

# I-TUTOR Plugin

## Presentation of the main features

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# Summary

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AI and Learning: an Evolving Relationship

- I-TUTOR project goals
- Plugin design
  - Requirements
  - Original architecture
  - Project constraints
- Plugin implementation
  - Architecture evolution
  - Interaction design
- Description of the plugin
- Conclusions

# I-TUTOR Project goals

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- Use AI in support of the three main actors in a VLE:
  - The instructional designer
    - When he/she has to design the course, and describe the course domain
  - Human tutor
    - When he/she has to gain quick access to (holistic) information related to the evolution of students and/or groups in the VLE
  - Student
    - When he/she has to use metacognition to increase learning performances

# I-TUTOR Project goals

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- Move from a cognition-oriented perspective to a more pedagogical approach in a wider sense
- ITS as *AI enriched VLE*
  - The new system is a community of agents

# Plugin Design

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## ■ Initial requirements 1/3

- I-TUTOR has to extend one of the most widespread VLE
- I-TUTOR has to support the instructional designer with a suitable author tool
- I-TUTOR has to collect data for monitoring purposes:
  - Entry dates;
  - Time spent on lessons;
  - What resources they click;
  - Where do they spend the most of the time inside a didactical unit;
  - Activity rate (in forums, chat, ...)
  - ...

# Plugin Design

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## ■ Initial requirements 2/3

- I-TUTOR has to alert the users
  - The student didn't access the system for a given period of time;
  - Deadlines
  - No task completion;
  - Administrative deadlines
  - ...
- I-TUTOR has to profile students with respect to their activity in the VLE, their grades, the number of logs, their social activity ...

# Plugin Design

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## ■ Initial requirements 3/3

- I-TUTOR has to implement a chatbot aimed at posing a few initial questions (i.e. when registering to the system) regarding the preferences of the student about learning materials, in a given list of available media
- I-TUTOR has to visualize parametric charts concerning all the aspects mentioned before according to a variety of metaphors
  - Time-line visualization with different time scales.

# Non functional Requirements

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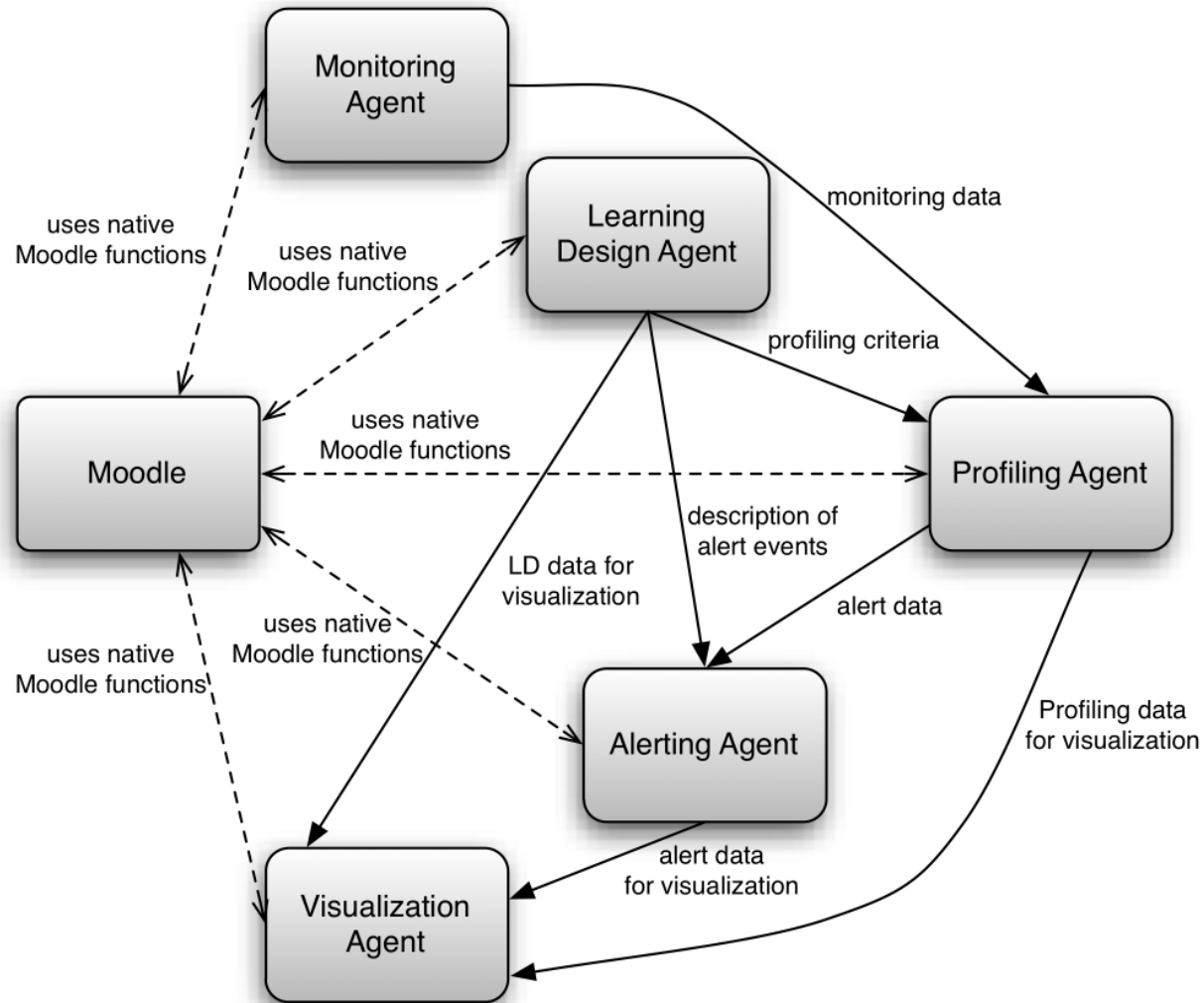
- I-TUTOR has to integrate seamlessly with the original VLE
  - Integrated GUI
  - Transparent control passing mechanisms
  - Efficient communication
  - Implemented as a web architecture
- I-TUTOR has to be a multi-lingual system with versions in English, Greek, Hungarian, and Italian;



