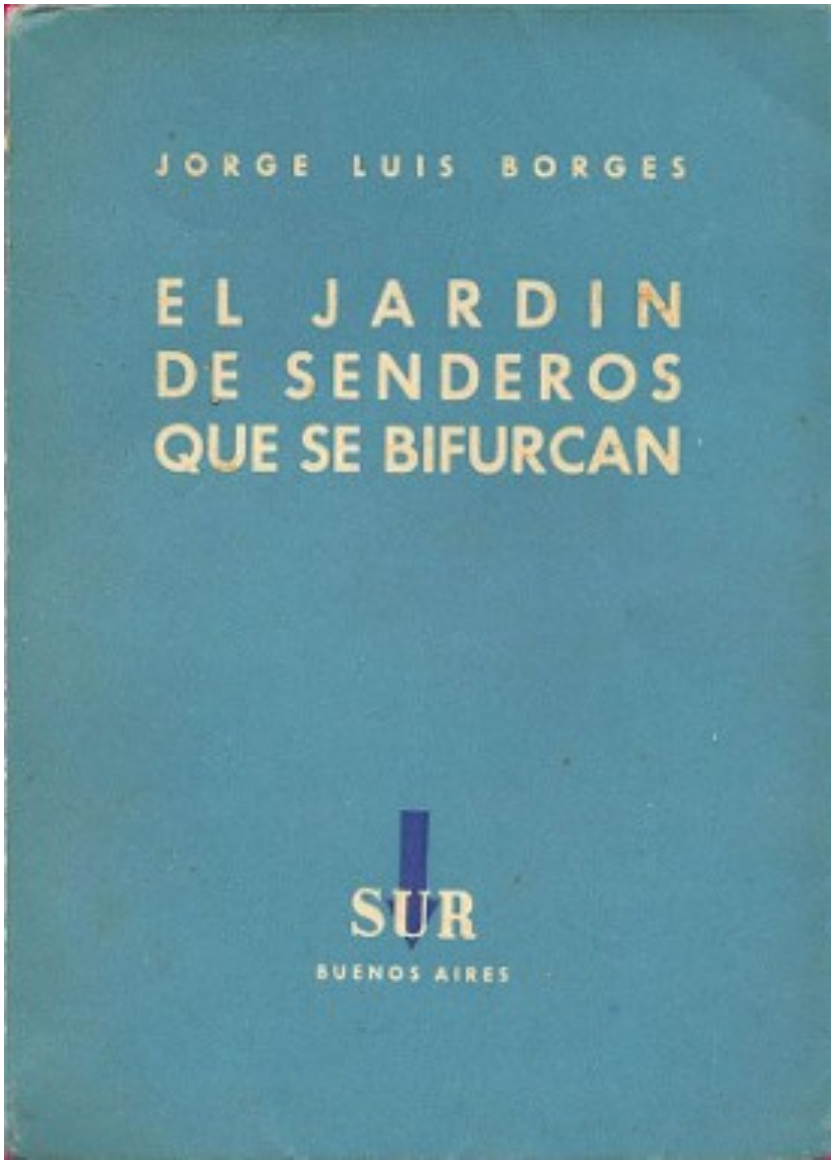
Garden of Forking Data

- The future:
  - Full of branching paths
  - Each choice closes some
- The data:
  - Many possible events
  - Each observation eliminates some



Garden of Forking Data

Contains 4 marbles

Possible contents:

(1) ○○○○

(2) ●○○○

(3) ●●○○

(4) ●●●○

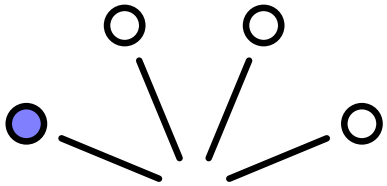
(5) ●●●●

Observe:

●○●

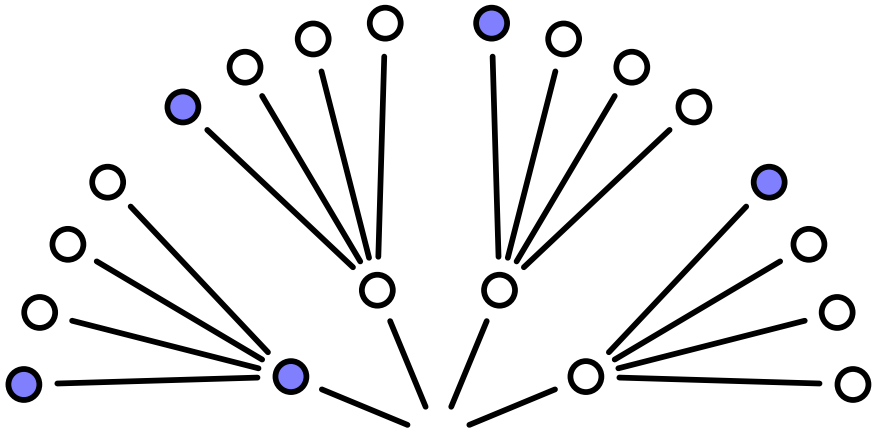
Conjecture: 

Data: 

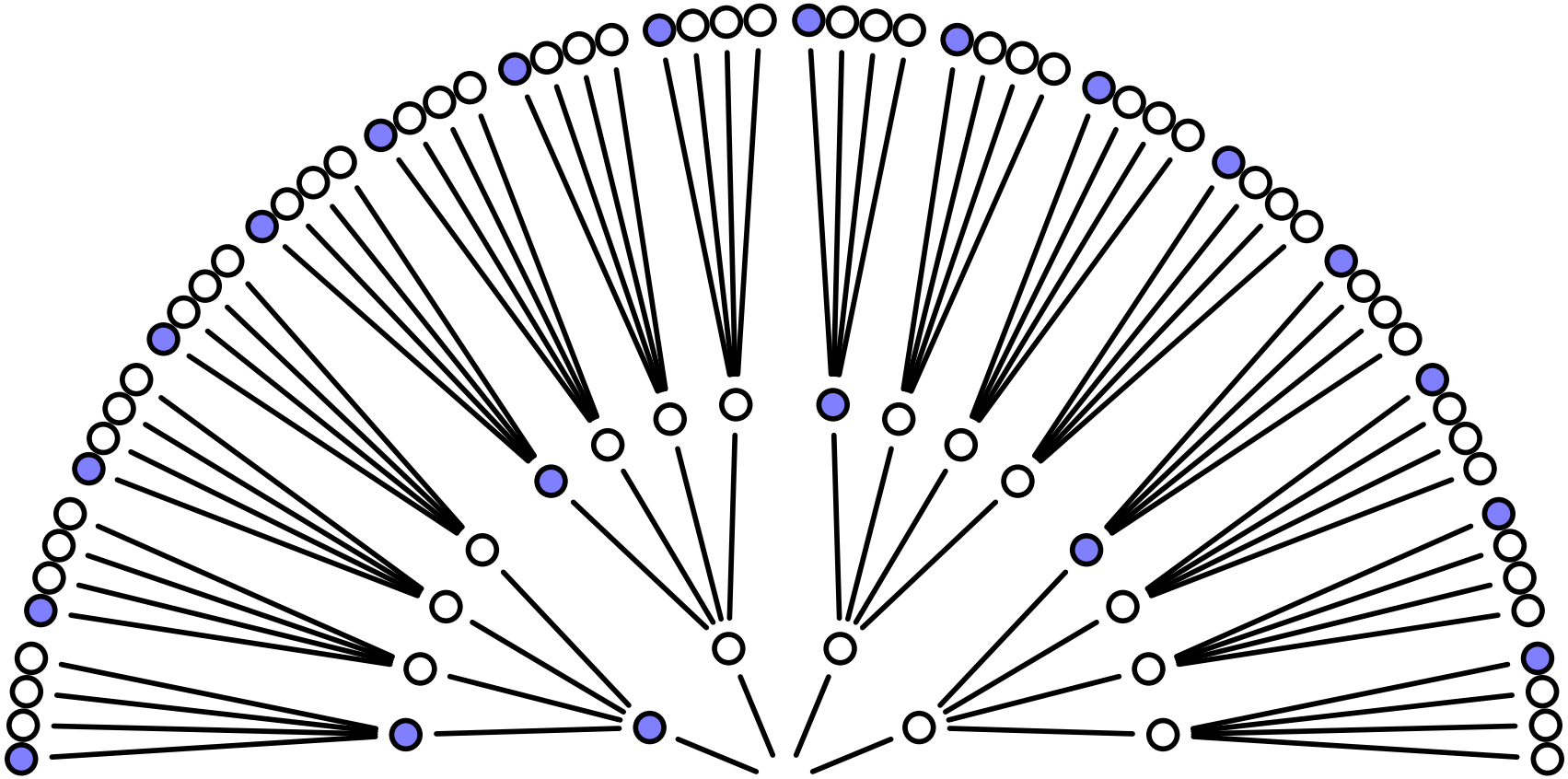


Conjecture:

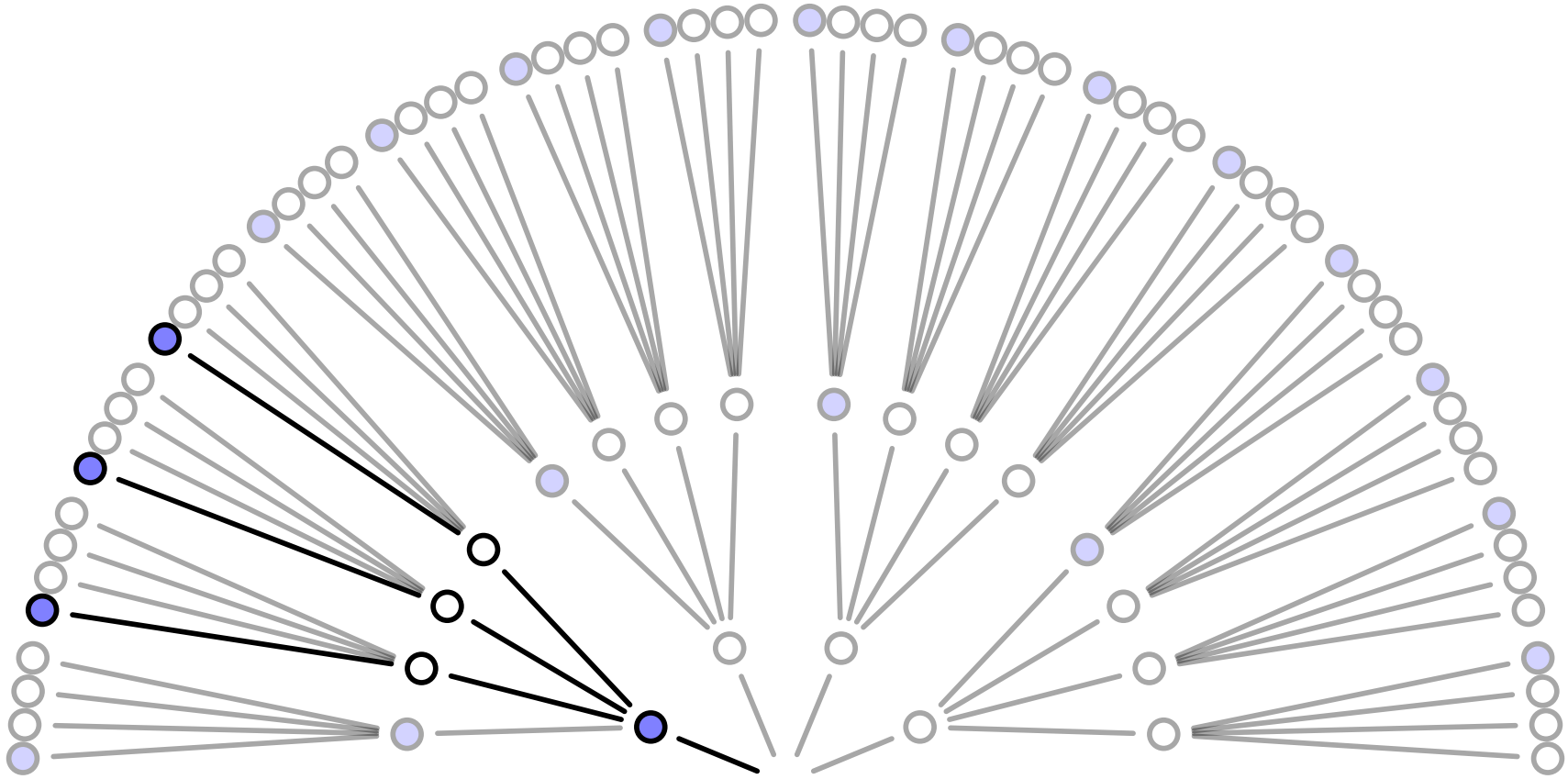
Data:



Conjecture: ●○○○ Data: ●○●



Conjecture: ●○○○ Data: ●○●



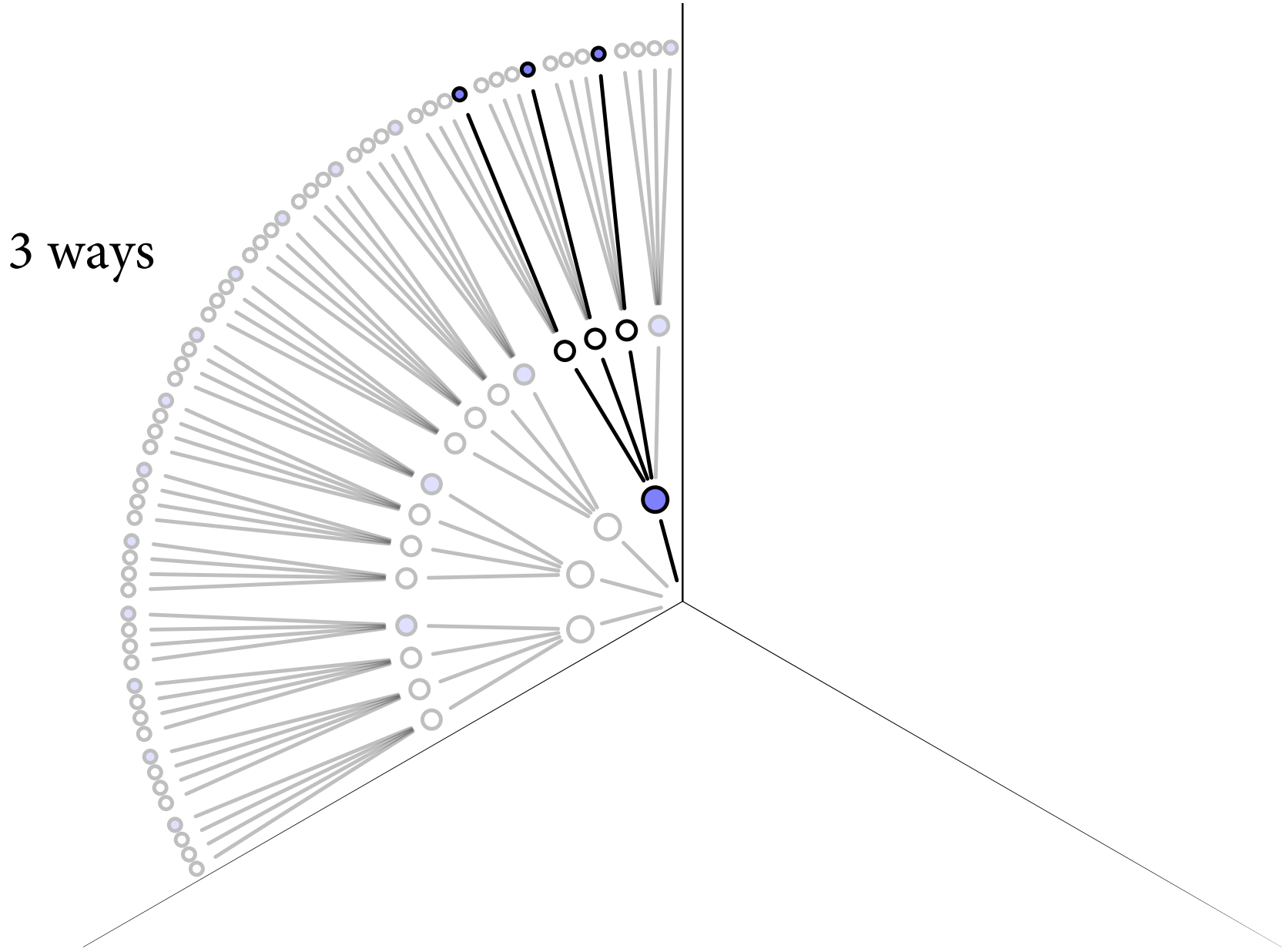
3 paths consistent with data

