Inter-temporal Privacy Measurement
ABSTRACT

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In certain jurisdictions, the right of informational self-determination implies the control over personal data. For that control, it is crucial for people to understand the implications of data disclosure. While visions for privacy-enhancing identity management [1] seek to provide means for managing the disclosure of personal data under different adversary models, it is still a challenging question how individuals can be supported in assessing the value of their personal data. The main obstacle that prevents people from making rational decision regarding their privacy is the uncertainty about possible future consequences of data disclosure at present [2]. Similarly, known information-theoretic privacy metrics [3–9] merely represent the present value of personal data. These metrics ignore that the value of personal data, for instance for re-identification, may change over time. Particularly the time between disclosure and exploitation of personal data is important for assessing the inter-temporal value of personal data. The more time passes between both events, the more uncertainty arises about the value. This is so because attribute values which apply to a data subject at the time of disclosure may not be applicable to the same data subject anymore when the data is exploited. Accordingly, the distribution of attribute values in the entire population changes over time. Attribute values which uniquely describe a single data subject at present may become common in the population in the future. So their value for purposes such as re-identification is shrinking over time.

The goal of my current research is to tackle uncertainty about the future value of personal data induced by time in the context of identity management. This includes (a) the description of the disclosure state of personal data (and obligations that come along with the data disclosure), i. e., a language design task, (b) an appropriate assessment of the future value of personal data, i. e., the design of measures for future privacy, and (c) a management (or enforcement) facility for obligations on personal data.

Recent results of my research draw on ideas from option pricing theory [10] for privacy measurement. Option pricing theory is well-known in financial mathematics for determining the future value of contracts or, more specifically, options. We used the analogy between financial options and the option to exploit personal data to design a framework for simple inter-temporal privacy measurements.

In my presentation, I will elaborate on these results in the field of privacy measurement and give, outline my current work on a more general framework as well as giving an outlook on my future work on the language and management tasks.

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