

# Lepton : Literate Executable Papers

Lepton is a tool to **do research** as opposed to publishing reproducible research results. It deals with :

- **everyday tasks** such as programming and writing technical reports
- **reviewing** the methods and results by collaborators and in the long term
- **re-using** source code, input data, research results

Further references :

- **Website** <http://www.math.univ-paris13.fr/~lithiao/ResearchLepton/Lepton.html>  
with program for download, manual, faq, examples
- 2 conference papers
  - Sébastien Li-Thiao-Té. Literate program execution for reproducible research and executable papers. *Procedia Computer Science*, 9(0):439 – 448, 2012. ICCS 2012.
  - Sébastien Li-Thiao-Té. Literate program execution for teaching computational science. *Procedia Computer Science*, 9(0):1723 – 1732, 2012. ICCS 2012.
- A poster + demonstration at ICERM



# Lepton : Reproducible Research

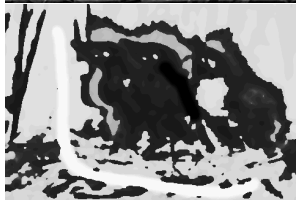
Lepton provides :

- provenance information
  - generated documents contain all the information required to reproduce the results
- executable papers
  - a Lepton file is a program and can be executed on the local machine
- coherence and correctness guarantees
  - Lepton executes commands and automatically embeds their output
  - no copy-and-paste
- literate programming features
  - everything in the same bundle,
  - related items placed in close proximity
  - meaningful chunks
- generated, up-to-date documentation
  - run benchmarks with scripts in any language
  - format the results into tables



# Lepton : In practice

## Image analysis



## Writing source code

### Code chunk 1: «header»

```
bp_typedef
#include <stdio.h>
#include <stdlib.h>
<<bp_typedef>>
```

### Code chunk 2:

```
<<bp_typedef>>
```

```
struct bp_node
{
    gsl_vector * belief;
    gsl_vector * evidence;
    gsl_vector * m_left;
    gsl_vector * m_right;
    gsl_vector * m_up;
    gsl_vector * m_down;
};
```

## Teaching statistics

### Code chunk 3: «R»

```
x = round(runif(5,0,10),1)
cat(x, "\n")
```

Interpret with R

```
1.7 6.2 4.5 7.3 0.8
```

Define the sample mean :

$$\bar{x} = \frac{\sum x_i}{n}$$

Example :

$$\bar{x} = \frac{(1.7 + 6.2 + 4.5 + 7.3 + 0.8)}{5}$$

