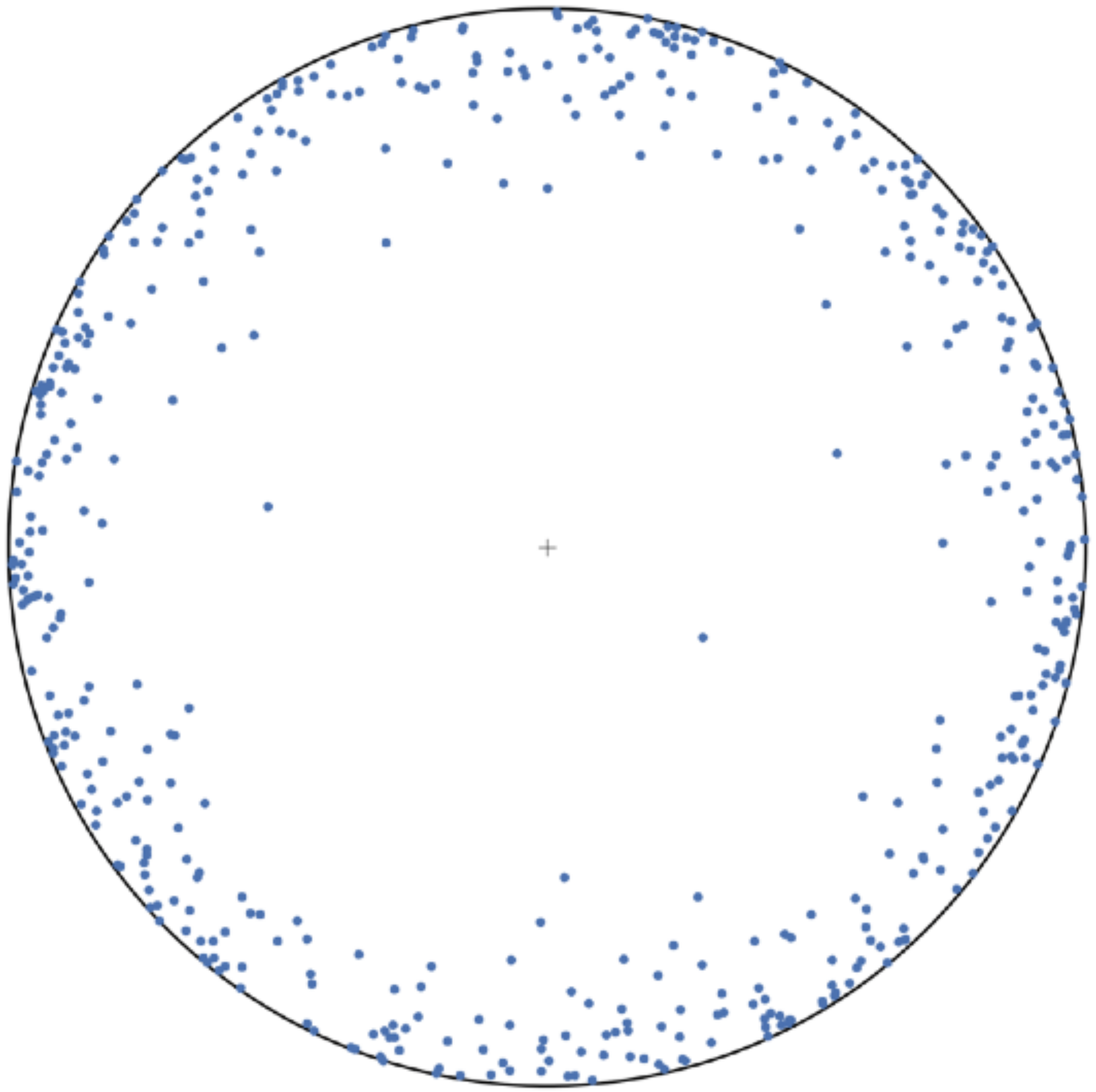
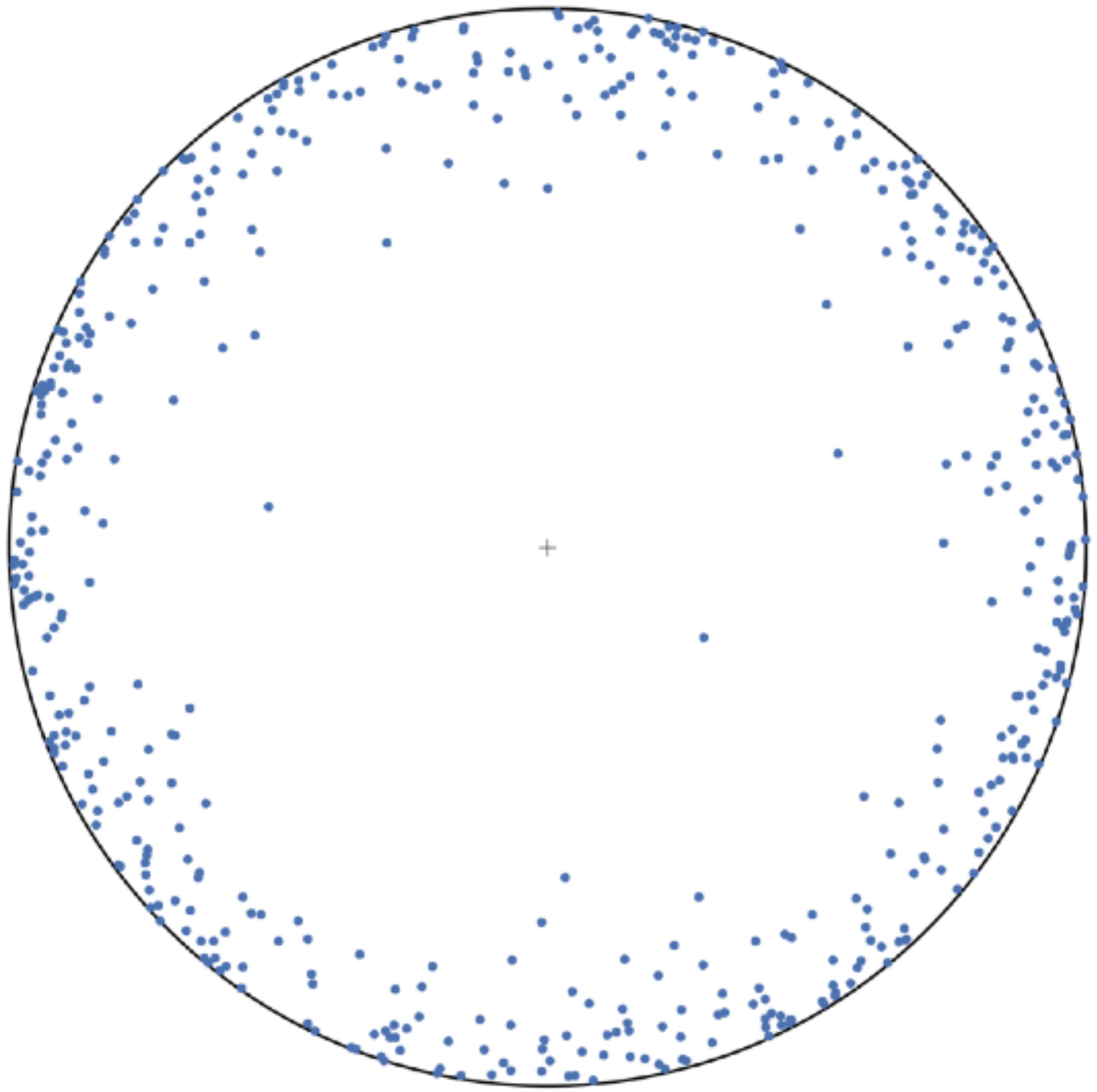
6





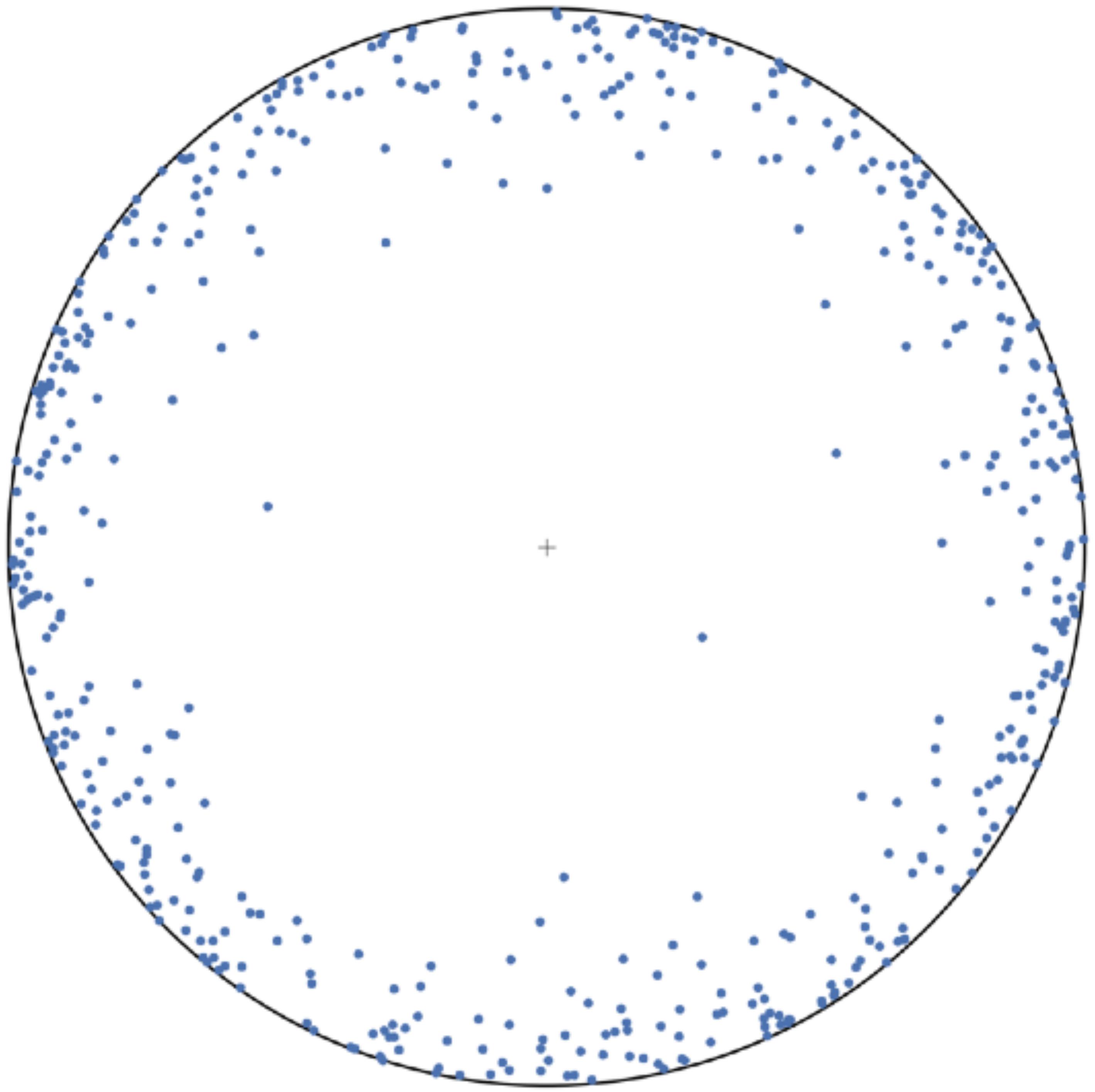
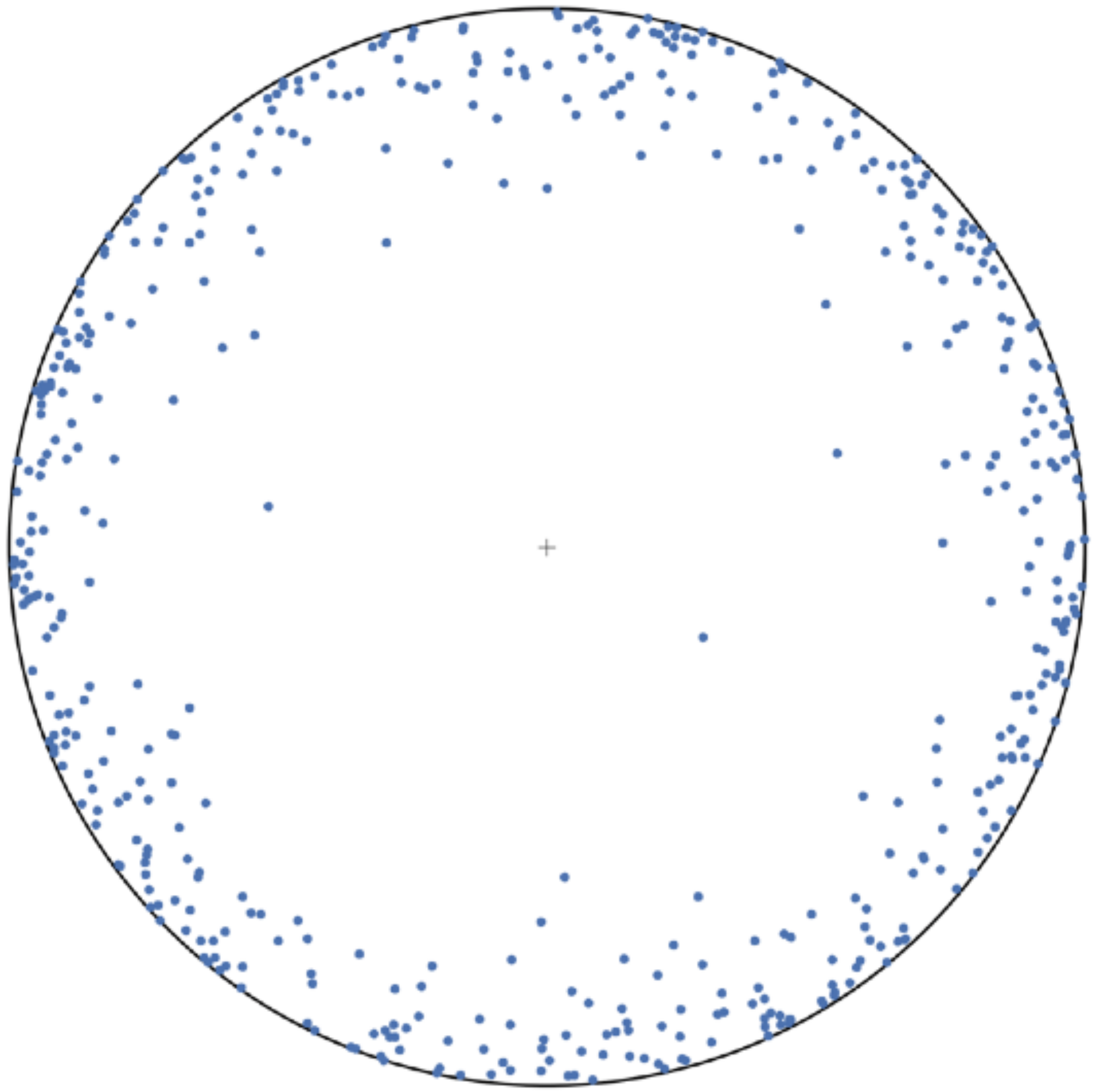
Hyperbolic geometry

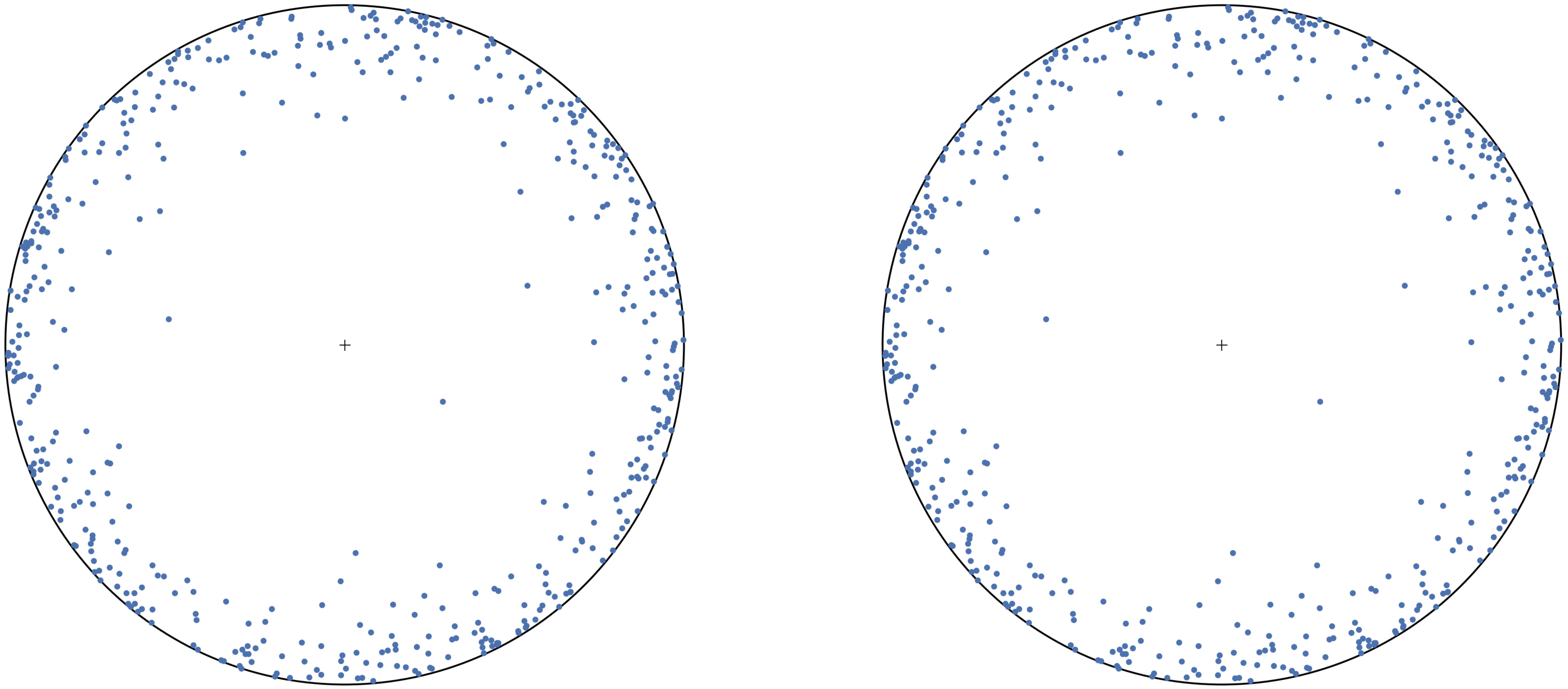
Simple random geometric graph

