Homework Assignment 0

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Stats 250 – Baines – Fall 2013 – UC Davis

Problem #1

Code attached.

Problem #2

Code attached.

Given that $u = y\cos x$ and $v = y\sin x$, then $r = \sqrt{u^2 + v^2}$ has the same distribution as y, which is Unif($[0, 1]$). Hence, we expect the magnitude of (u, v) to be uniformly distributed between 0 and 1; as the angle is uniformly distributed as well, these points are just uniform over the unit circle.

Problem #3

Code attached.

Problem #4

boot_camp_sarray.sh run successfully.

Problem #5

Twitter crawl code performed successfully; updates for finding the fraction of tweets and new plot added to GitHub repo. Roughly 1/3 of users had explicit geotags. My plot had lots of negative sentiments, clustered around the East coast. As I ran it around 4 AM PST, on the weekend before finals, I can imagine why that might be the case.

Problem #6

Code attached.

Problem #7

Code attached.

For the importance sampling computation, we note that for $Z \sim TN(0, 1; A)$ with A some interval, denoting ϕ for the density of $N(0, 1)$,

$$\mathbb{E}[Z] = \frac{\int x\phi(x)\mathbf{1}_A(x)\,dx}{\int \phi(x)\mathbf{1}_A(x)\,dx} = \frac{\mathbb{E}_U[x\phi]}{E_U[\phi]} \quad ,$$

where the expectation is taken with respect to the uniform distribution on A. Hence, for sufficiently large N, we can always satisfy a tolerance ϵ so that for $x_n \sim U(A)$,

$$\mathbb{E}[Z] \approx \frac{\sum_n^N x_n\phi(x_n)}{\sum_n^N \phi(x_n)} \quad .$$

Problem #8

Code attached.

Problem #9

Uploading to GitHub straightaway!