# The Agent Community

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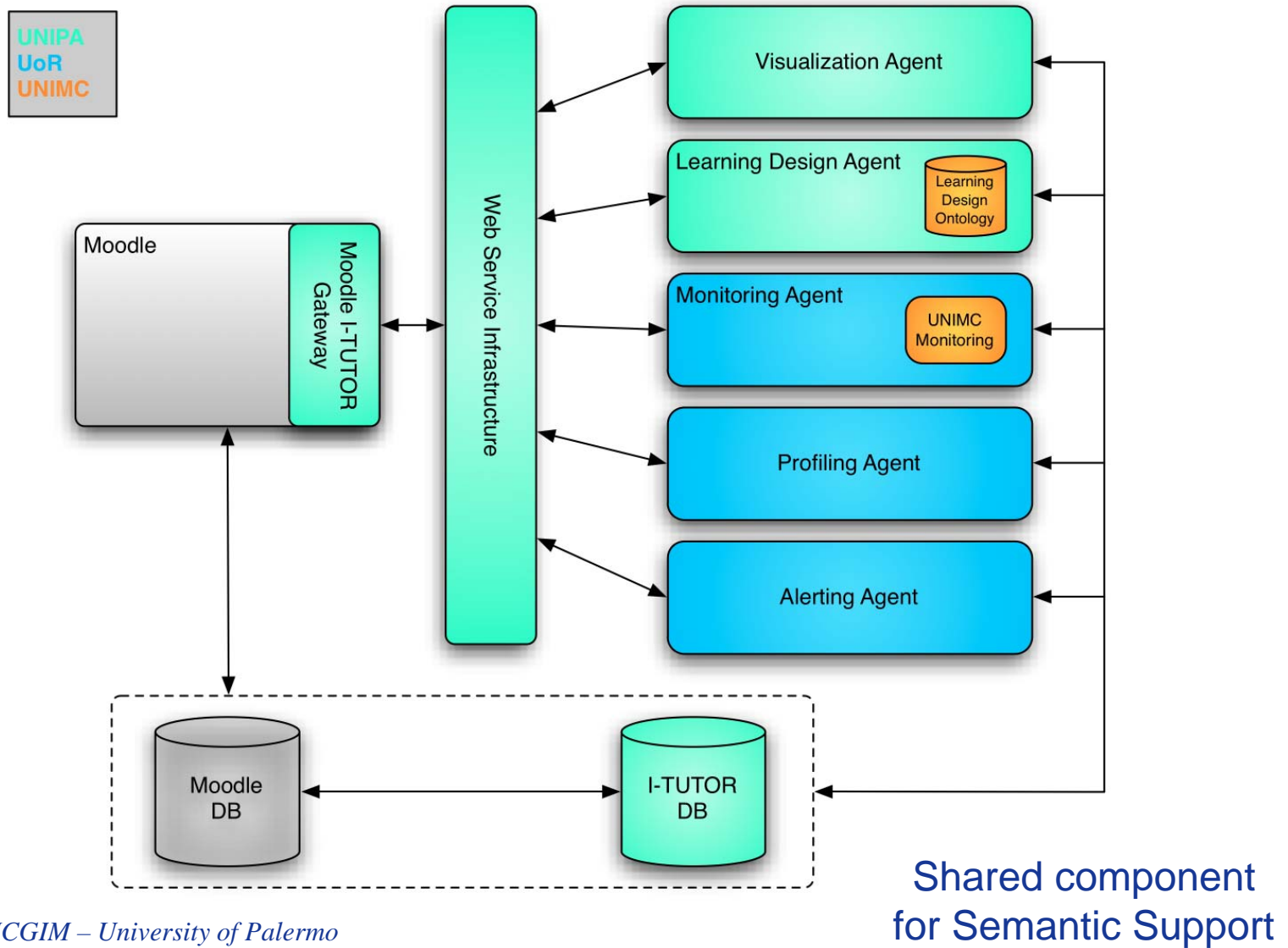
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# The Original Architecture

