**Slide 1: Title Slide**

* **Title**: Employee Satisfaction and Turnover Analysis Using Predictive Modeling and Graph Analytics
* **Subtitle**: Capstone 3 Presentation
* **Mira Hussien – Mirna Kordab – Sara Wehbi**

"Hello everyone, today we will be presenting my Capstone 3 project, which focuses on analyzing employee satisfaction and turnover. This analysis is based on the datasets from the book *Predictive Analytics in Human Resource Management*. Let’s dive into the project."

**Slide 2: Research Questions & Dataset Overview**

* **Research Questions**:
  + What factors influence employee job satisfaction?
  + What factors contribute to employee turnover?
* **Datasets**:
  + **Predictive Model of Selection Dataset**: Attributes like psychological traits, performance, job satisfaction.
  + **Predictive Model Turnover Dataset**: Attributes like job satisfaction, quality of work life, intention to leave.

"For this project, we focused on two key research questions: First, what factors influence employee job satisfaction? And second, what factors contribute to employee turnover? To address these questions, we used two datasets: one related to employee selection and performance, and another focused on turnover and job satisfaction."

**Slide 3: Intelligent Analyses & Methodology**

* **Intelligent Analyses Implemented**:
  + Regression Analysis: Predicting **Job Satisfaction**.
  + Classification Analysis: Predicting **Employee Turnover**.
  + Graph Analytics: Visualizing relationships between employee attributes.
  + Unsupervised Learning: **K-Means Clustering** to identify employee trends.

"In terms of methodology, we implemented multiple intelligent analyses. First, we used **regression analysis** to predict job satisfaction based on employee characteristics. Next, a **random forest classifier** was used to predict the likelihood of employee turnover. We also created a **knowledge graph** to visualize relationships between attributes like psychological traits and job satisfaction. Finally, we performed **unsupervised learning** with **K-Means clustering** to segment employees into meaningful groups."

**Slide 4: Regression & Classification Results**

* **Regression**:
  + **MSE** = 0.757
  + **R²** = 0.549
* **Classification**:
  + **Accuracy** = 90.3%
  + **F1 Score** = 0.903

"Let’s review the results of the models. For the **regression model**, we achieved an **R² of 0.549**, indicating that the model explains about 55% of the variance in job satisfaction. The **MSE** was 0.757, which suggests room for improvement.

For **classification**, the **accuracy was 90.3%**, and the **F1 score was 0.903**, showing that the model performs well in predicting employees who are likely to leave the organization."

**Slide 5: Knowledge Graph and Clustering Results**

* **Knowledge Graph**: Visualizes the relationships between employee features.
* **Clustering**: K-Means with 3 clusters.
  + Cluster 1: High job satisfaction, low turnover risk.
  + Cluster 2: Moderate satisfaction, moderate turnover risk.
  + Cluster 3: Low satisfaction, high turnover risk.

"We also created a **knowledge graph** to visualize how employee attributes like **Resilience**, **Efficacy**, and **Openness** relate to job satisfaction and turnover intentions.

Furthermore, **K-Means clustering** revealed three distinct employee groups based on performance and job satisfaction. Cluster 1 consists of employees with high satisfaction and low turnover risk, while Cluster 3 is made up of employees who are dissatisfied and more likely to leave."

**Slide 6: Visualizations & Key Insights**

* **Clustering Coefficients Bar Chart**.
* **Heatmap of Clustering Coefficients**.
* **Key Insights**:
  + **Efficacy** and **Resilience** are strong predictors of job satisfaction and turnover.
  + **Job satisfaction** and **performance rank** are key factors in determining turnover intention.

"Here, you can see two key visualizations. The **bar chart** and **heatmap** of **clustering coefficients** show which features are most influential in clustering employees. We see that **Efficacy** and **Resilience** are significant predictors.

Overall, **job satisfaction** and **performance rank** are key determinants of employee turnover, which HR managers can use to identify at-risk employees."

**Slide 7: Conclusion & Future Work**

* **Conclusion**:
  + Predictive models and graph analytics provide actionable insights for HR management.
  + The models are effective in identifying key factors influencing job satisfaction and turnover.
* **Future Work**:
  + Improve models with additional features.
  + Implement more advanced techniques like **XGBoost**.

"In conclusion, this project successfully applies predictive modeling and graph analytics to provide valuable insights into employee satisfaction and retention. The regression and classification models can help HR professionals identify employees at risk of leaving, while the knowledge graph and clustering results offer additional insights into employee dynamics.

Moving forward, we plan to refine the models with more advanced techniques and additional features, such as **XGBoost**, to improve the accuracy and predictive power of the models."