An Experiment Data Analysis Framework: Evaluating Interactive Information Behavior with R

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Overview

1. Introduction / Background / Rutgers
2. System framework
   - Experiment System
   - Analysis System
3. Context evaluation with the framework
4. Screenshots
5. Current State (Demo) and future plans

Introduction / Background

- Information Science / Information Retrieval
  - Traditionally: Matching search request to documents
    - Query as search unit
    - Context-free search
    - Performance measure: Relevance
  - Integrating Interaction as part of the search process
    - Task as search unit
    - User's information interaction (central) part of search process
    - Developing models that explain usefulness of content

- Need for more effort for context model evaluation
  - Initial activity in IRIX workshops and IIiX conferences (3rd time this year in New Brunswick)
  - **PooDLE project @ Rutgers**

The PooDLE Project

http://comminfo.rutgers.edu/imls/poodle

- **Goal:** a personalization assistant to support contextualized (i.e. personalized) information retrieval
- **Questions** we address:
  - Determination of significant contextual factors
  - Implicit identification of values of factors
  - Determination of interaction effects amongst factors
  - Construction of a computational framework for taking account of context factors and their interactions
  - Creation and Evaluation of a personalization prototype
- **What we do:**
  - Experiments (information seeking for different tasks)
  - Observing users' interactive search behavior
  - Collect feedback on usefulness from their saved pages
  - Analyze data to find behavioral correlates of contextual features and predict usefulness based on behaviors

Technical challenges / requirements

- Large data sets
  - ~ 1+ GB of textual log data / experiment
  - ~ 1x GB of video log data / experiment

- Processing Speed of models / test / visualizations
- Flexibility (many possible models/combinations)
- Support

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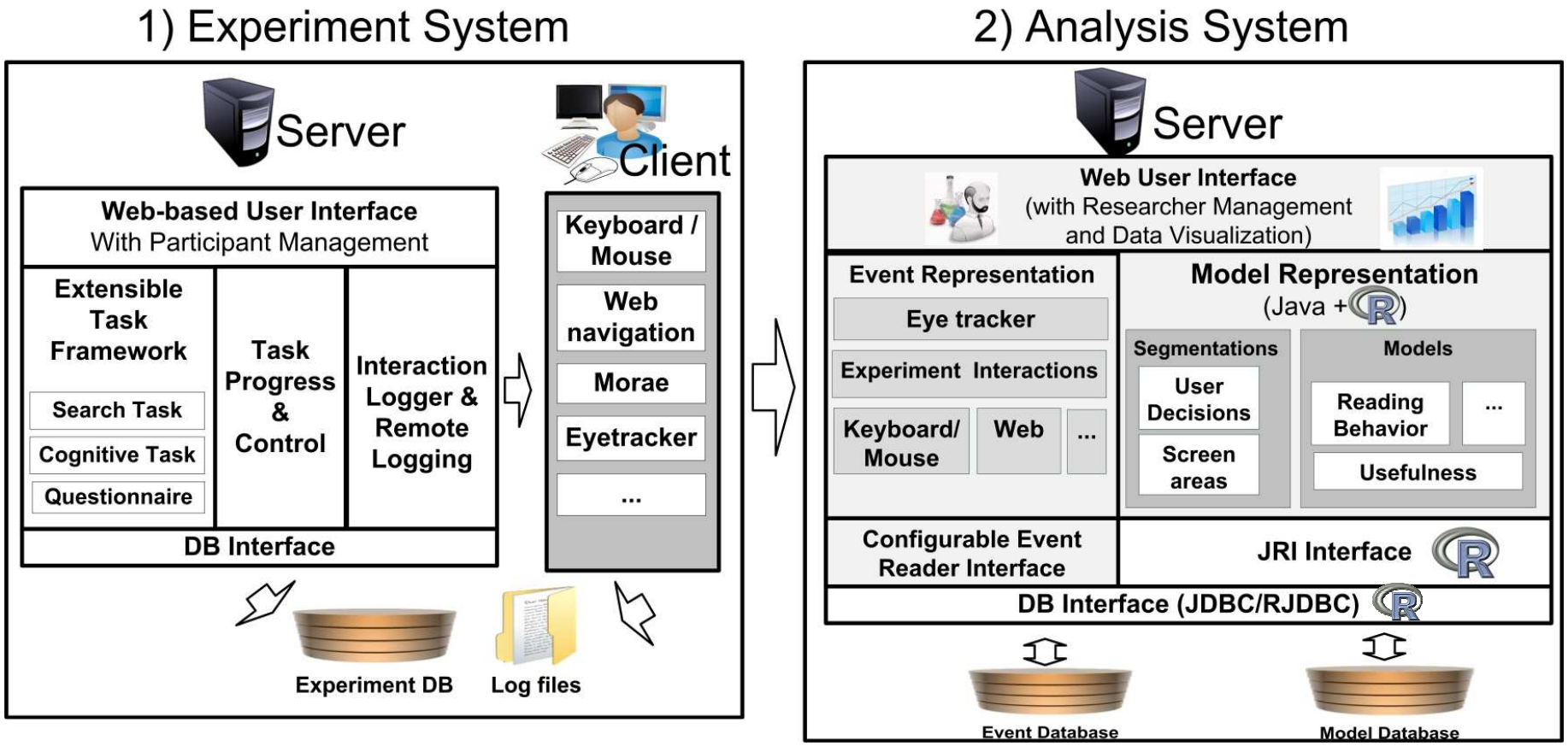
- Integration with Java (JRI)
- Data access (RJDBC)
- Data processing
  - Data manipulation
  - Numerical processing
  - Libraries

