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

- Academic investigators:
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  - **Stephanie Forrest**, *University of New Mexico*
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PORTIA Personnel

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  - Sam Hawala, *US Census Bureau*
  - Kevin McCurley, *IBM Research*
  - Perry Miller, *Yale Center for Medical Informatics*
  - John Morris, *Center for Democracy and Technology*
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PORTIA Personnel

- Supported PhD students
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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.

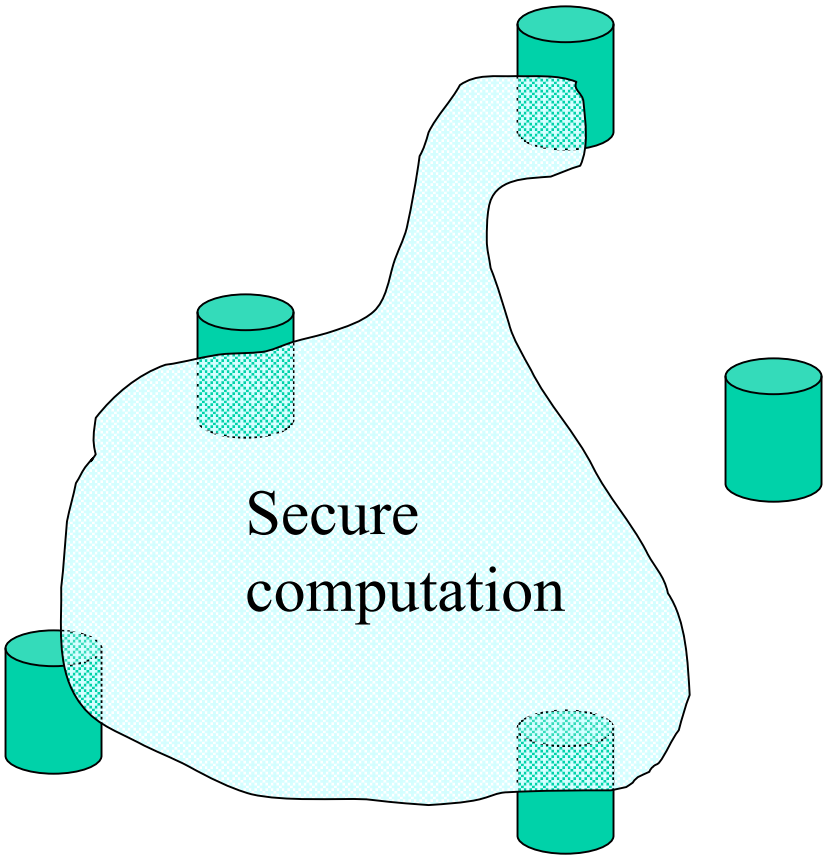
Advantages of privacy protection

- 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

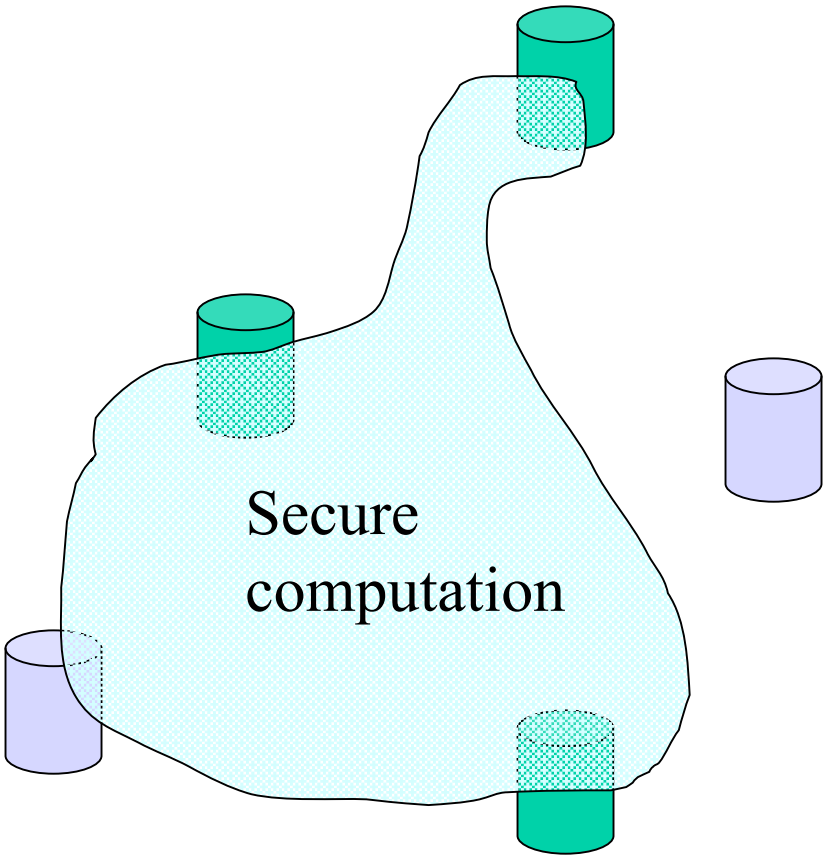
- Cryptography is a very useful tool.
- But, cryptographic secure multiparty computation definitions are both too strong and too weak for privacy-preserving data mining:
  - Too strong: do not allow leakage of innocuous information, and pay the price in efficiency.
  - Too weak: do not address leakage 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