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# Project constraints

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- Too few months for developing all the functionalities
  - Learning design in its original form was dropped
- Need for having a *real multilingual* software to be delivered the Moodle community
- UML modeling has been accomplished for the most part of the original system

# Plugin Implementation

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- Constraints for interaction design
  - Unskilled users wrt computer-related stuff
    - cultural background
    - Heterogeneous domains of application;
  - Multilingual system
  - quick access to monitoring and/or profiling data to enable decision processes in teachers/tutors
  - people acquainted with web and/or mobile technology so they expect to get excited by the interaction with such a new system.

# Evolutionary prototyping

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- Day-by-day interaction between partners involved in development
- Continuous refinement during the first piloting
- Final test during the second piloting

# Development Guidelines/Techniques

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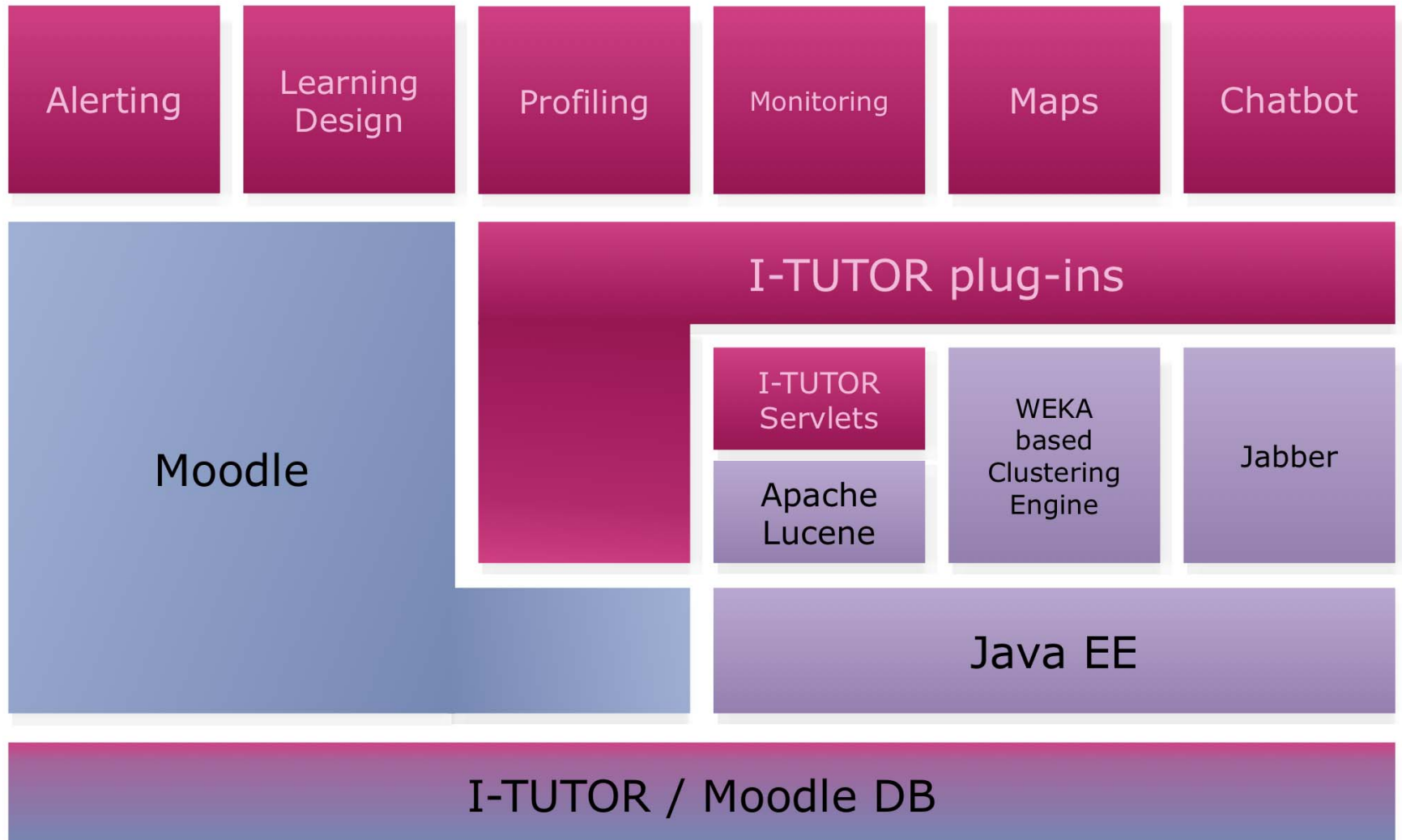
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- Graphic visualization for conveying information: no texts if possible
- Using color gamut for expressing variations and or difference in the parameters to be observed
- Standard W3C technologies (HTML5, SVG, Javascript, CSS3) for managing interaction
- The burden of graphic computation is moved to the client
  - Possible bottlenecks due to concurrent requests