Overview



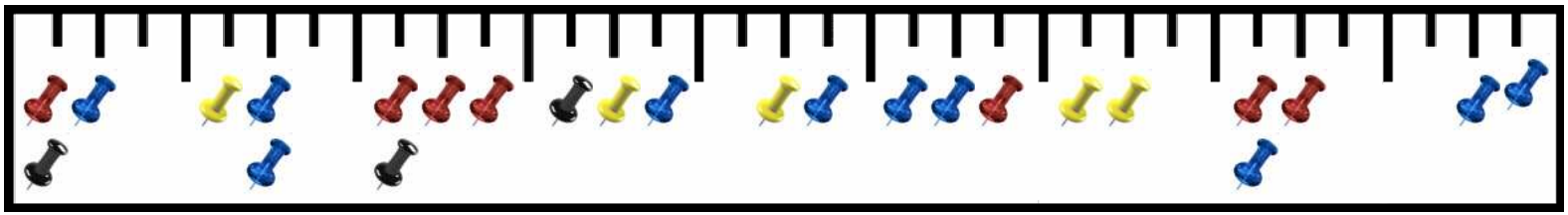
- Experiment system for designing and conducting interactive experiments in realistic application environments
- Analysis system for integrating and analyzing results from experiments

Main features

- Integrating behavoral experiment logs and user feedback
  - Unified representation (event data)
  - Single timeline
    - Synchronization of events in 
    - Error recovery
- Modeling on events in 
  - Segmentation (semantic categorization) of events
  - Hypothesis testing and learning

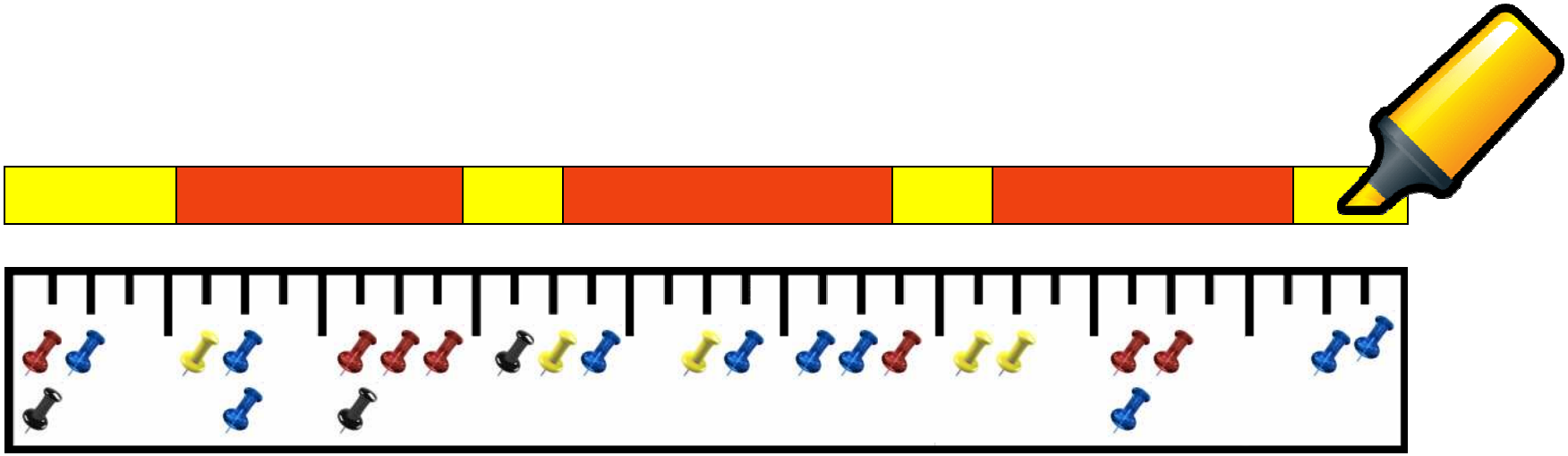
Logical elements:

- **Events** 



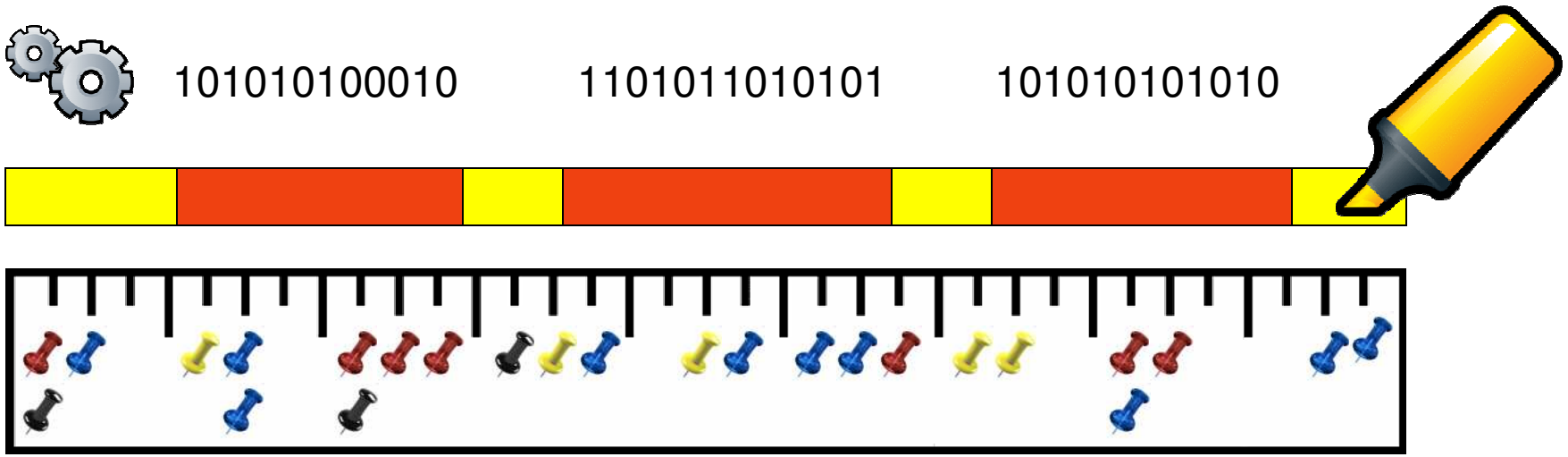
Logical elements:

- **Events**
- **Segmentations**



Logical elements:

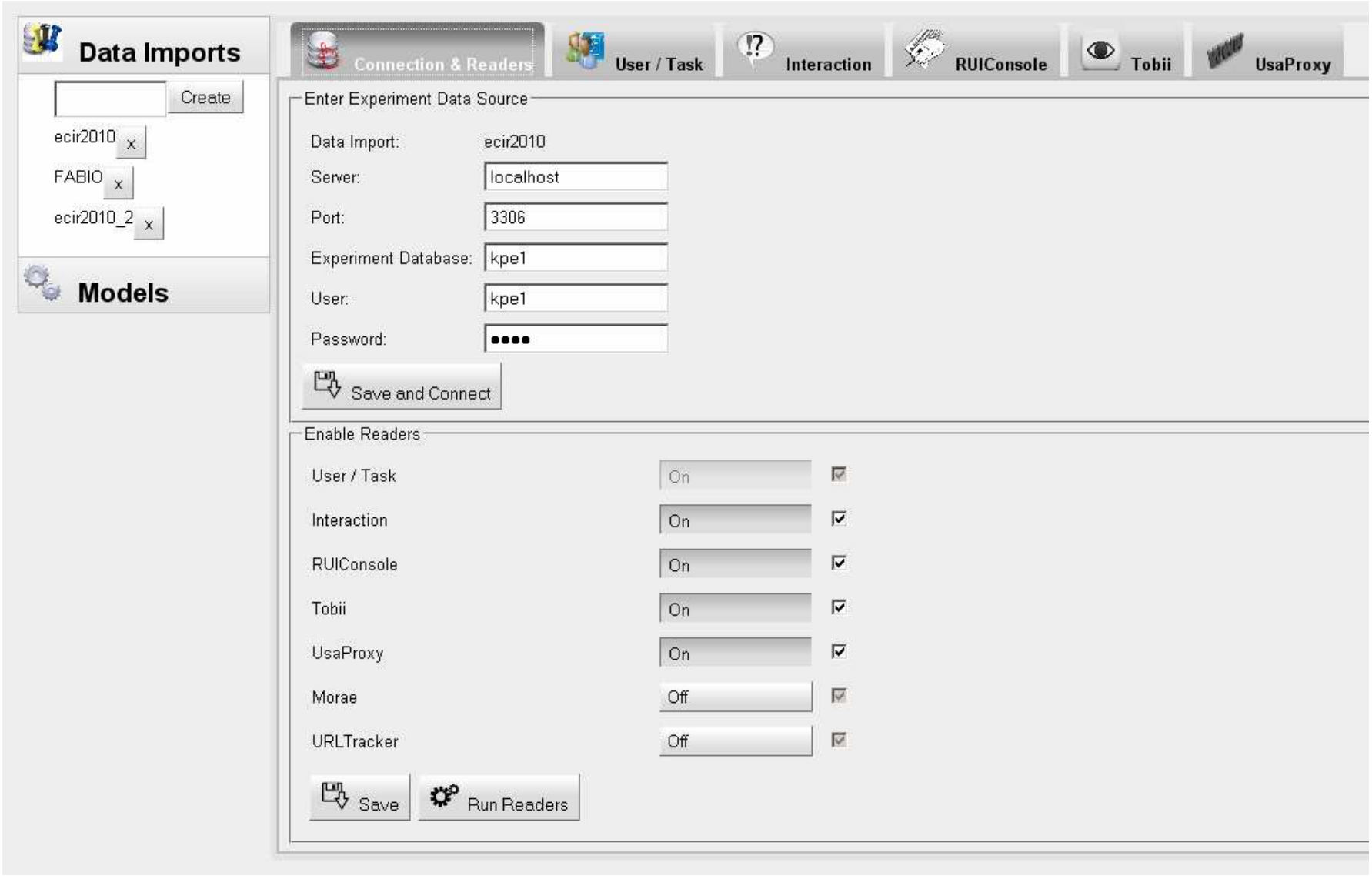
- **Events**
- **Segmentations**
- **Models**