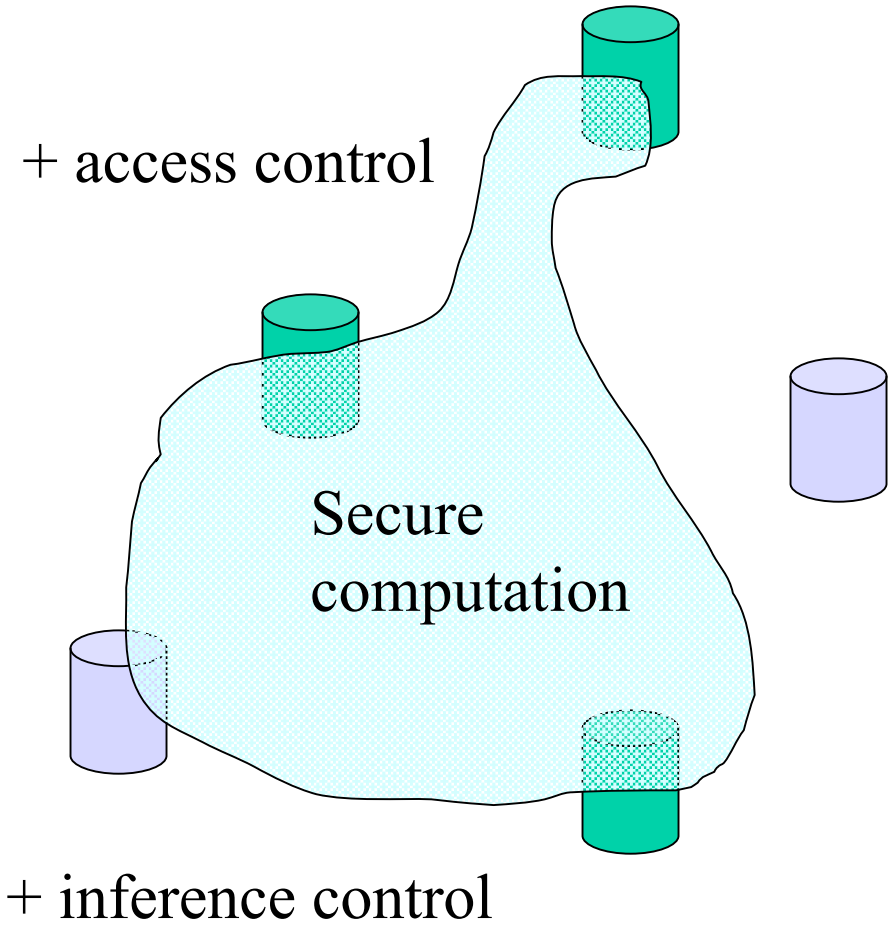
- Secure computation to protect critical data

Potential Integration



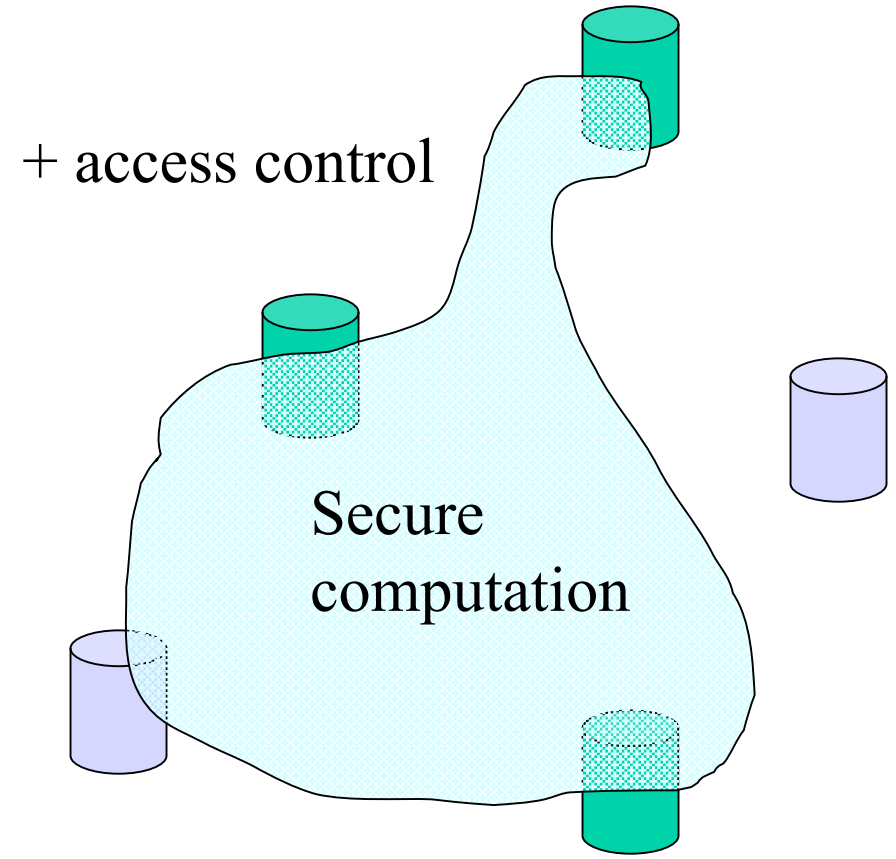
- Secure computation to protect critical data
- Perturbation or aggregation to protect possibly sensitive data
- No protection on completely innocuous data

Potential Integration



- 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.