# Plugin implementation

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# Maps

- Represent both course domain and students' activity
- ZUI implemented as an HTML5 *iframe* containing SVG code, produced by a servlet and embedded in a Moodle page
- The teacher *describes* the course relevant item through a suitable document corpus
- Learning materials are *referenced* in the map



# Maps production process

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- Building the document corpus
  - Definitions associated with keywords and extended textual description
  - Original learning materials of the course
- Weighting the keywords
- Semantic analysis
  - TF-IDF + LSA → *Semantic space* where close keywords and/or documents have a high chance of being semantically related

# Maps production process

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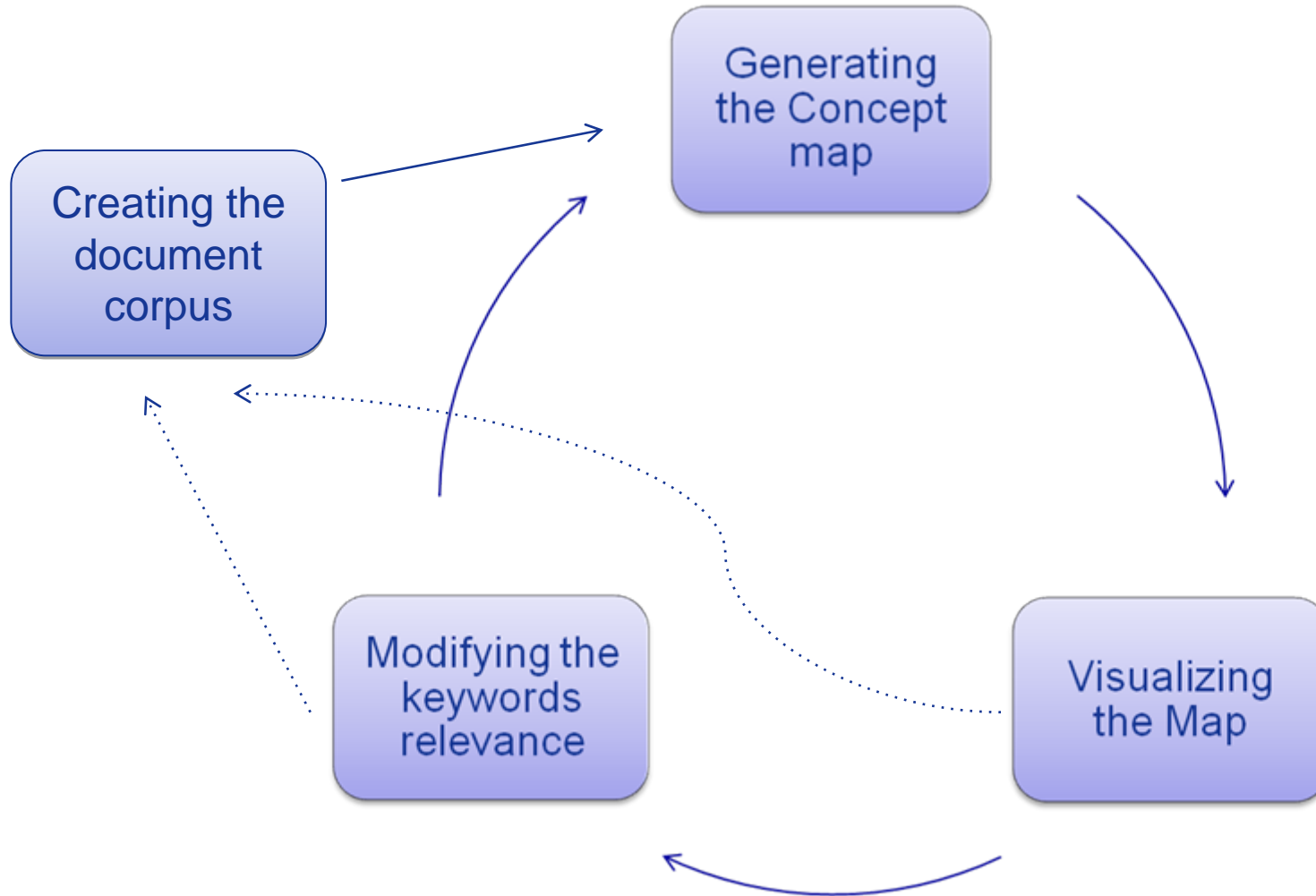
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- Training a Self Organizing Map (SOM) to group documents
- Re-clustering w.r.t. the most relevant keywords associated to close neurons in the SOM
- The whole process can be re-iterated either partially or globally