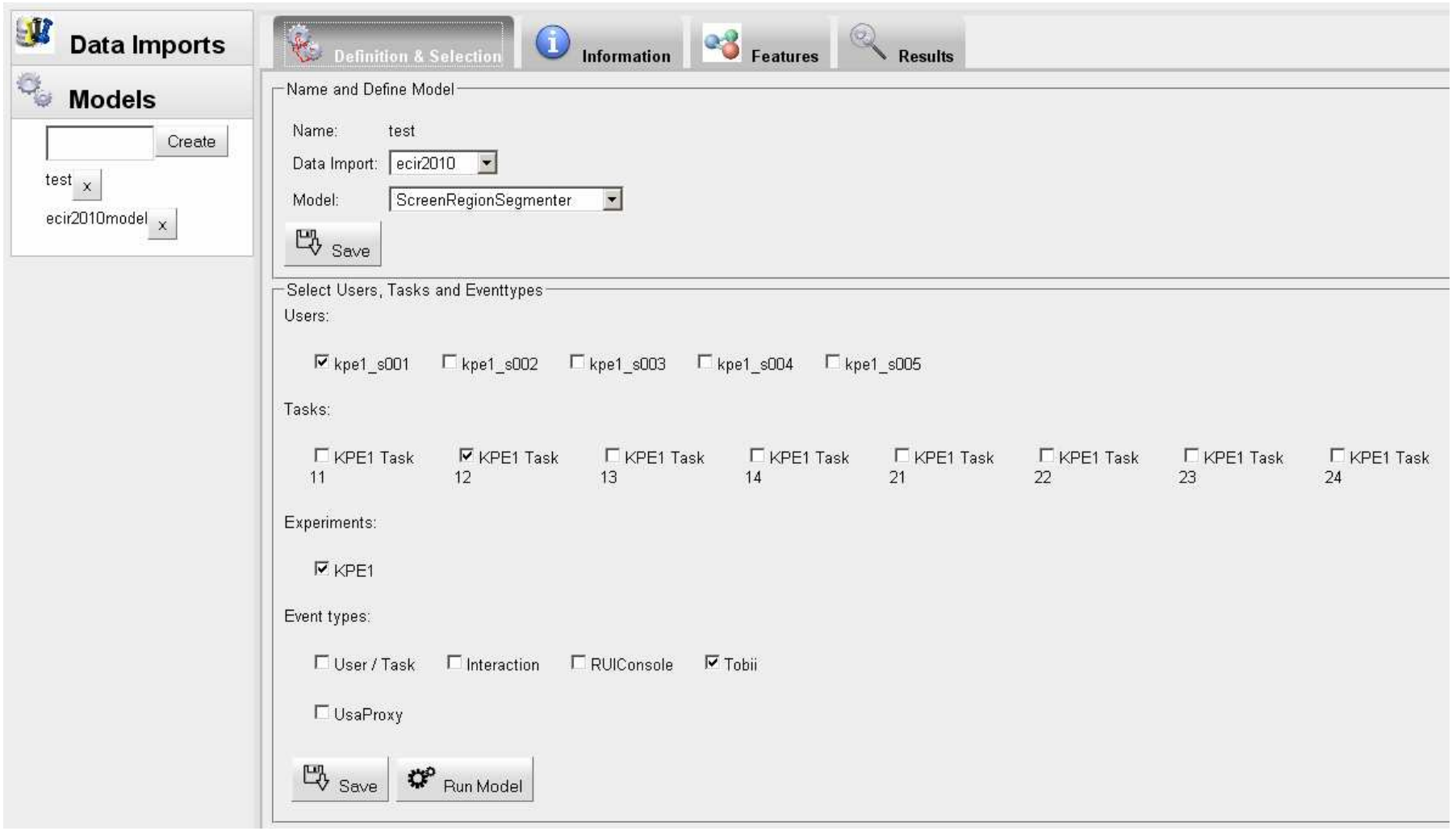
How does the framework support context evaluation?

