

Monthly Report on “An Extensible Model for Deduplication of the GDELT Events Database”

Andee Kaplan (andee.kaplan@colostate.edu; 832-526-7947)

September 2019

Progress and Plans

1. Description of progress made against each deliverable during the reporting period

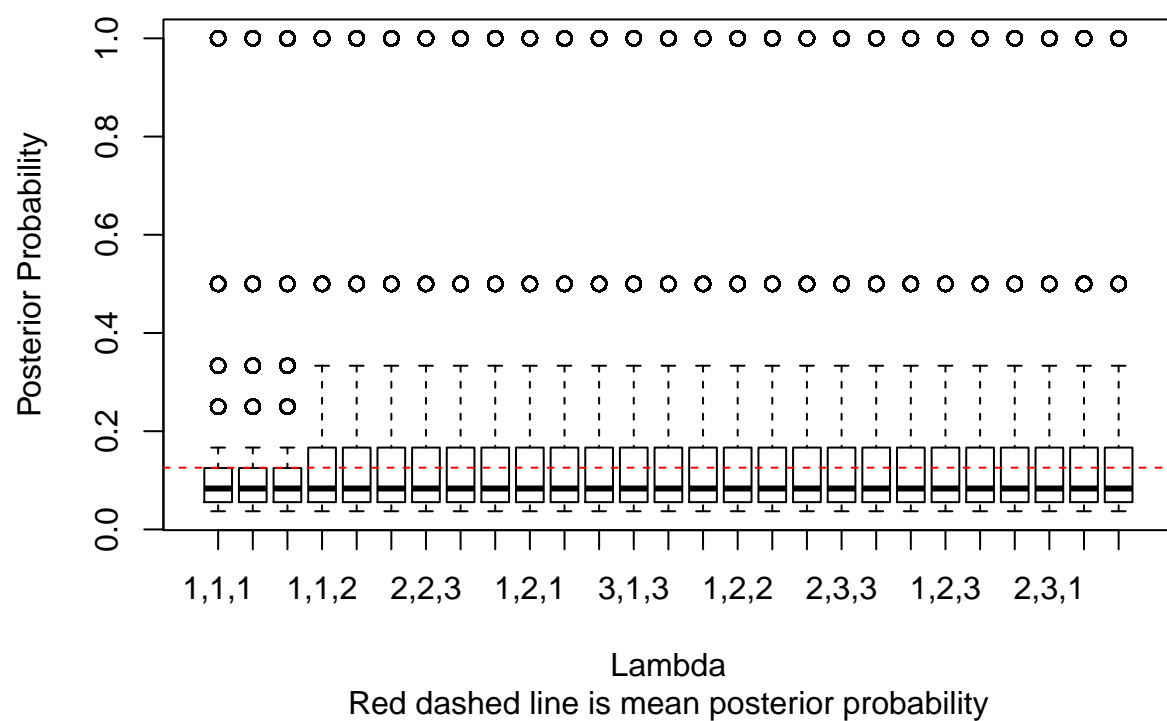
Casey has created a framework to compare the resulting posterior probabilities of a Bayesian hierarchical deduplication model using the uniform prior of Steorts, Hall, and Fienberg (2016) and one using the partitioning prior of Sadinle (2014). We have spent September looking at numerical comparisons of small toy size models for completeness, as well as a larger, more realistic scenario.

