1145-05-695 **Ashwin Sah*** (`asah@mit.edu`). *Improving the $\frac{1}{3}-\frac{2}{3}$ Conjecture for Width Two Posets.*

Extending results of Linial (1984) and Aigner (1985), we prove a uniform lower bound on the balance constant of a poset P of width 2. This constant is defined as $\delta(P)=\max_{(x,y)\in P^2}\min\{\mathbb{P}(x\prec y),\mathbb{P}(y\prec x)\}$, where $\mathbb{P}(x\prec y)$ is the probability x is less than y in a uniformly random linear extension of P. In particular, we show that if P is a width 2 poset that cannot be formed from the singleton poset and the three element poset with one relation using the operation of direct sum, then

$$\delta(P)\geq\frac{-3+5\sqrt{17}}{52}\approx 0.33876\ldots.$$

This partially answers a question of Brightwell (1999); a full resolution would require a proof of the $\frac{1}{3}-\frac{2}{3}$ Conjecture that if P is not totally ordered then $\delta(P)\geq\frac{1}{3}$.

Furthermore, we construct a sequence of posets T_n of width 2 with $\delta(T_n)\to\beta\approx 0.348843\ldots$, giving an improvement over a construction of Chen (2017) and over the finite posets found by Peczarski (2017). Numerical work on small posets by Peczarski suggests the constant β may be optimal. (Received September 13, 2018)