1. Sprinkle N nodes uniformly on the hyperbolic disk of radius R.
2. Connect any nodes separated by a distance less than $r = R$.

- ✓ high clustering
- ✓ power-law degree distribution with exponent -3

Phys. Rev. E 82, 036106 (2010)



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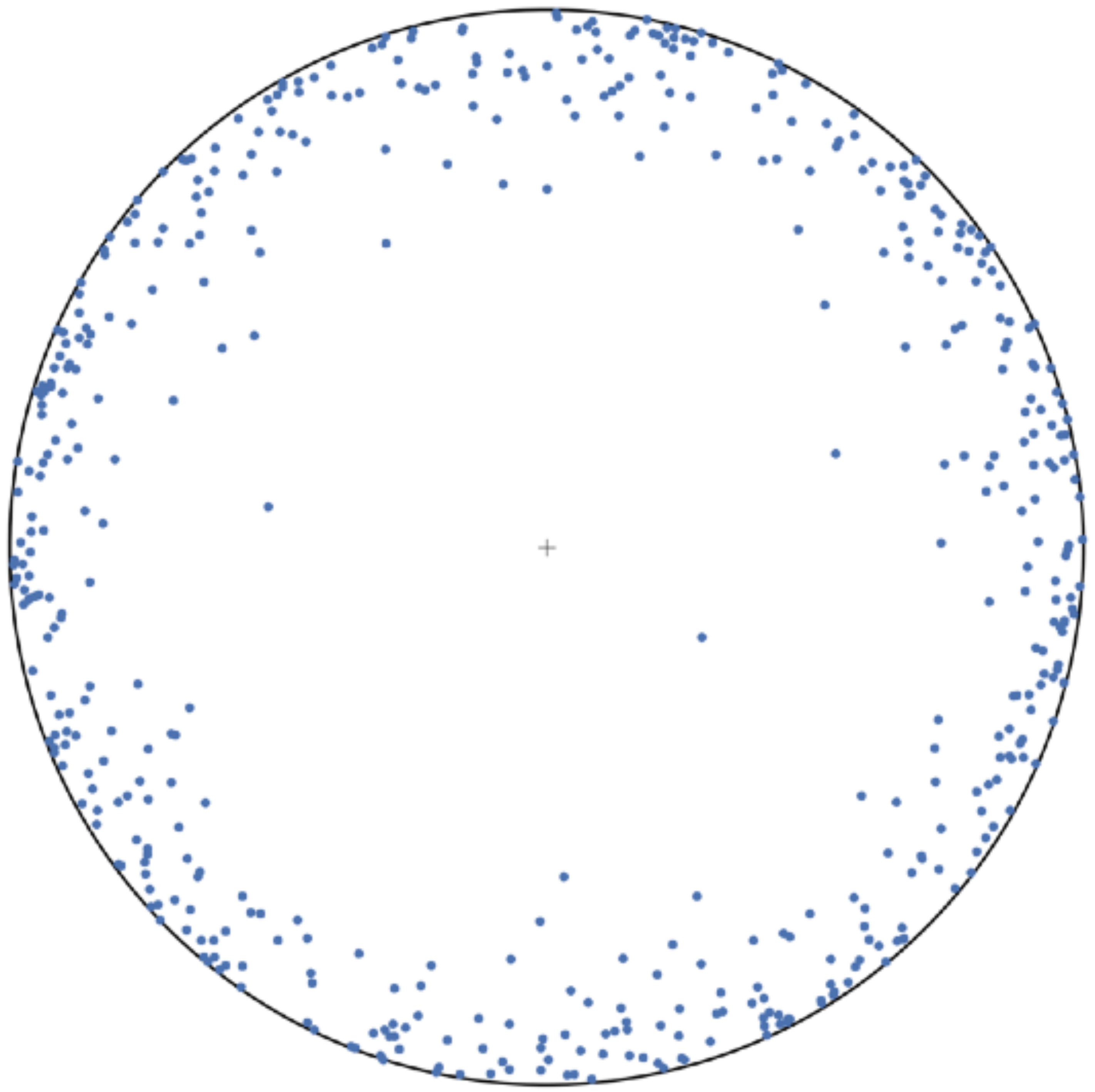

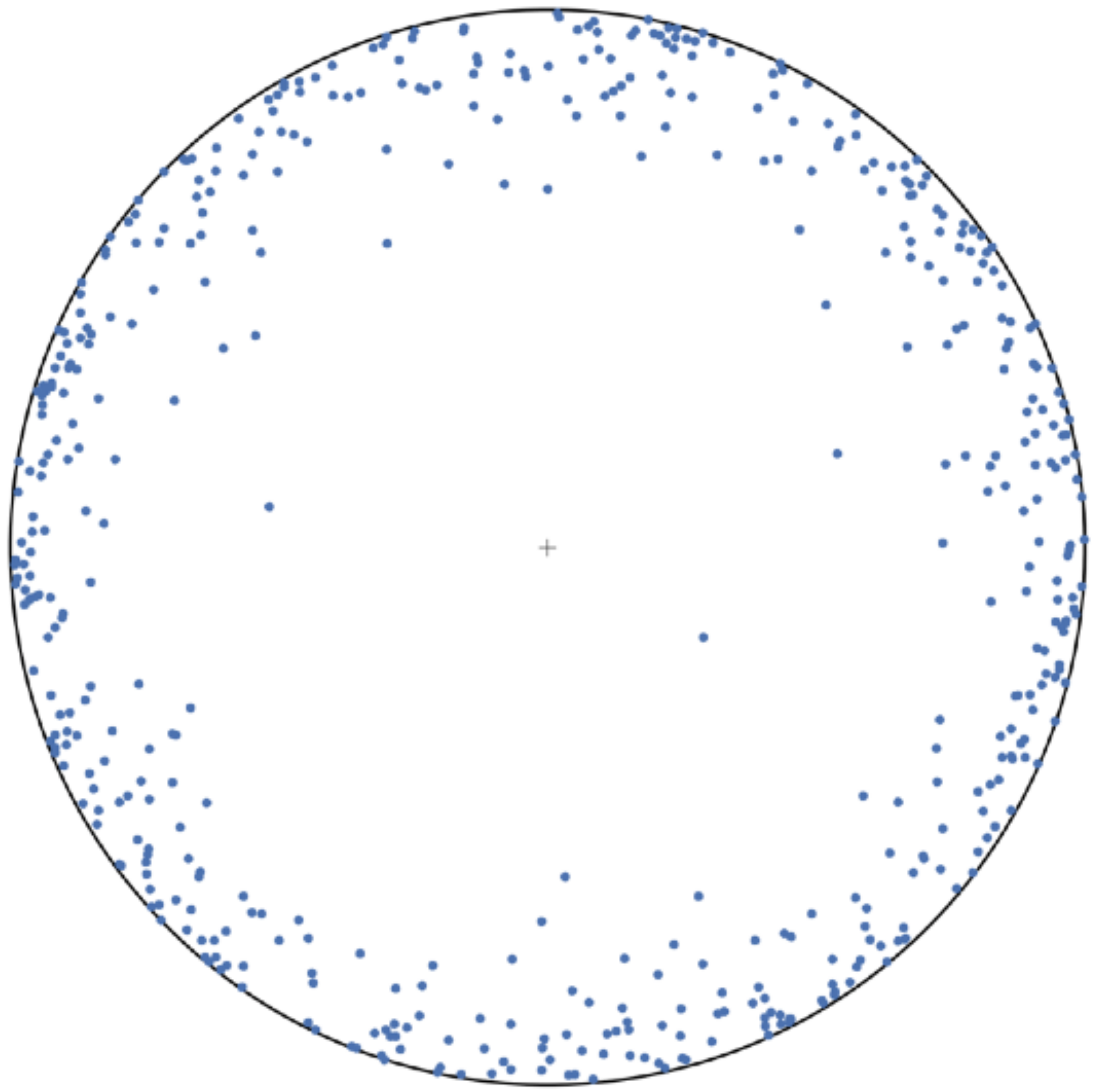

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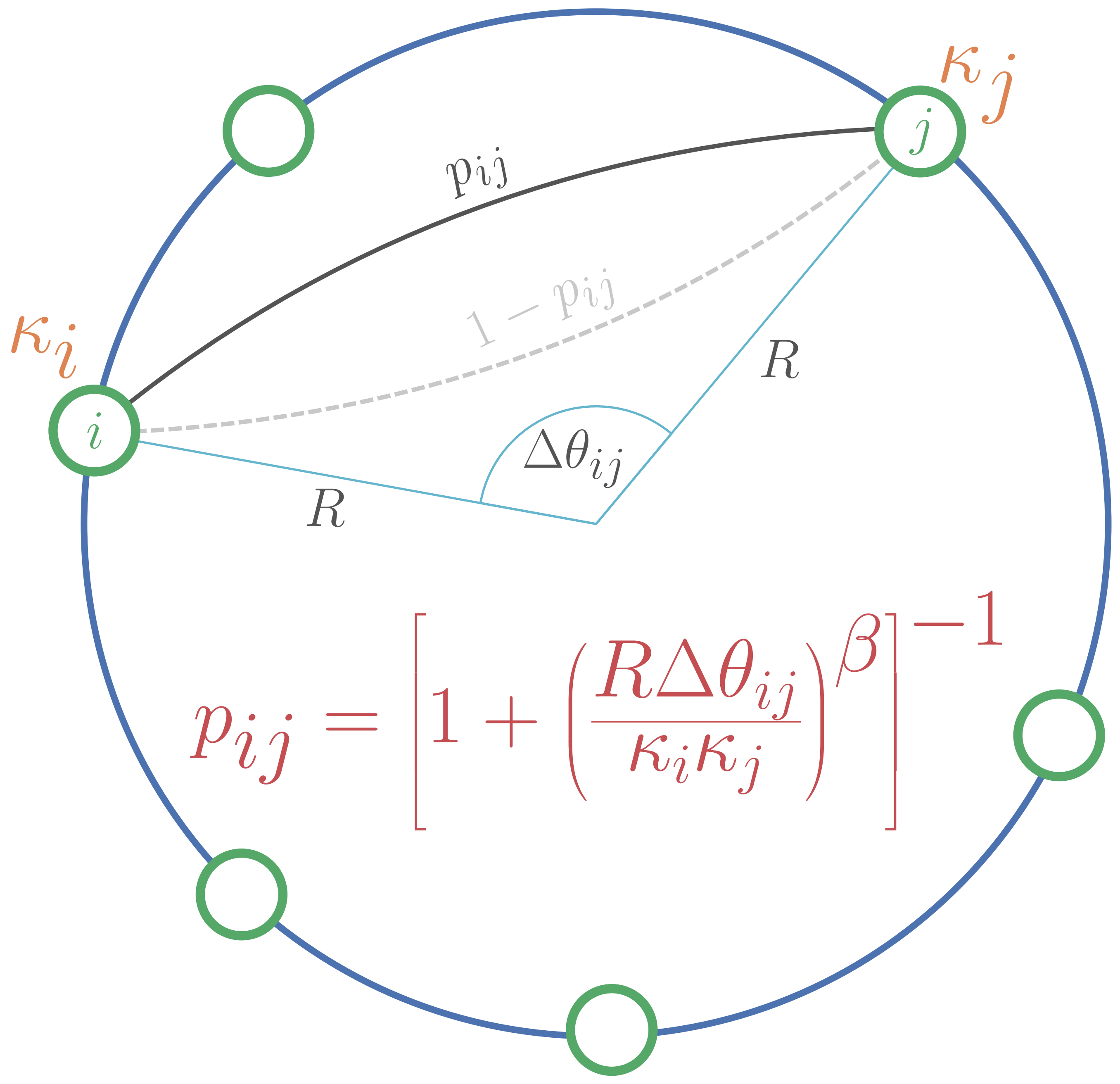
