



# Managing Research Flows with the RM System

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# The RM Framework

- Basics of Research Flows
- The RM 4Es Framework
- The ResearchMap Framework

# Research Flows Help to

- Store individual data transformation and analysis steps
- Compose larger research from individual research components (the components can be independent or connected by some control flow or data flow logics)
- Provide paths for automation
- Support easy modifications of research
- Foster collaborations

# Research Flows Help

- Researchers to handle a few critical issues
  1. Reproducibility
  2. Provenance
  3. Sharing

# Research Flow Life Cycle

- Creation
- Execution
- Reuse
- Mapping

# The RM4Es Framework

- Equation
  - Estimation
  - Errors (evaluation)
  - Explanation
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- The above 4Es cover all the needed components for any research flow

# The ResearchMap Framework

- A research flow is a collection of all the needed steps (actions) taken by a researcher to reach the goal of a research project.
- A research map is a collection of all the possible research flows for a research project.
- A research map can be represented by a DAG (directed cyclic graph) with its node to represent a research status at every stage and with its edge to represent an action of employing certain statistical techniques (a statistical strategy).

# The RM System

- Research Flow Composition
- Research Flow Execution
- Research Flow Mapping
- Research Flow Sharing

# Research flow creation

- Design a research flow
  1. Find the right steps
  2. Set the right parameters
  3. Find the right data
  4. Connect appropriate pieces together
- Support both experts and novices

# Research Flow Execution

- Research flow controller
- Event system
- Logging and database
- Scheduler
  - Resource provisioning
  - Fault tolerance
  - Efficient collaboration
  - Multi environment execution

# Research flow mapping

- Mapping helps

1. Ease of use
2. Portability
3. Optimization
4. Fault tolerance

ResearchMap system provides intelligent supports.

# Research flow sharing

- Template and component libraries
- Keyword and semantic search capabilities
- Composite research flows

ResearchMap system provides intelligent supports.