



# Lheuristic-A Shiny app to select genes potentially regulated by methylation

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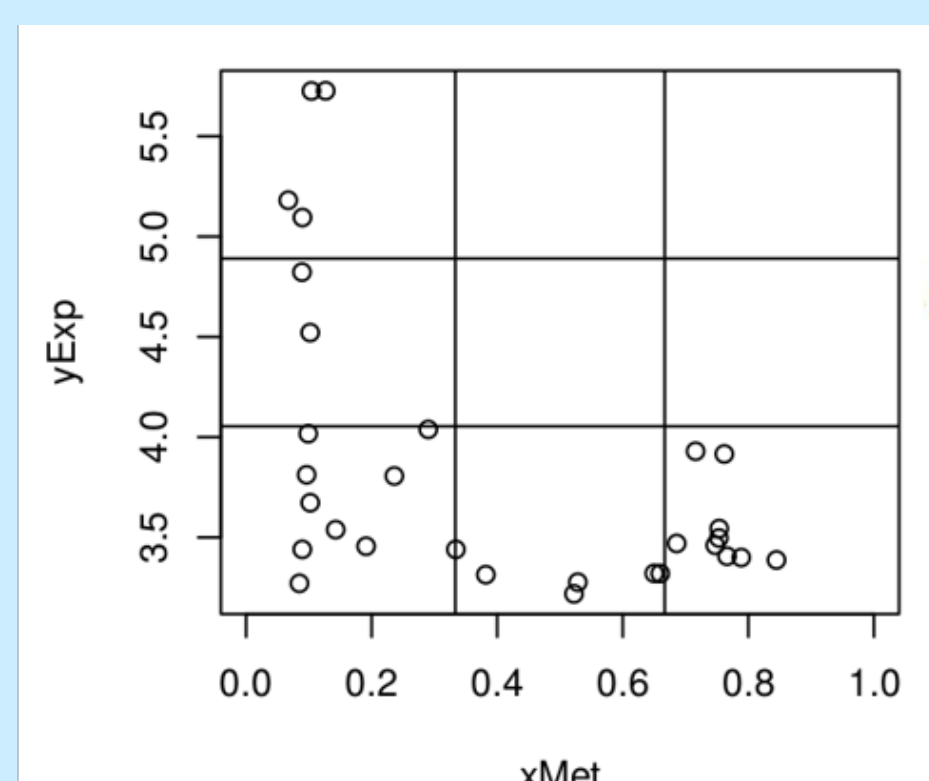
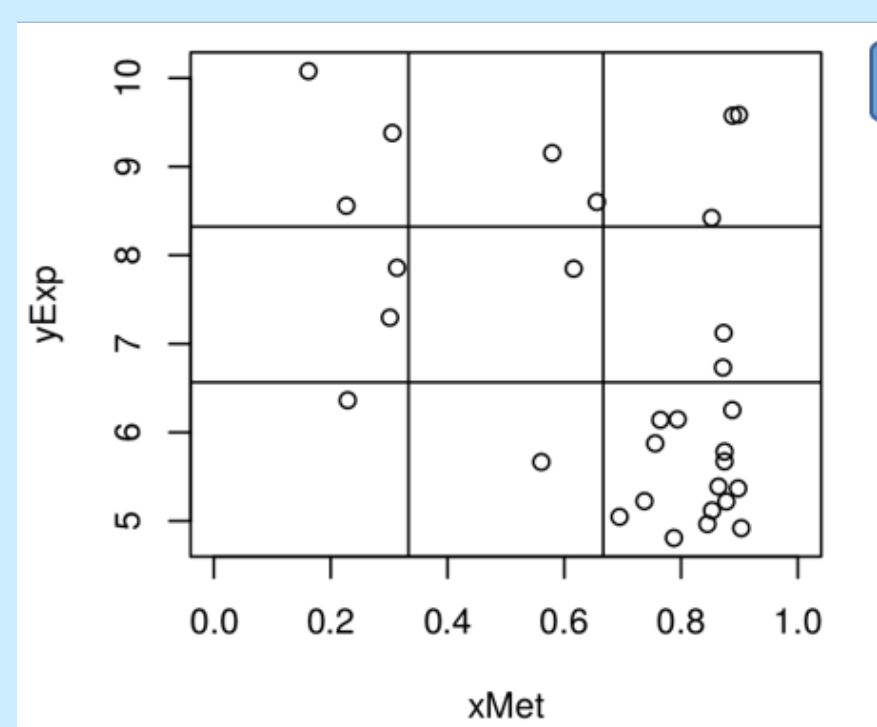