A geometric approach to clustering : the $\mathbb{S}^1/\mathbb{H}^2$ model



$$p_{ij} = \left[1 + \left(\frac{R\Delta\theta_{ij}}{\kappa_i \kappa_j}\right)^{\beta}\right]^{-1}$$

The $\mathbb{S}^1$ model

1. Sprinkle N nodes uniformly on a circle of radius R.
2. Assign an expected degree κ to each node according to some pdf $\rho(\kappa)$.
3. Draw a link between node i and node j with probability p_{ij}.

- ★ fixes the expected degree of nodes (κ) $\rightarrow$ soft configuration model (CM)
- ★ triangle inequality of the underlying metric space $\rightarrow$ triangles from pairwise interactions
- ★ level of clustering tuned with parameter β

[1] Phys. Rev. E 80, 035101 (2009)
[3] Phys. Rev. Lett. 100, 078701 (2008)
[2] Phys. Rev. E 82, 036106 (2010)
[4] Nat. Rev. Phys. 3, 114 (2021)
[5] Nat. Commun. 8, 14103 (2017)
[6] Phys. Rev. E 84, 026114 (2011)
[7] Phys. Rev. E 95, 032309 (2017)
[8] Mol. Biosyst. 8, 843 (2012)
[9] Nat. Phys. 12, 1076 (2016)
[10] Phys. Rev. Lett. 118, 218301 (2017)
[11] Nature 489, 537 (2012)
[12] Sci. Rep. 5, 9421 (2015)
[13] J. Stat. Phys. 173, 775 (2018)
[14] New J. Phys. 20, 052002 (2018)
[15] New J. Phys. 21, 123033 (2019)
[16] Nat. Commun. 8, 1615 (2017)
[17] Nat. Commun. 1, 62 (2010)
[18] PNAS 117, 20244 (2020)