- Modularity
  - Capture the context you need
  - Analyse selective contextual effects and their interactions
- Extensiblity
  - Add own events, read them from own log files
  - Add own segmentations and models (written in R)
  - Adapt framework-based models to your needs
- Data is separated from segmentations / models
- Data and models can be accessed as service and shared among researchers

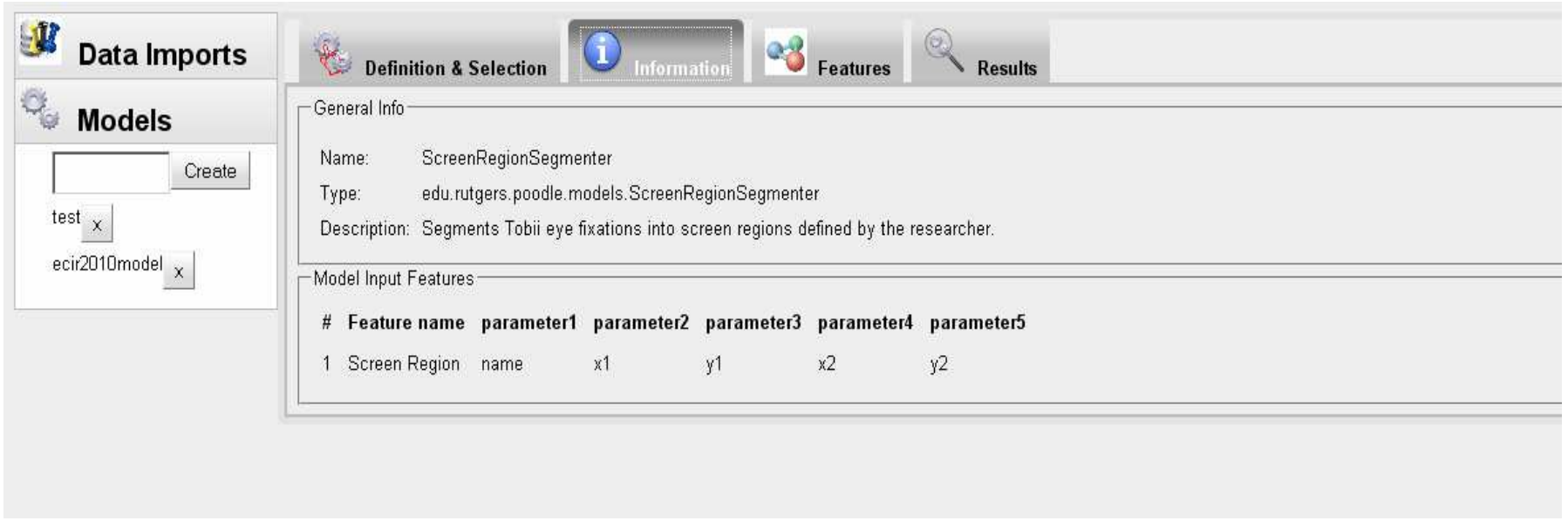
Screenshots (1) - Importing Data



Screenshots (2) – Model Selection



Screenshots (3) – Model Info & Features



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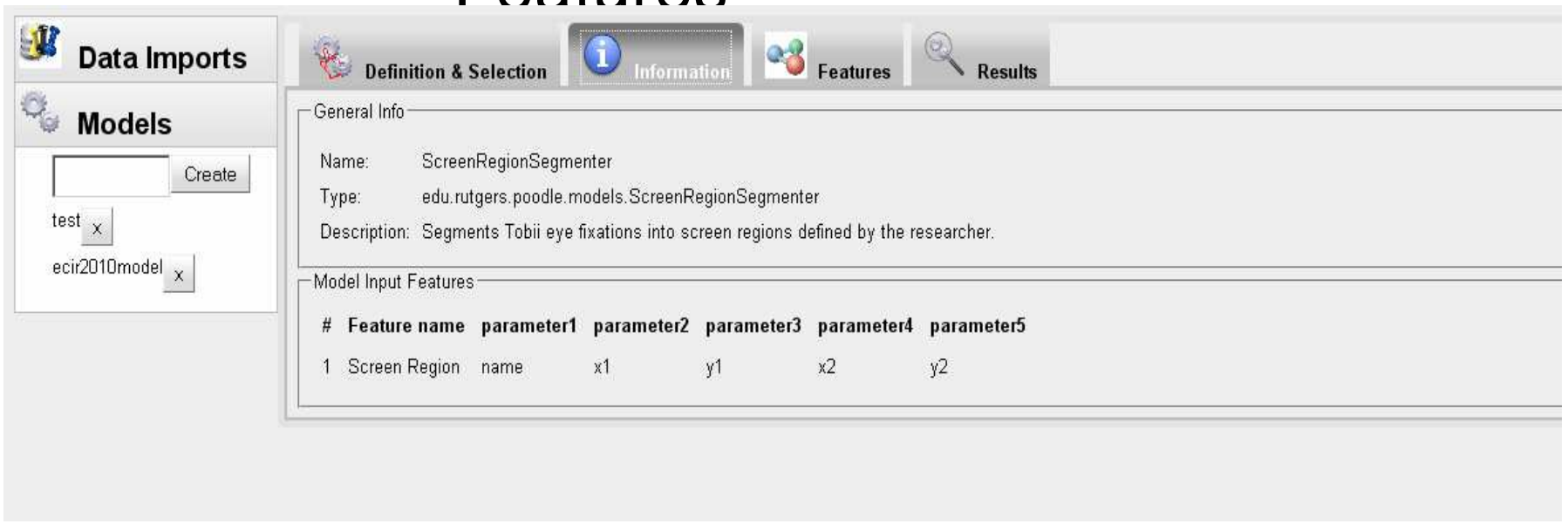

