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1. Title Slide

- Project title: *"Predicting Vaccine Uptake Using Machine Learning"*
- Your name, course, date

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2. Background / Business Understanding

- Vaccination is crucial in preventing pandemics.
- Uptake varies across populations (due to risk perception, demographics, access).
- 2009 H1N1 dataset used to analyze and predict vaccination behavior.

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3. Problem Statement

- Public health campaigns often lack targeted focus.
- Limited resources → inefficient blanket strategies.
- Goal: Predict vaccine uptake and identify key influencing factors.

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4. Objectives

- Identify key predictors of vaccine uptake.
- Build models to classify individuals as likely/unlikely to vaccinate.
- Compare performance of different ML models.

- Provide actionable insights for targeted vaccination campaigns.

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5. Dataset Overview

- Source: 2009 H1N1 flu survey (~26,000 respondents).
- Features: demographics, health conditions, behaviors, opinions.
- Target: uptake of H1N1 and seasonal flu vaccines.

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6. Data Preprocessing

- Handling missing values (imputation).
- Encoding categorical variables.
- Balancing dataset (SMOTE / class balancing).
- Feature scaling (if used).

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7. Models Used

- Logistic Regression (baseline).
- Decision Tree.
- Random Forest / XGBoost (advanced).
- Metrics: Accuracy, Precision, Recall, F1, ROC-AUC.

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8. Results

- Best model: [Insert your best model here].
- Key performance metrics (accuracy, F1, AUC).
- Highlight confusion matrix/ROC curve visuals.

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9. Key Predictors (Insights)

- Doctor recommendations strongly influence uptake.
- Risk perception and knowledge levels matter.
- Demographics (age, education, healthcare access) also play a role.

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10. Implications

- Helps **target hesitant groups** with tailored messaging.
- Supports **efficient resource allocation** for vaccination drives.
- Useful for **future pandemic preparedness**.
- Ethical considerations: avoid bias & stigmatization.

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11. Conclusion

- ML can effectively predict vaccine uptake.
- Predictive insights can improve public health strategy.

- Limitations: dataset from 2009 context.
- Overall: valuable tool for decision support in healthcare.

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12. Next Steps / Future Work

- Apply to more recent data (e.g., COVID-19).
- Explore deeper models (ensemble learning, neural networks).
- Include fairness audits to check for bias.

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13. Q&A / Thank You Slide

- “Questions?”
- Contact details (optional).