## 1 Background

- Methylation of genes involved in the oncogenic process is a key process contributing to tumor initiation and/or progression [4].
- Finding *Genes Regulated by Methylation* (GRM) can lead to a better understanding and be a guide to finding new drug targets.
- In cancer-related genes it is common to observe a decrease in gene expression associated with hypermethylation.
  - When methylation is low (“off”) the gene can express normally and its expression may be any value, low or high,
  - when methylation is medium or high (“on”), the expression of the gene will be *repressed* and its values will tend to be low .
- As a consequence relation plots depicting methylation and expression may show L-shape patterns so the strategy adopted will be to mine such plots and select those that have such a shape.

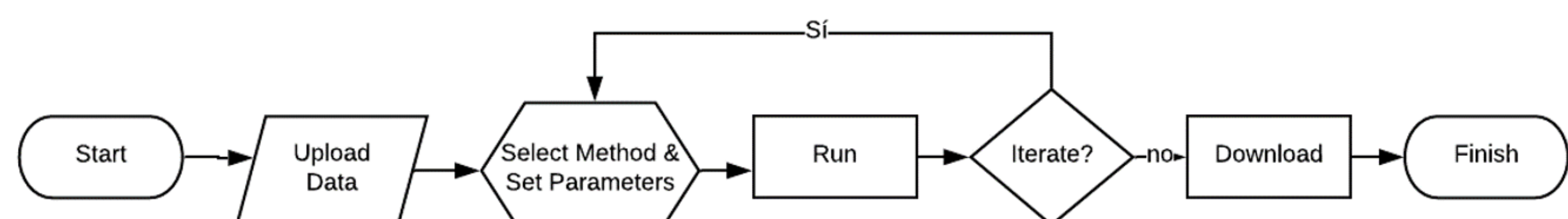
## 2 Results

- We developed a heuristic method based on imitating the visual selection of L-shapes by superimposing a  $3 \times 3$  grid on the scatterplot ([5]).