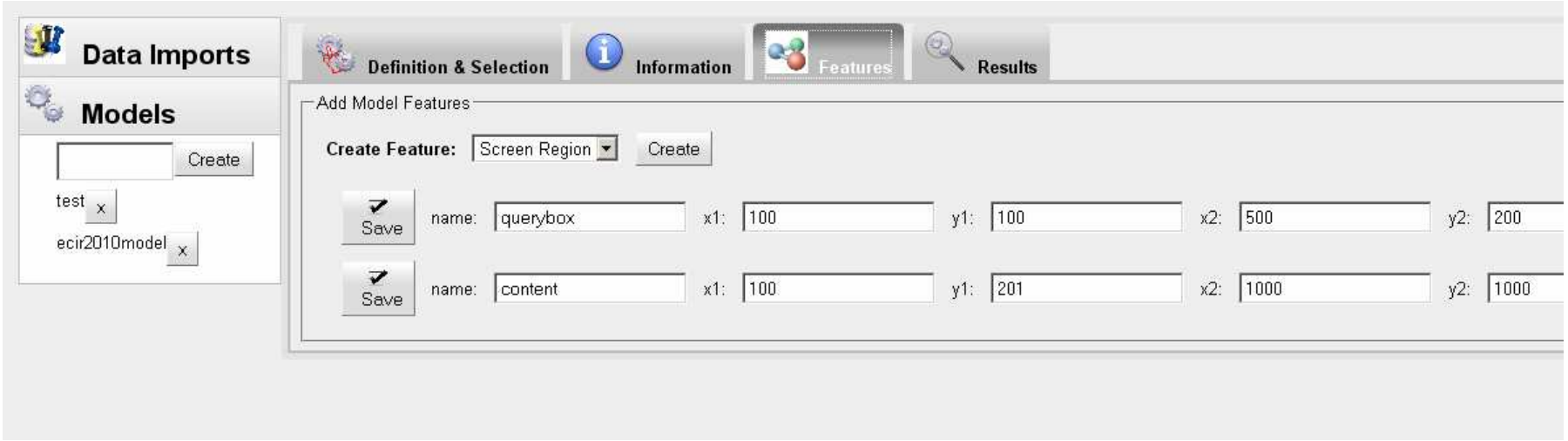

Screenshots (4) – Model Results

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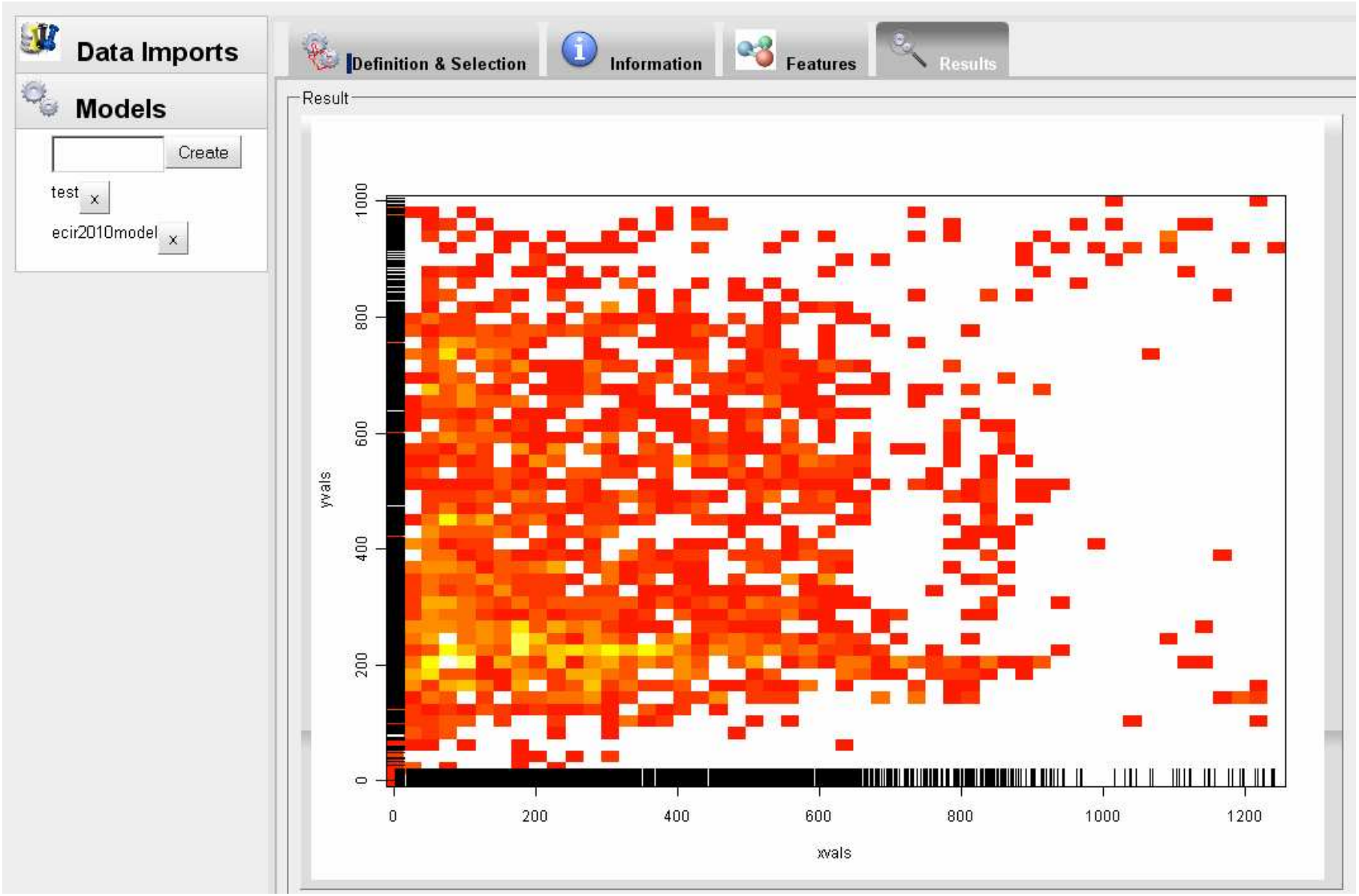

