MEAL “2”: story of a software package

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Problem 1

- Different methods to analyze methylation data
- Not easy to run all in the same dataset
  - Different packages
  - Different input and output objects
  - Different parameters names
  - Different visualization of results
Solution 1

- Develop **MEAL** package
- Includes wrappers to methylation data analyses
  - limma, DiffVar, bumphunter, blockFinder, DMRcate, RDA
  - Same input object (GenomicRatioSet – minfi package)
  - Common parameter names
  - Run several methods with one function
- Includes commonly used plots
  - Violin plot, Manhattan, QQplot...
- Uses single class to encapsulate all type of results
  - ResultSet – MultiDataSet package
**ResultSet**

- Stores data required to make plots and produce results
  - Analysis results
  - Feature data
- Unique methods to get results and plots
- Can store results from different methods
- New plot with different layers of information

Joint work with Carles Hernandez-Ferrer
Problem 2

- Changes in methylation can produce changes in gene expression
- Some methods in MEAL are common for gene expression and methylation data
  - Limma, DiffVar and RDA
- Co-analysis of expression and methylation
Solution 2

- Adapt **MEAL** wrappers to also accept expression data
  - Accept ExpressionSet and SummarizedExperiment
- Add plot to simultaneously show *methylation and expression* analysis results
Annotation
Region
Results

Different
Mean
Results

Different
Variance
Results

Methylation
Gene expression
Take-home message

- **MEAL** is a package that eases performing methylation and gene expression data analyses
  - Homogenizes input and output
  - Includes plots to easily visualize results
  - Includes a new plot to simultaneously visualize gene expression and methylation results
True story

1. Encapsulates functions to run methylation analysis
2. Implement classes to manage methylation data and results
3. Encapsulate functionality in a package (MEAL)
4. Add new functionalities 1
5. Add new functionalities 2
6. ...

- **Problem**: design of original package was not prepared for new functionalities
- MEAL “2”?  
  - major changes to original package
  - remove of original functions and substitution of classes
Questions

- New package or new version?
- If new version:
  - New main version or new subversion?
  - Deprecate old names functions?
  - Maintain compatibility with old result classes?
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