

Life science & technology

# Project Bioinformatics II

Designing and implementing a web interface for  
microarray design

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# Presentation Overview

- Microarray design
- The web
- User interface
  - Input/Output
  - Help
- Java & R
- Demonstration of the web
- Future perspective

# Microarray design

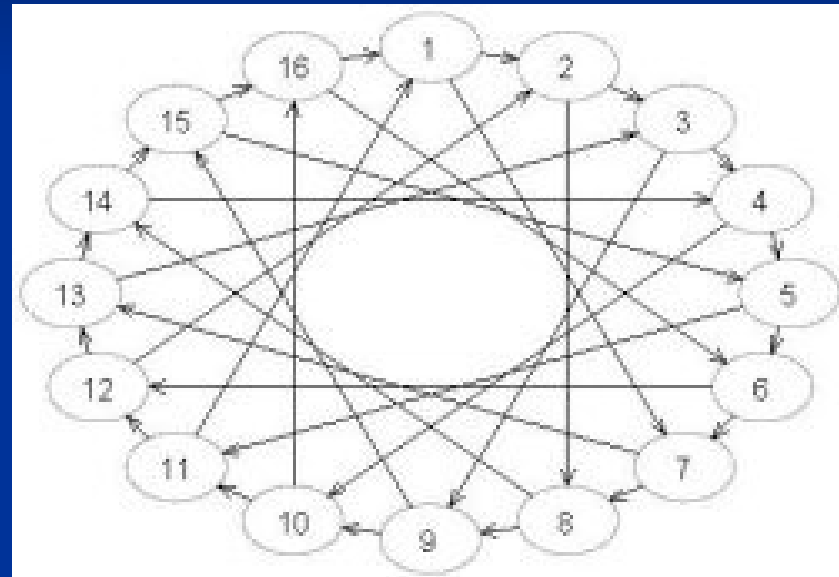
Selecting the right individuals for the experiment...

- Random Selection
- Selective profiling
  - Select the most dissimilar individuals
  - Marker specific

# Microarray Design

Allocating individuals to the slides...

- Random design
- Reference design
- (interwoven) Loop design



# Microarray Design

Allocating individuals to the slides...

- Generalized Experimental Design Model

$$y_i = a + Q_i + F_i^{(1)} + F_i^{(2)} + F_i^{(3)} + QF_i^{(1)} + QF_i^{(2)} + QF_i^{(3)} + F^{(1)}F_i^{(2)} + F^{(1)}F_i^{(3)} + F^{(2)}F_i^{(3)} + QF^{(1)}F_i^{(2)} + QF^{(1)}F_i^{(3)} + QF^{(2)}F_i^{(3)} + F^{(1)}F^{(2)}F_i^{(3)} + QF^{(1)}F^{(2)}F_i^{(3)} + e_i$$

# Microarray Design

- Complexity
  - # of variables
  - # of markers

# Enviromental factors	# of variables
0	1
1	3
2	7
3	15
N	

# Microarray Design

## Optimality criterion

- Weighted generalized A/D-optimality

## Optimization methodes

- Simulated annealing
- Metropolis Hasting

# Microarray Design

Allocating individuals to the slides...

- Advantages:
  - Higher power
  - G.E.D. : scoring on genetic difference
  - Whole genome v.s. Chromosome or Region

# The web

## Advantages:

- Project Milestone
- Presentation of results all over the world
- Easy to use for users
- Newest algorithms



# User Interface

## Input

### HTTP-Post to a java servlet

- Directly through html-inputs website
- From other website
- Integrated into a stand alone application

# User Interface

## Input

- Simple value's (integers, chars, strings)
  - e.g. individuals, methods, # array
  - Also weight of each factor
- Genome File upload
  - Marker-selection
    - 1 or more chromosomes
    - marker specific
  - Genetic information for each individual


# User Interface

## Output

- Selective profiling
  - List of individuals to select
- G.E.D.
  - .jpg picture of the simulated annealing process
  - summary .PDF/.XSL file

# User Interface

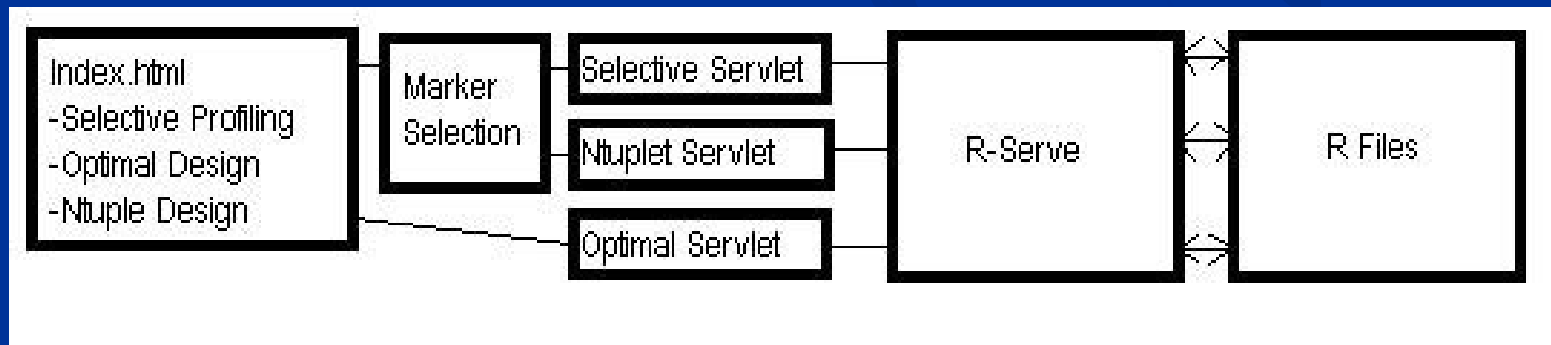
## Help

- Help-icon when help is available 
- Client side JavaScript to unhide the selected help
- Help text always in html so findable by search engines

# Java & R

## Glue it together

- Java servlets
  - Receive user input
  - Check input for errors
  - Communicate with R
  - Build result page



# Java & R

## Glue it together

- R-serve
  - load libraries
  - execute R
  - save pictures & files
- R scripts
  - Contain the algorithm
  - Replaceable with new versions

# Java & R

## Glue it together

- Error Handling
  - Check before sending it to R-serve
  - Notify user that they did something wrong
- File Management
  - \User\Upload folder for (genome) file uploads
  - \User folder for generated results
  - Upload of files always HACKER-prone

# Demonstration

- [Http://129.125.143.175/BioInf/](http://129.125.143.175/BioInf/)

# Future perspectives

- Exhaustive testing
- More design methods
- User-specific job handling
- Alternative for R-Serve
  - Java library with R-connectivity
  - R based web server

# Questions/Suggestions

