Week 3: Classroom Data Collection and Cleaning

Data Science for Mathematics Teachers

November 11, 2025

Course Information

Course: Data Science for Mathematics Teachers
Series: Professional Development Series
Duration: 8 weeks
Level: Beginner To Intermediate
Target: Mathematics Teachers

1 Week 3: Classroom Data Collection and Cleaning

1.1 Learning Objectives

By the end of this week, you will be able to:

- Set up automated data collection from digital assessments
- Clean and standardize educational data formats
- Handle missing grades and incomplete assignments
- Create consistent data structures for analysis

1.2 Topics Covered This Week

- Collecting assessment data from multiple sources
- Cleaning and standardizing student records
- Handling incomplete assignments and missing grades

1.3 Key Concepts You Will Work With

- Data validation with .{isnull()} and .{notnull()}
- String cleaning with .str.{strip()}, .str.{lower()}, .str.{replace()}
- Data type conversion with .{astype()}
- Duplicate removal with .{drop_duplicates()}
- Outlier detection using statistical methods
- Data merging with pd.{merge()} and pd.{concat()}
- Regular expressions for pattern matching
- Creating data quality reports and validation rules

1.4 Practical Exercises

Difficulty Level: Intermediate
Total Exercises: 3

Exercise 1: AI-Enhanced Challenge: Collecting assessment data from multiple sources

Difficulty: Intermediate
AI-Enhanced Programming Exercise
Task: Using Python, develop a Python solution focusing on data validation with .{isnull()} and .{notnull()}.
Step-by-Step Instructions:

1. Focus on implementing data validation with .{isnull()} and .{notnull()} effectively
2. Create clear, educational examples for student understanding
3. Test your implementation with classroom scenarios
4. Add comprehensive comments for teaching purposes
5. Validate results and create sample outputs

Technical Requirements:

- Use Data validation with .{isnull()} and .{notnull()} in your implementation
- Use String cleaning with .str.{strip()}, .str.{lower()}, .str.{replace()} in your implementation
- Use Data type conversion with .{astype()} in your implementation

Expected Output: A working Python script that mathematics teachers can run in their classroom to solve real educational problems.
Assessment: Your solution should be practical, well-commented, and directly applicable to teaching mathematics.
Teaching Context: Real classroom data management challenges

Exercise 2: AI-Enhanced Challenge: Cleaning and standardizing student records

Difficulty: Intermediate
AI-Enhanced Programming Exercise
Task: Using Python, create a Python program using variables and data types for mathematical calculations.
Step-by-Step Instructions:

1. Focus on implementing data type conversion with .{astype()} effectively
2. Create clear, educational examples for student understanding
3. Test your implementation with classroom scenarios
4. Add comprehensive comments for teaching purposes
5. Validate results and create sample outputs

Technical Requirements:

- Use Data type conversion with .{astype()} in your implementation
- Use Duplicate removal with .{drop_duplicates()} in your implementation
- Use Outlier detection using statistical methods in your implementation

Expected Output: A working Python script that mathematics teachers can run in their classroom to solve real educational problems.
Assessment: Your solution should be practical, well-commented, and directly applicable to teaching mathematics.
Teaching Context: Real classroom data management challenges

Exercise 3: Concept-Based Challenge: Handling incomplete assignments and missing grades

Difficulty: Intermediate
Task: Create a data management system for classroom information.
Data Handling:

- Use Outlier detection using statistical methods to import student records
- Apply Data merging with pd.{merge()} and pd.{concat()} to structure information
- Generate reports for parents and administrators
- Ensure data privacy and security

Deliverable: A complete data management solution for educators.
Teaching Context: Real classroom data management challenges

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