# Maps production process

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# Concept Map

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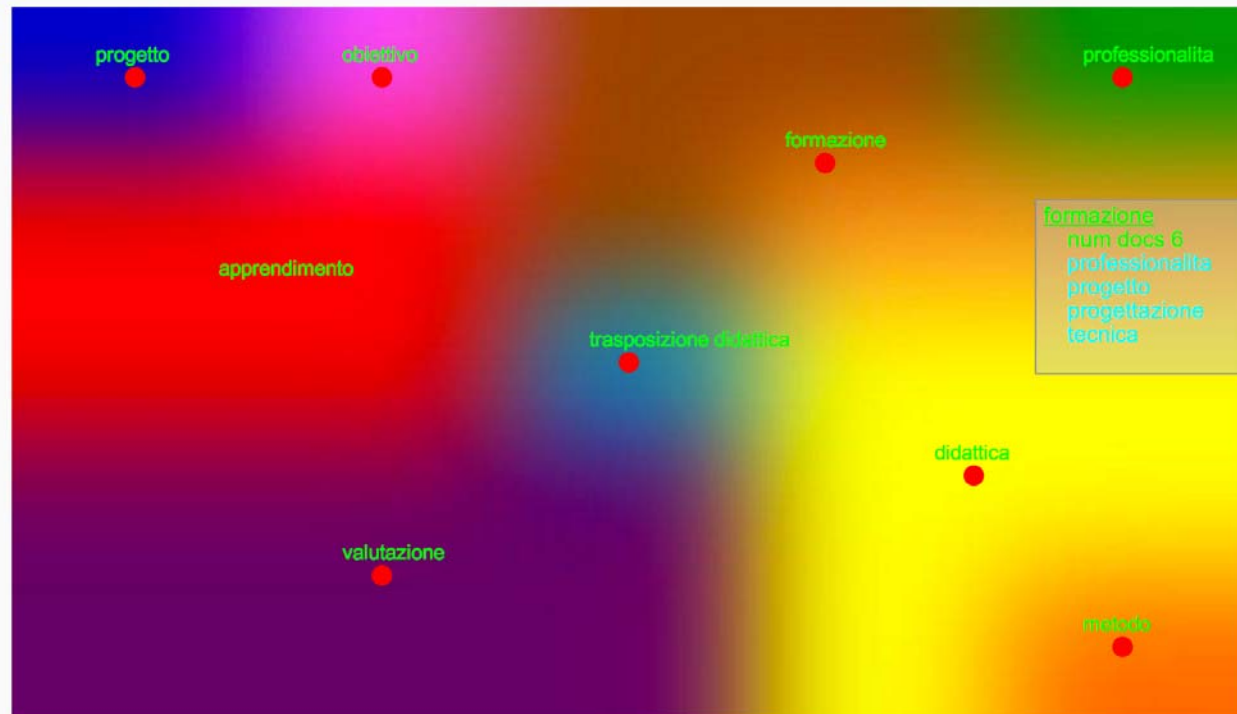
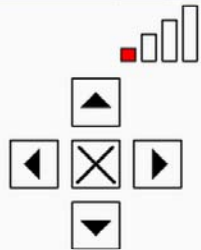
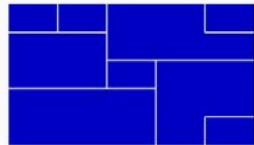
Conceptual Map