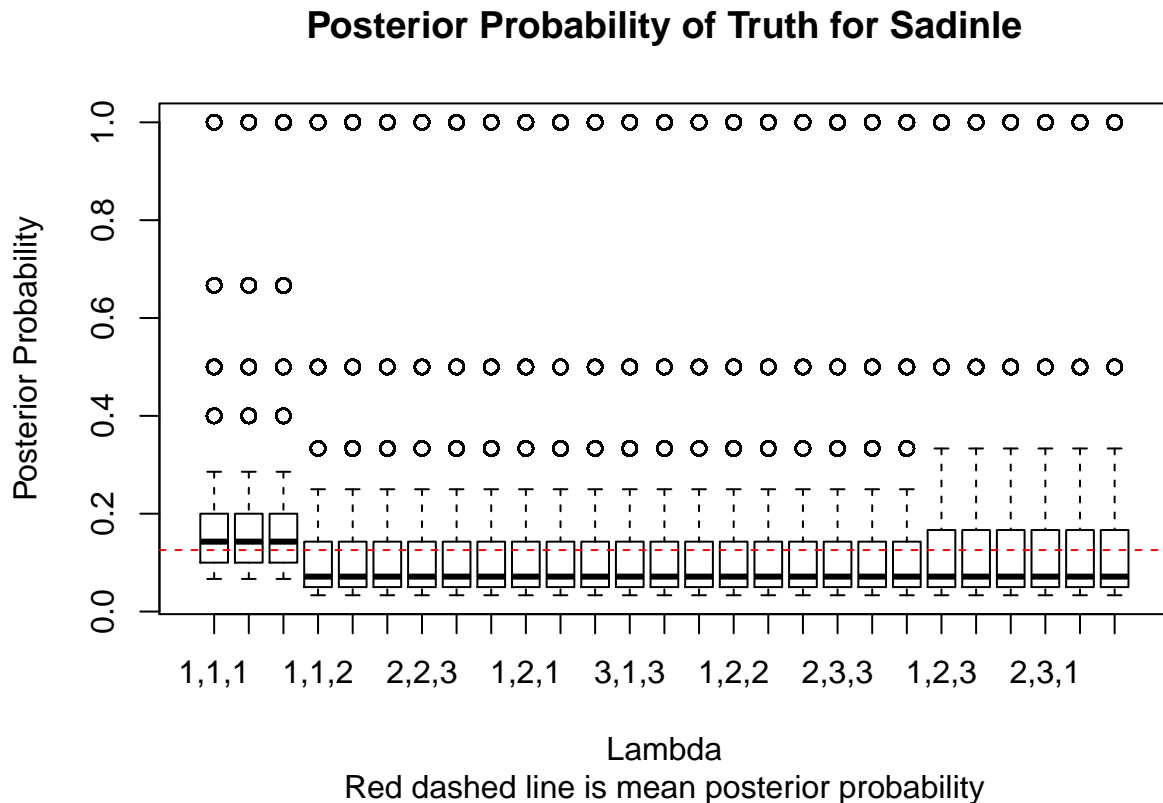
Our goal with this exploration is to choose a suitable model for deduplication of the GDELT events data, while a secondary goal is to choose a suitable model that is a good candidate for extension to a streaming version.

2. Brief description of significant results

Changing of the prior from uniform on the partitions (Sadinle) to uniform on matching of observations to entities (Steorts) resulted in minor changes in the full conditional of matchings for a small sample size. For a given matching, we measured the posterior probability of obtaining this true matching. For matchings where the prior probabilities differed significantly between the two prior specifications, we found the posterior probability to also have a relatively higher difference. The matchings where this occurred were matchings where all observations corresponded to the same underlying entity, in which cases the Sadinle prior put twice as much weight on these matchings as the Steorts prior. The following plots show the change in posterior probability of truth for Steorts and Sadinle priors, where each lambda corresponds to a unique matching of observations to entities for $n=3$.

Posterior Probability of Truth for Steorts





3. Planned activities for the following reporting period

We will choose a candidate model and do preliminary work to prepare the GDELT data for deduplication.

4. List of any LAS-funded trips during reporting period, with description of work presented

None.

5. Description of any significant meetings/events held (e.g., a focused discovery activity, LAS Symposium) or conducted related to this task

Casey and I meet weekly for one hour.

Issues

1. Progress on/results obtained related to previously identified problem areas

None.

2. Proposed significant changes to your methodology, goals, milestones, or deliverables

None.

3. New challenges affecting technical performance or schedule, with background

None.

4. Has anything happened to impact your anticipated schedule?

No.

References

Sadinle, Mauricio. 2014. “Detecting Duplicates in a Homicide Registry Using a Bayesian Partitioning Approach.” *The Annals of Applied Statistics* 8 (4). Institute of Mathematical Statistics: 2404–34.

Steorts, Rebecca C, Rob Hall, and Stephen E Fienberg. 2016. “A Bayesian Approach to Graphical Record Linkage and Deduplication.” *Journal of the American Statistical Association* 111 (516). Taylor & Francis: 1660–72.