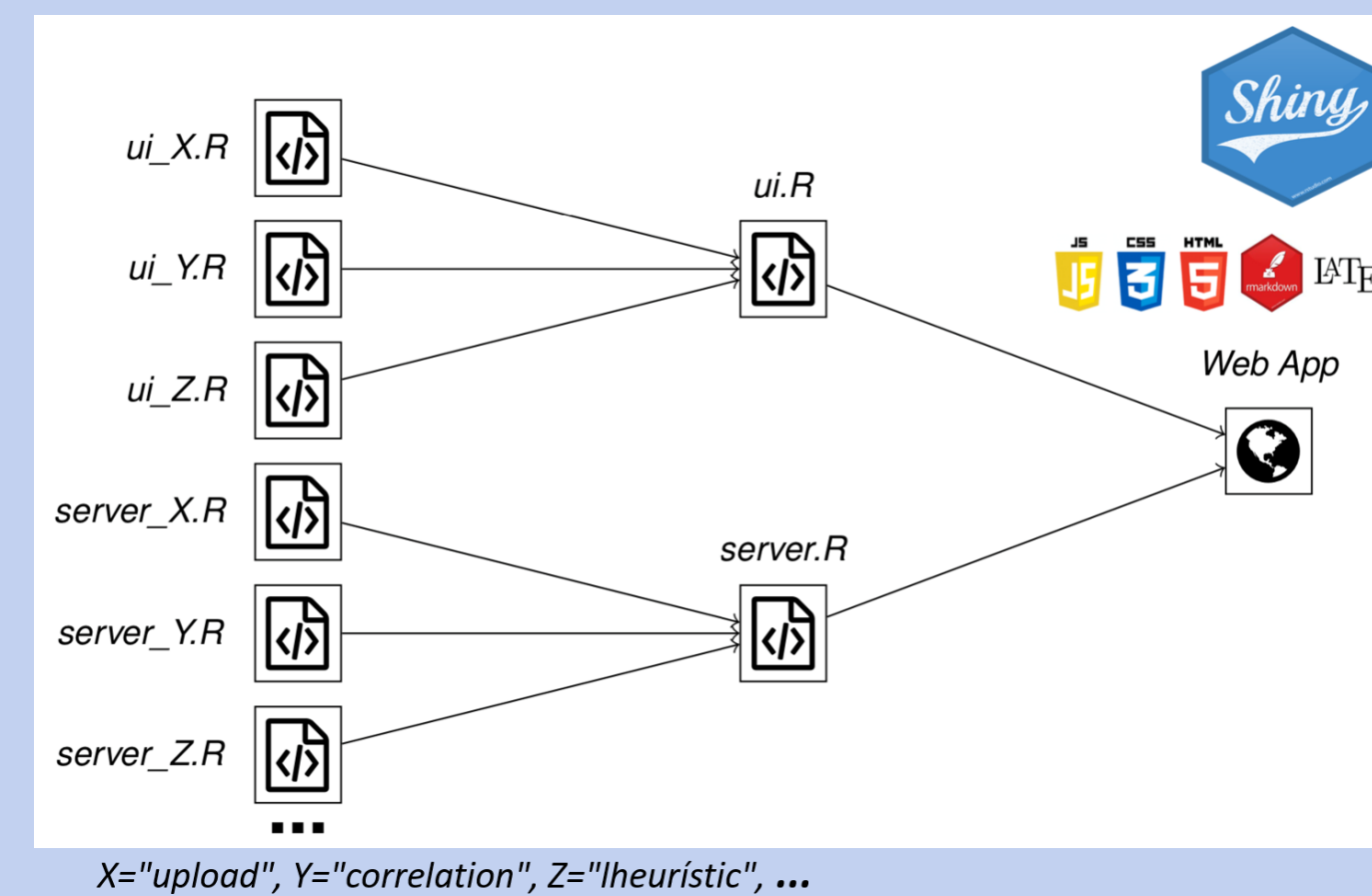


- The algorithm has been implemented in R (package ready-to-be-submitted to Bioconductor).
- A Shiny application has been created to select genes potentially regulated by methylation using a combination of the *Lheuristic* method and a *naïve* approach (negative correlation).
- Code is available in github:  
<https://github.com/pcastellanoescuder/Lheuristic>
- The application is available in:  
<http://cinna.upc.edu:3838/alex/lheuristic>

