1. **Summary.** In this paper the authors presents two major contributions to the recent work of privacy on streaming data initially introduced by Dwork et al. [2]. First the authors study the family of problems related to the decayed sums. These problems are motivated by the fact that only the most recent part of the stream is often considered important in real applications rather than considering the whole stream. In this scenario the authors proposed three decayed sums results: on fixed length windows (window sum), exponential decay (the sum is computed through a exponential function which decades with the past) and polynomial decay (where the sum decades polynomially). Contrary to the solutions in [1, 2] which consider the whole stream the results in this paper show a considerable improvement in the term of accuracy, since in this case the error is proportional to the length of the window rather than the entire stream. The second major contribution consists in the notion of privacy with expiration where the privacy is relaxed in the past part of the stream while is enforced on the recent data. The authors show that with this relaxation the utility results improve since the error scales with the length of the stream where the privacy is enforced rather than the entire stream.

2. **Positive Points.**

- The paper provides a very complete study of basic functions on binary stream. The idea of using a window $W$ over the stream is very interesting and as the author show it allows to reduce the noise for the running sum problem from $O(\frac{1}{\epsilon} \log^{1.5} T)$ to $O(\frac{1}{\epsilon} \log^{1.5} W)$, where $T$ is the length of the stream. Furthermore, the authors provides a set of upper and lower bounds for the error in computing each decayed sum.

- The privacy expiration concept is very interesting and I personally think it is quite appealing in the streaming scenario. This notion
allows to relax the privacy constraint on the past hence to provide stronger utility guarantees on old events.

4. Discussion.

• I found the paper interesting and rich of technical steps. Concerning my current research I think some points of this paper could be useful. First, the paper present a result to bound the probability of sum of Laplace noise that I could use in parts of the analysis of my work. Second, the authors illustrate a clever way to use dyadic tree to reduce the noise injected in computing the sums over the stream, which is very useful in many streaming algorithms.

• I think the definition of privacy expiration well fits in the data streaming scenario. However, it rises the question of how to choose an appropriate function that model how fast the privacy concerns degrade with time. Although, the paper provides some indications, it is not easy for the user to select the function that best reflects its needs. It could be also interesting to investigate other type of functions that allows to distribute the privacy constraints in different ways over the stream.

References