Activity Map

Use Maps

Snapshots

## DOMAIN CONCEPTUAL MAPS

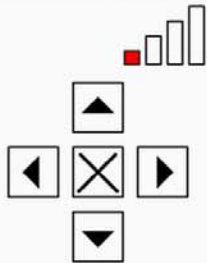
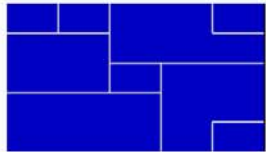


# Activity Map

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## "BRAMUCCI ANNA" ACTIVITY MAPS



# Clustering Engine

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- Implemented on WEKA (now RapidMiner)
- Expectation maximization analysis to cluster student data
  - Number of logs
  - Grades
  - Last access
  - Number of posts
  - ...
- In general 4 clusters:
  - “not at all”, “low”, “on average”, “high”

# Monitoring

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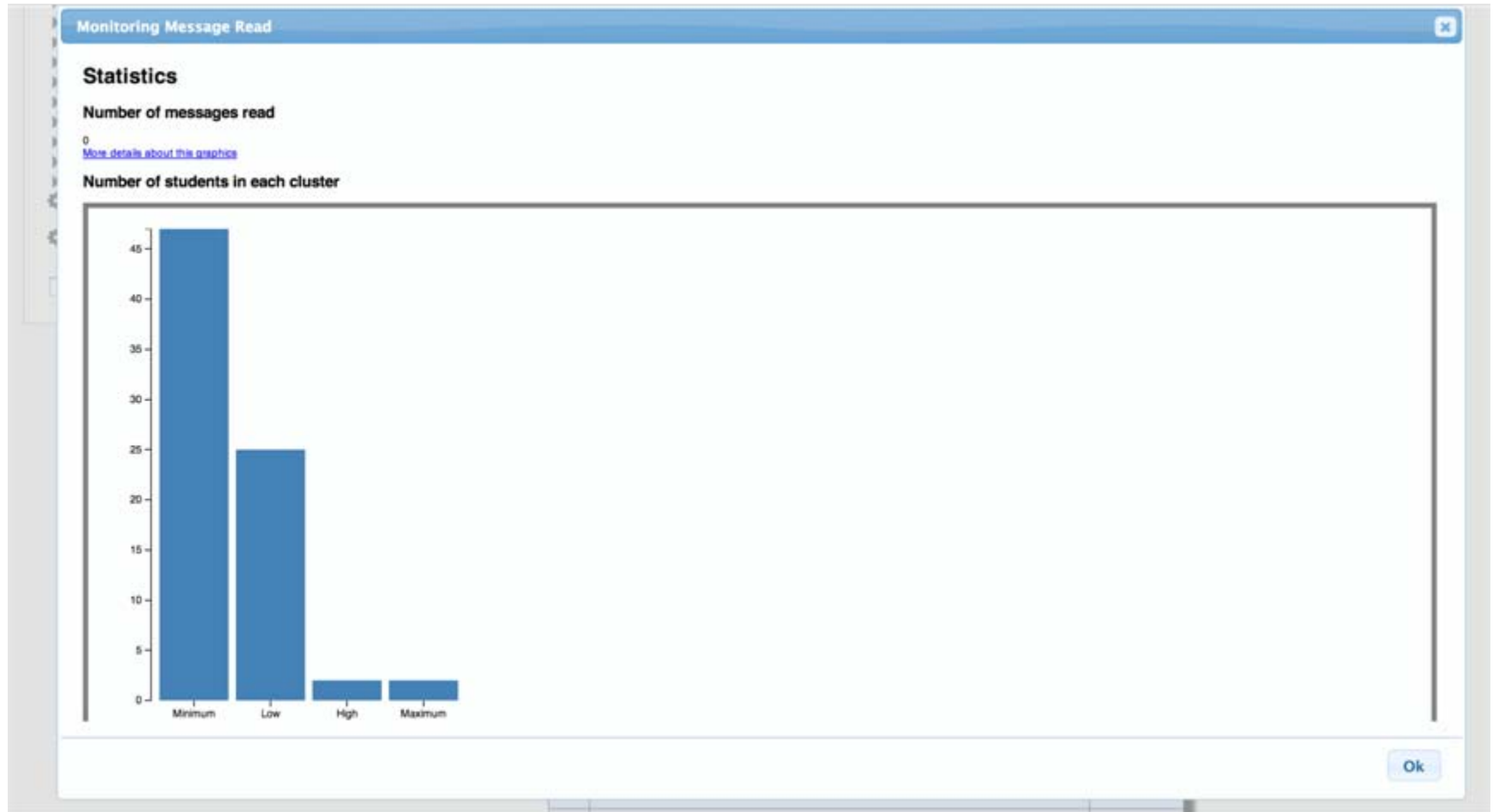
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- Charts to report clustering of students w.r.t. each property investigated by the CE
  - Bars
  - Box plots
- A servlet takes data from the extended DB, and produces a JSP where the D3.js library is used to produce actual charts
- PHP code is used to frame the JSP, and connect all this stuff to the main I-TUTOR plugin