Current State and Future Work

- Context models for the prediction of usefulness
- Software
  - Experiment System prototype completed and will soon be available as open source from http://sourceforge.net/projects/piirexs
  - Analysis System will be released as open source in Fall 2010.
- Demo (on request)
- Feedback?

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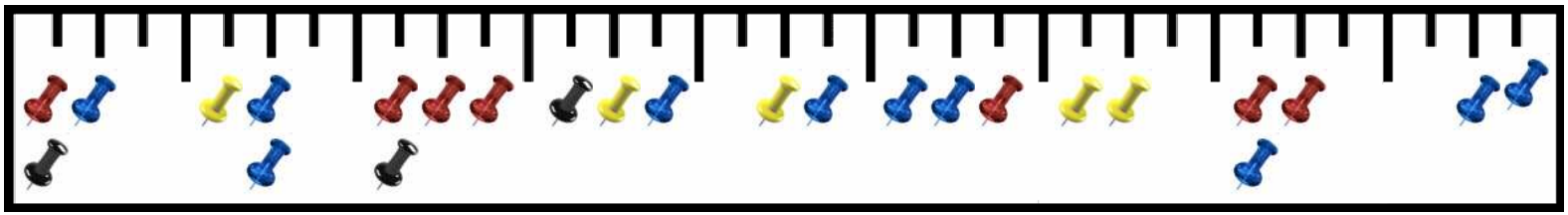
Additional Slides

