they escalate**.

🔹 **Trend Analysis:**

* We **track historical risk trends** to show how risks evolve over time.
* Users can **spot patterns** in which risk categories tend to worsen in specific projects or industries.

🔹 **Risk Probability Scores:**

* Risks are **ranked by likelihood and severity** based on past occurrences and pre-mitigation impact scores.
* This helps teams **focus on risks that have a higher probability of occurring again**.

🔹 **Quarterly & Yearly Risk Forecasting:**

* Our Power BI dashboard enables users to **compare risk frequencies by quarter and year** to identify seasonal patterns.

🔹 **AI-Assisted Insights (Future Improvement):**

* Our approach lays the foundation for **machine learning risk prediction**, where AI could identify **emerging risk patterns** over time.

✅ **Key Benefit:** Users don’t just react to risks—they can **proactively prepare for them** based on predictive insights.

#### **4️⃣ Not all risks are created equal. How does your solution point users to the biggest risks to focus on?**

To ensure that users prioritize **the most critical risks**, our solution **automatically ranks and highlights high-impact risks**.

🔹 **Severity-Based Risk Prioritization:**

* Risks are categorized by **financial impact, probability, and contingency status**.
* **Color-coded visualizations** ensure high-impact risks stand out immediately.

🔹 **Cost-Based Risk Ranking:**

* A dedicated **"Cost Impact Chart"** highlights the **highest and lowest cost risks**.
* Users can **compare pre- and post-mitigation costs** to see where action is most needed.

🔹 **Risk Heatmaps:**

* **Projects with the highest risk loads** are visually flagged.
* This helps users **quickly spot high-risk projects or departments**.

🔹 **Mitigation Effectiveness Metrics:**

* If certain risks **aren’t reducing significantly after mitigation**, they are **flagged for review**.

🚀 **Key Impact:**

Users are **automatically directed to the risks that matter most**, ensuring time and resources are spent where they **drive the biggest impact**.

### **🎯 Final Summary: Why Our Solution Stands Out**

✅ **User-Friendly & Interactive** – Easy for different users to derive insights.

✅ **Instant Insights** – Filters, KPIs, and risk rankings **simplify decision-making**.

✅ **Predictive Capabilities** – Helps users **anticipate and prepare for risks**.

✅ **Focus on the Biggest Risks** – **Automated prioritization** ensures critical risks get attention.

Our solution doesn’t just **display risk data**—it **empowers users to take action** and **stay ahead of future risks!** 🚀🔥

Would you like to add anything specific from your team's perspective? 😊