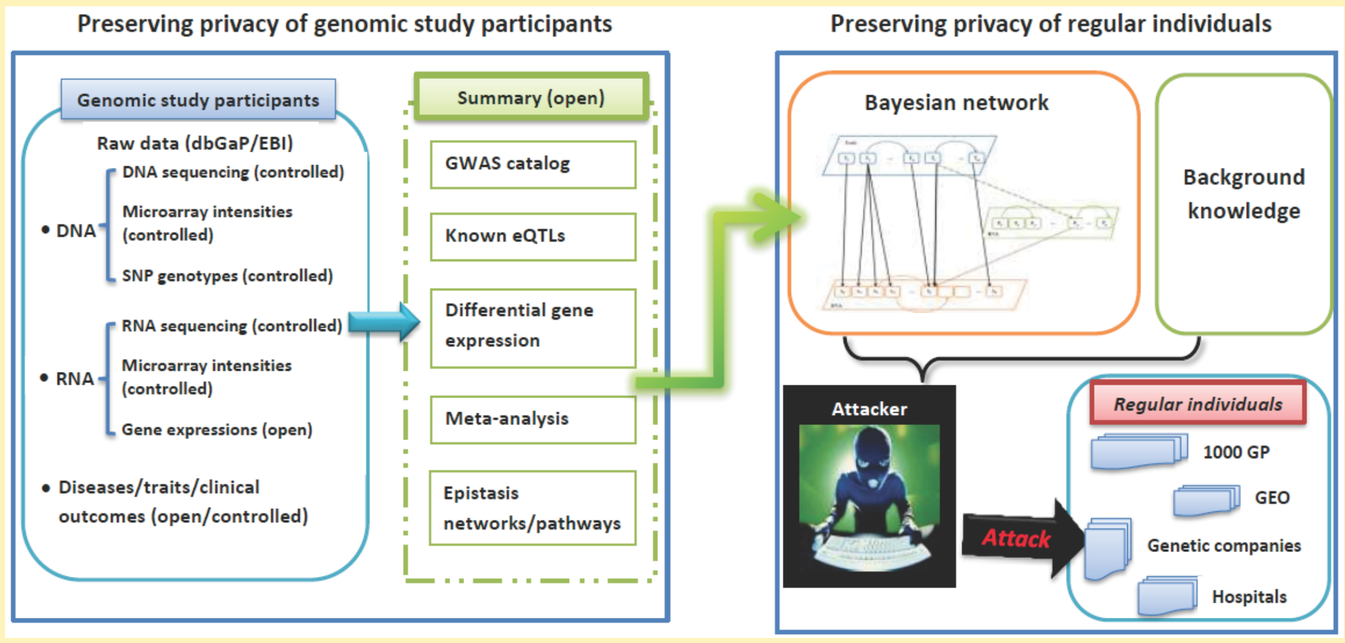
Enhancing Education in Genetic Privacy

Xintao Wu, Univ. of Arkansas, Xinghua Shi, UNC Charlotte
http://csce.uark.edu/~xintaowu/GeneticPrivacy/

This project will enhance education in genetic privacy from both technical and regulatory perspectives and has three thrusts:

- Build an education framework for genetic privacy protection
- Design course modules dedicated to enhance education of genetic privacy in CS, bioinformatics and genomics
- Develop hands-on projects for genetic privacy infringement and protection



Approach

- Build an integrative framework for protecting privacy of both study participants and regular individuals
- Leverage the use of differential privacy and Bayesian network based attack modeling techniques
- Develop an integrative Web-portal
- Develop course modules on genomic data analysis, privacy breaching techniques, ethics, regulations, laws, and pertinent techniques about genetic privacy protection.
- Develop hands-on projects on privacy infringement and protection using genomic data

Preserving privacy of study participants

- Apply differential privacy (DP) to provide rigorous privacy guarantees when publishing GWAS statistics and/or conducting meta, epistasis, and eQTL analysis
- Incorporate state-of-the-art DP solutions, e.g., divide-and conquer, smooth sensitivity, exponential mechanism, and function perturbation

Preserving privacy of regular individuals

- Construct a multi-layered Bayesian network by extracting the information contained in GWAS catalog, known eQTLs and analytical results
- Model various attacks as the inference over conditional dependencies among SNPs, genes, and traits

Course modules & hands-on projects

- Genomic data analysis (GWAS, eQTL, etc.)
- Genetic privacy breaching techniques
- Ethics, regulations, laws about genetic privacy protection
- Privacy preservation techniques including differential privacy preservation and cryptographic solutions

Evaluation and dissemination

- Evaluate in two graduate courses at Arkansas and UNC Charlotte by two evaluators, collaborators and participating faculty
- Develop a useable and effective Web-portal
- Design a suite of effective course modules and hands-on projects
- Enhance and enrich genetic privacy nationwide

Interested in meeting the PIs? Attach post-it note below!

National Science Foundation
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NSF Secure and Trustworthy Cyberspace Principal Investigator Meeting
Jan. 9 -11th 2017
Arlington, VA
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