

Potential projects for students at the Msc level in the regulatory genomics group:

<http://regulomics.mimuw.edu.pl>

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1) Mapping contacts between regulatory regions and genes in the samples from human brain tumors: applied data analysis, likely to be published (eventually), close collaboration with biologists.

2) Development of algorithms for chromosome contact matrices analysis (segmentation, de-convolution, normalization): design and implementation of new or modified methods for chromosomal contact matrices (large, symmetric, non-negative). Some linear algebra and quite a bit of algorithm optimization. The developed software will be made publicly available.

3) Evolution of gene regulation – mapping of regulatory relations across species: applied data analysis in a hypothesis-driven project. There are two hypothesis of how regulatory domains have evolved. The data is in for several organisms now. It can be tested by statistical analysis.

4) Machine learning for regulatory element detection: lots of small projects related to improvements in the already published methods by the group. Applications and modifications of models involving Bayesian methods and Random Forests

5) Monte Carlo Simulations of chromosome structure: a new project in the group. Further development of efficient software for long polymer simulations (haskell and python code). Some biological hypotheses to test.