Figure 1: **An Overview of How PFMs Improve Data Analysis. Updated with 8-subsection co-occurrence based grouping.** The figure illustrates the relationships between key data analysis tasks (left column)—Data Management, Exploratory Data Analysis, Implementation, and Assessment—and the Improvements enabled by PFMs (right column). The middle column lists representative methods and studies that bridge specific tasks to the corresponding improvements. Arrows indicate how PFMs address challenges within each task, facilitating the transition towards optimized data analysis processes. This visual framework underscores the multifaceted role of PFMs in systematically enhancing data analysis by connecting practical tasks with advanced improved strategies and the core role of scaling and consolidating domain-specific language (DSL) during data analysis. 1