# Monitoring

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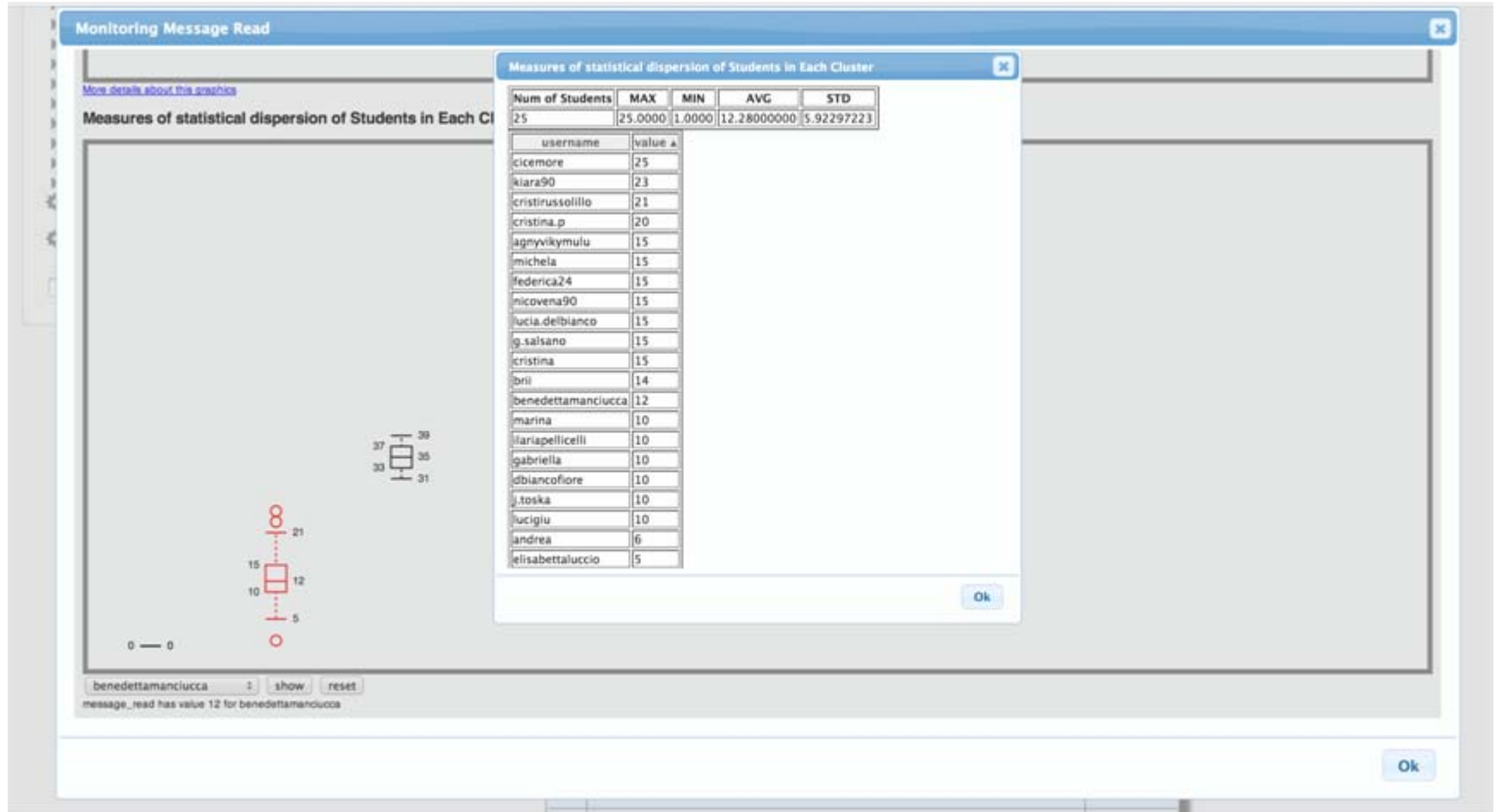




