PORTIA: Privacy, Obligations, and Rights in Technologies of Information Assessment

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Erosion of Privacy

“You have zero privacy. Get over it.”
- Scott McNealy, 1999

• Changes in technology are making privacy harder.
  – increased use of computers and networks
  – reduced cost for data storage
  – increased ability to process large amounts of data

• Becoming more critical as public awareness, potential misuse, and conflicting goals increase.
Abuses of Sensitive Data

• Identity theft

• Loss of employment, health coverage, personal relationships

• Unfair business advantage

• Potential aid to terrorist plots
Historical Changes

- Small towns, little movement:
  - very little privacy, social mechanisms helped prevent abuse

- Large cities, increased movement:
  - lost social mechanisms, but gained privacy through anonymity

- Now:
  - advancing technology is reducing privacy, social mechanisms not replaced.
What Can We Do?

• Use technology, policy, and education to
  – maintain/increase privacy
  – provide new social mechanisms
  – create new models for better understanding

Problem: Using old models and old modes of thought in dealing with situations arising from new technology.
What is Privacy?

- Means different things to different people
  - seclusion: the desire to be left alone
  - property: the desire to be paid for one’s data
  - autonomy: the ability to act freely
Product Design as Policy Decision

• product decisions by large companies or public organizations become de facto policy decisions

• often such decisions are made without conscious thought to privacy impacts, and without public discussion

• this has been particularly true in the United States, where there is not much relevant legislation
Example: Metro Cards

Washington, DC

- no record kept of per card transactions
- damaged card can be replaced if printed value still visible

New York City

- transactions recorded by card ID
- damaged card can be replaced if card ID still readable
- have helped find suspects, corroborate alibis
The PORTIA Project

*Privacy, Obligations, and Rights in Technologies of Information Assessment*

A five-year multidisciplinary project focusing on the technical challenges of handling sensitive data and the policy and legal issues facing data subjects, data owners, and data users.

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PORTIA Personnel

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PORTIA Personnel

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PORTIA Goals

• Produce a next generation of technology for handling sensitive information that is qualitatively better than the current generation’s.

• Enable end-to-end handling of sensitive information over the course of its lifetime.

• Formulate an effective conceptual framework for policy making and philosophical inquiry into the rights and responsibilities of data subjects, data owners, and data users.
Major Technical Themes

• privacy-preserving data mining
• identity theft and identity privacy
• database policy enforcement tools
• managing sensitive information in P2P systems
• using trusted platforms to provide trusted privacy-preserving services
• contextual integrity
Privacy-Preserving Data Mining

Allow multiple data holders to collaborate to compute important information while protecting the privacy of other information.

- Security-related information
- Public health information
- Marketing information
- etc.

Technological tools include cryptography, data perturbation and sanitization, access control, inference control, trusted platforms.
Advantages of privacy protection

• protection of personal information

• protection of proprietary or sensitive information

• enables collaboration between different data owners (since they may be more willing or able to collaborate if they need not reveal their information)

• compliance with legislative policies
Cryptography and Secure Computation

• Cryptography is a very useful tool.

• But, cryptographic secure multiparty computation definitions are both too strong and too weak for privacy-preserving data mining:
  
  – Too strong: do not allow leakage of innocuous information, and pay the price in efficiency.

  – Too weak: do not address leakage or misuse caused by the function itself (e.g., info implied by the outputs, misbehavior in choosing an input, poorly chosen ideal functionality).
Potential Integration

- Secure computation to protect critical data
Potential Integration

- Secure computation to protect critical data
- Perturbation or aggregation to protect possibly sensitive data
- No protection on completely innocuous data
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- Secure computation to protect critical data
- Perturbation or aggregation to protect possibly sensitive data
- No protection on completely innocuous data
- With policies, access control and inference control to prevent additional leakage
Potential Integration

Problems:

• How to determine which information is critical, possibly sensitive, innocuous?

• How to define appropriate policies?

• How to handle conflicting goals and desires?

• How to determine identities for access control?
Contextual Integrity

• Contextual integrity can help clarify privacy concepts: what are norms, expectations, and contractual obligations in various settings (and what *should* they be)?

• May be a helpful starting point for formalizing mathematical privacy definitions that allow for finer granularity than “output-only” crypto definitions.
Summary

- Increasing use of computers and networks has led to a proliferation of sensitive data.

- Without proper precautions, this data could be misused, misinterpreted, or mismanaged.

- The PORTIA project aims to develop a comprehensive, end-to-end technological infrastructure for handling sensitive data throughout its lifetime.