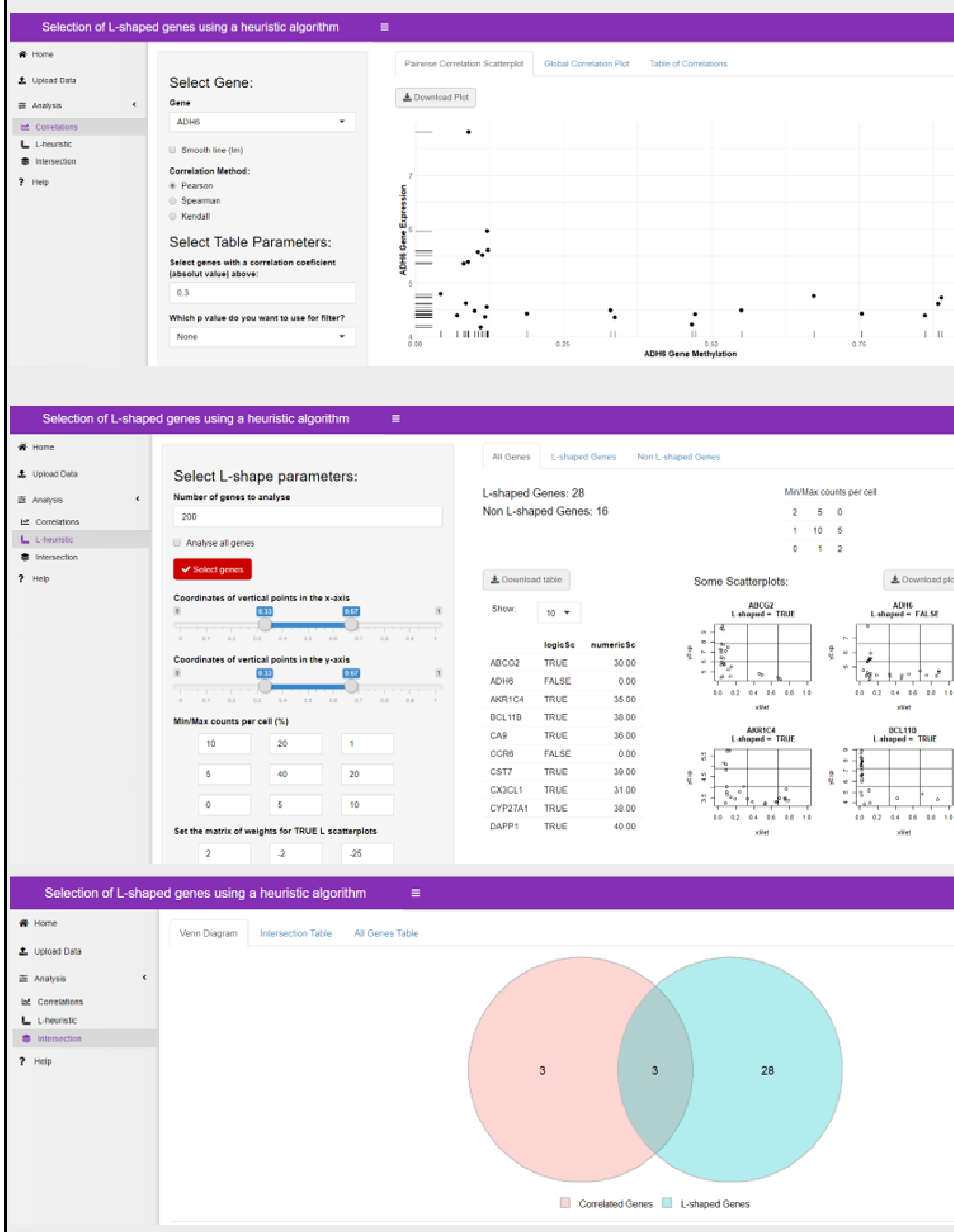
## 3 App Usage



## 4 App architecture



## 5 Interface



- [1] Sarah Bazzocco, Hafid Alazzouzi, M. Carme Ruiz de Villa, Alex Sanchez-Pla, John M. Mariadason, Diego Arango (2013) *Genome-Wide Analysis of DNA Methylation in Colorectal Cancer*. Submitted.
- [2] Yihua Liu and Peng Qiu. (2012) *Integrative analysis of methylation and gene expression data in TCGA* IEEE International Workshop on Genomic Signal Processing and Statistics (GENSIPS)
- [3] Jeffrey Racine. (2012) A primer on regression splines.  
[http://cran.r-project.org/web/packages/crs/vignettes/spline\\_primer.pdf](http://cran.r-project.org/web/packages/crs/vignettes/spline_primer.pdf)
- [4] B Sadikovic, K Al-Romaih, J.A Squire, and M Zielenska. Cause and Consequences of Genetic and Epigenetic Alterations in Human Cancer. *Current Genomics*, 9(6):394–408, September 2008.
- [5] Sanchez-Pla, A., Miró B., Carmona, F. et al. *A heuristic algorithm to select genes potentially regulated by methylation* [version 1; not peer reviewed]. F1000Research 2019, 8:1017 (slides) (doi: 10.7490/f1000research.1116986.1)