Definitions

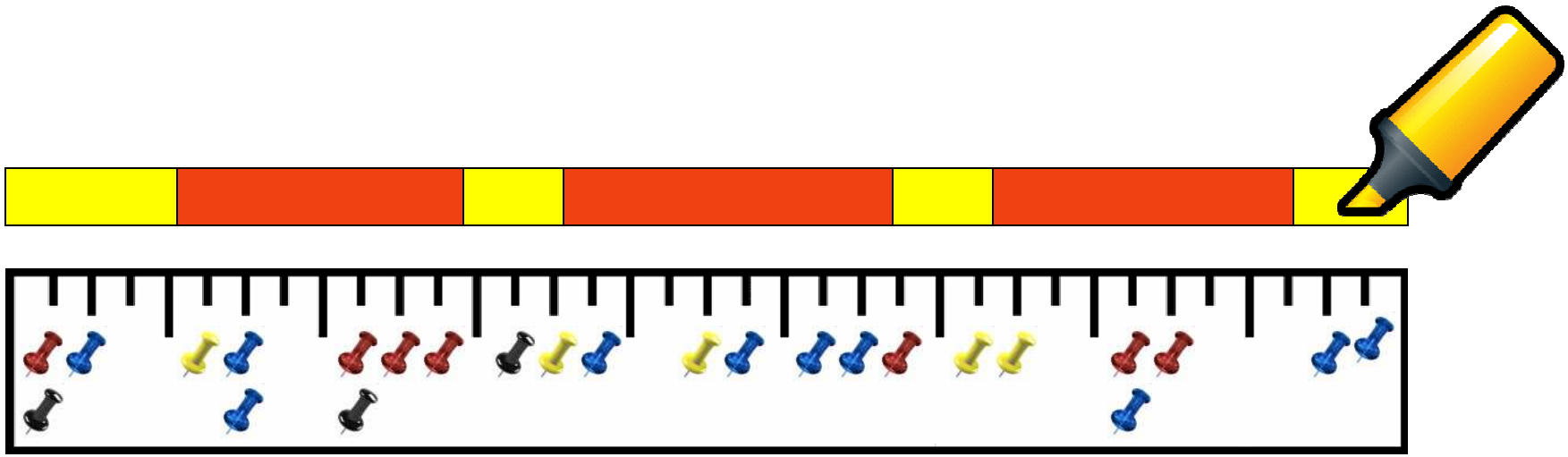
- **What is an event**

  - Unique, single, and smallest unit of activity
  - Marking one point in time (no time span)
  - Synchronized in one time system
  - Simple and no hypothesis
  - Typed by origination (logging source) and categorized in simple sub-types (e.g. mouse move, keystroke)



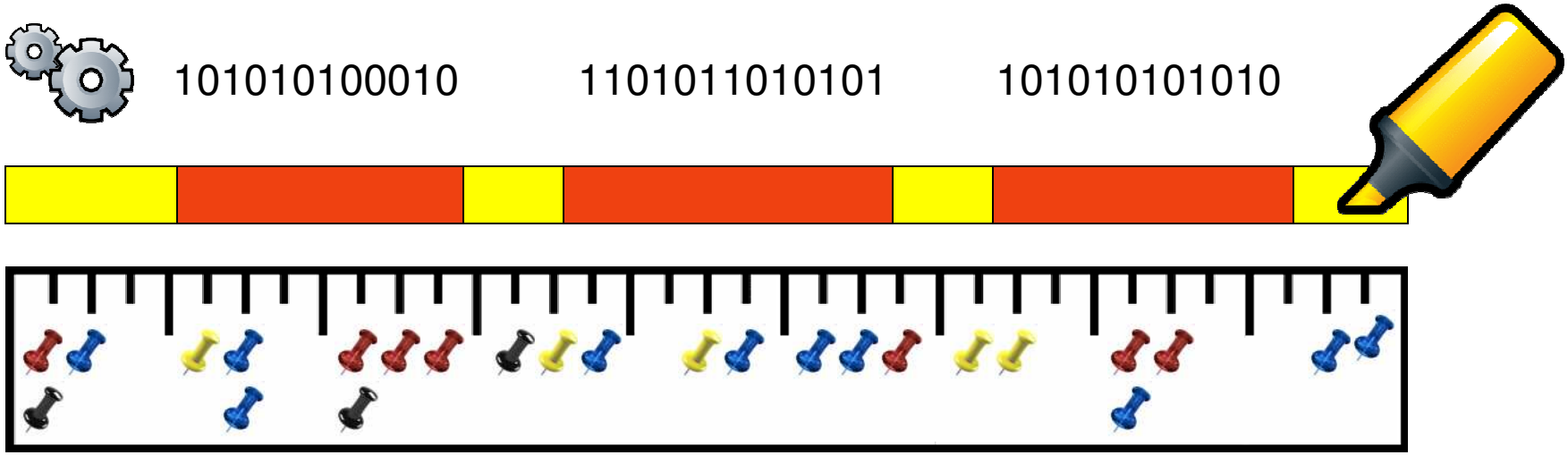
Definitions

- **What is a segmentation?**
  - Categorizes events in semantic groups
  - Pre-conditions event data for modeling
  - Segmentation is a categorization model; many can co-exist and operate on one event data set



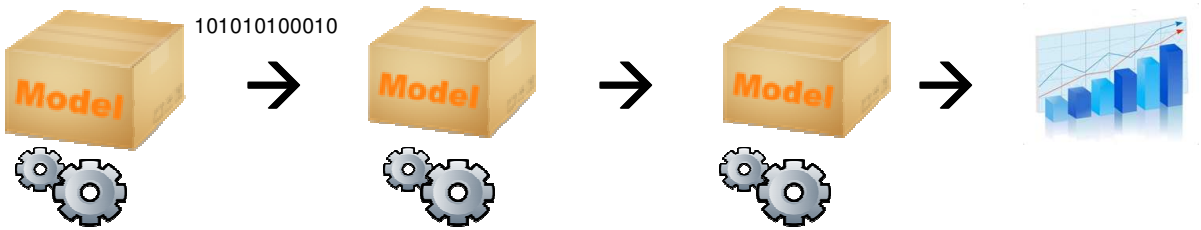
Definitions

- **What is a model?**
  - Defines one or more hypothesis
  - Generates secondary data from events
  - Independent from events
  - Can be based on segmentation

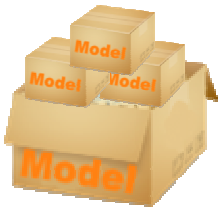


What to do with Models?

- Models can be chained



- Models can re-use other models (Templates/Pattern)



- Models can be adapted or extended