# Monitoring

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# Profiling

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- Radar charts for visualizing a set of indicators of the student's activity
  - Implemented in the same way as Monitoring
- Suitable block plugin for visualizing temporal evolution of an indicator
  - Native Moodle GUI

# Profiling

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# Profiling

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Student selection



Choose which personal report to see :

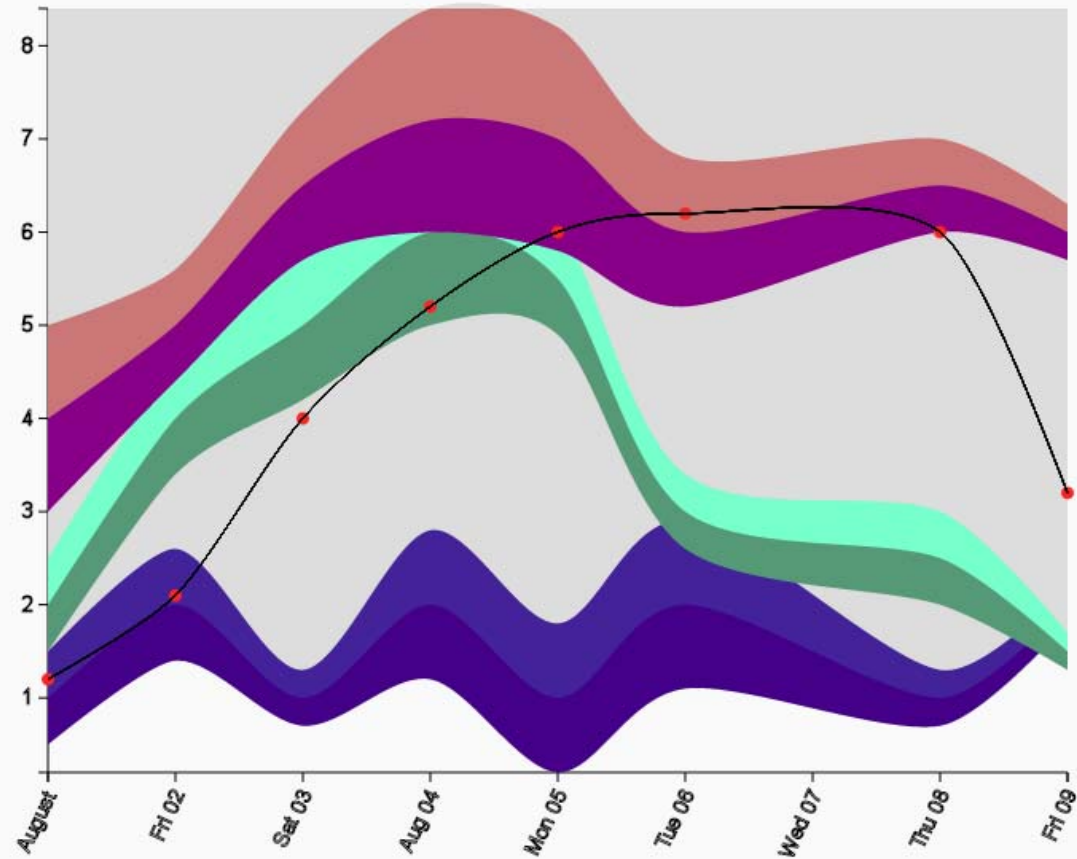
Choose... All days forum\_posts Get these logs



Time period selection



Metric selection



# Alerting

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- Suitable block plugin for composing alert messages based on
  - Date of alert
  - A threshold value on some property for issuing alerts
  - The actual property to be monitored for alerting

# Alerting

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## Add Alert?

Alert day: 30  October  2013

Alert type: Lowest 10% scores in Cluster

Alert data (type of cluster to base alert on): Any activity (Log)

Alert message: Dear student,  
  
The iTutor profiling software has noticed that you have not made much use of the Moodle course set up for your class. Many of your classmates have used the system up to 10 times more often than you have, and you may wish to ask them why they find it useful.

Send to you (if unticked sent to student)

# Conclusions

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- I-TUTOR is still ongoing work
- Learning design
  - Knowledge discovery for eliciting *learning design patterns* shared by different projects
- Extended semantic support
  - Managing texts in deep detail
  - Analysis of chat texts (poor context)
- Refined models for the semantic space