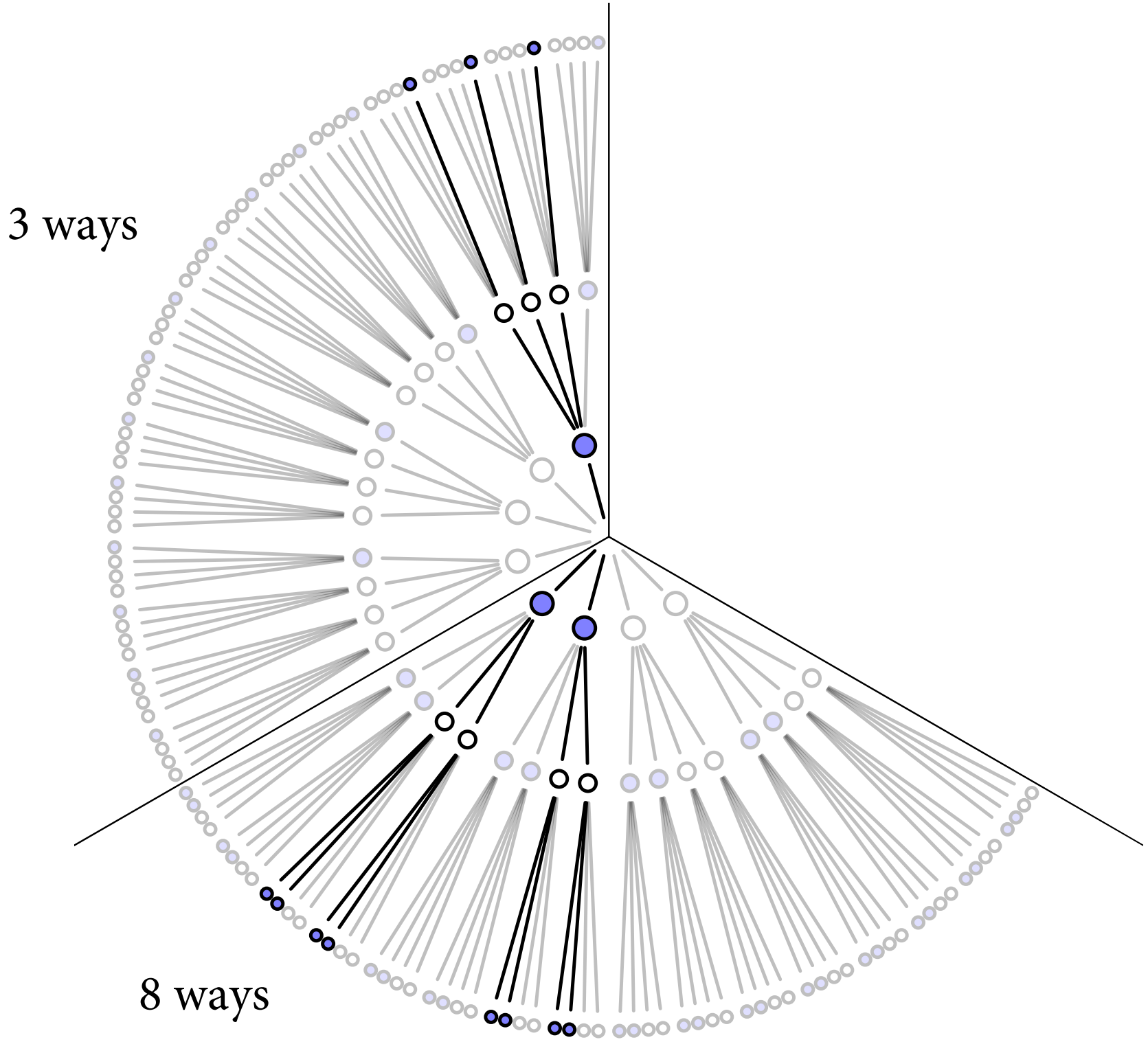
Garden of Forking Data

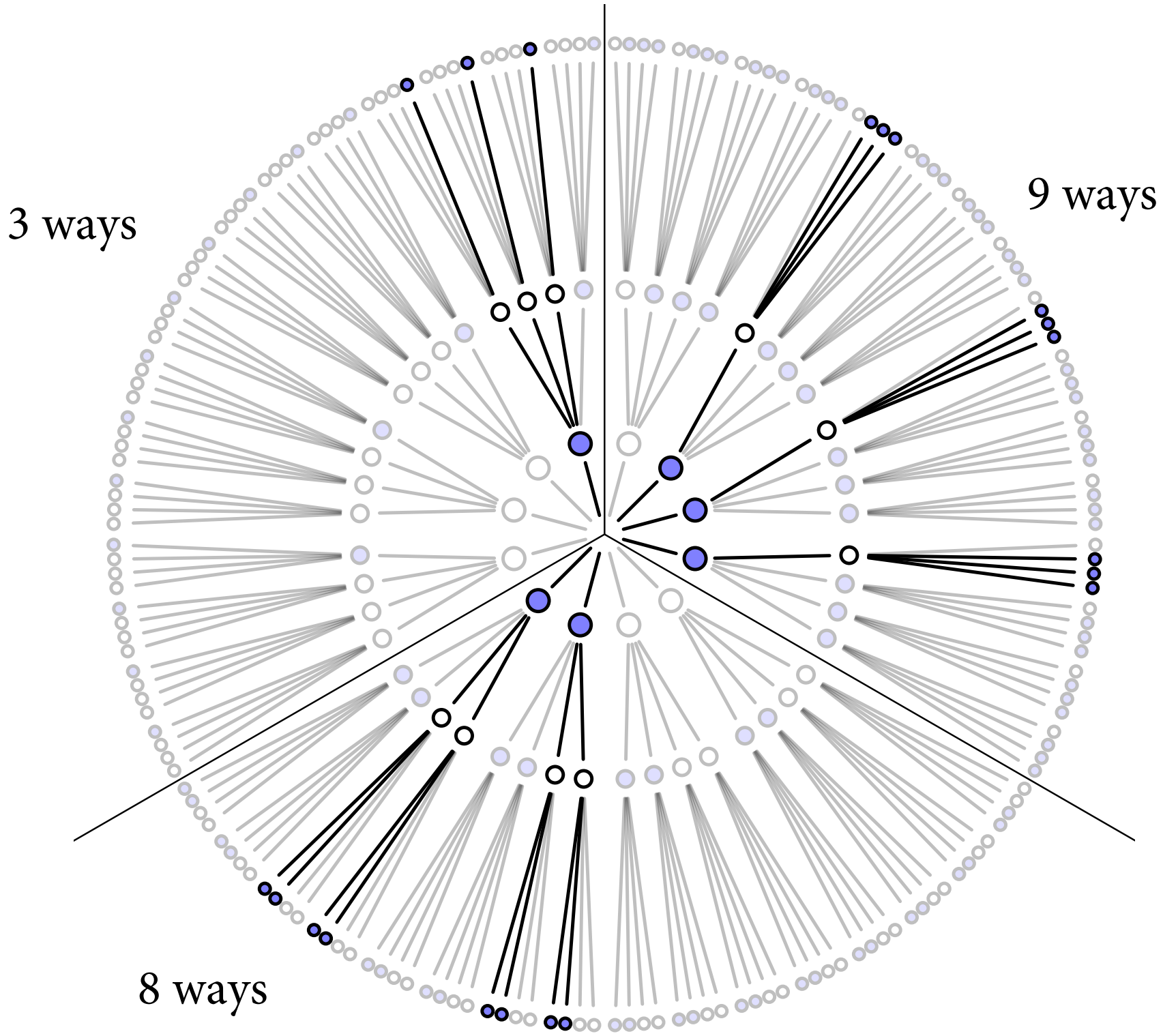
Possible contents:	Ways to produce ●○●
(1) ○○○○	?
(2) ●○○○	3
(3) ●●○○	?
(4) ●●●○	?
(5) ●●●●	?

Garden of Forking Data

Possible contents:	Ways to produce ●○●
(1) ○○○○	0
(2) ●○○○	3
(3) ●●○○	?
(4) ●●●○	?
(5) ●●●●	0

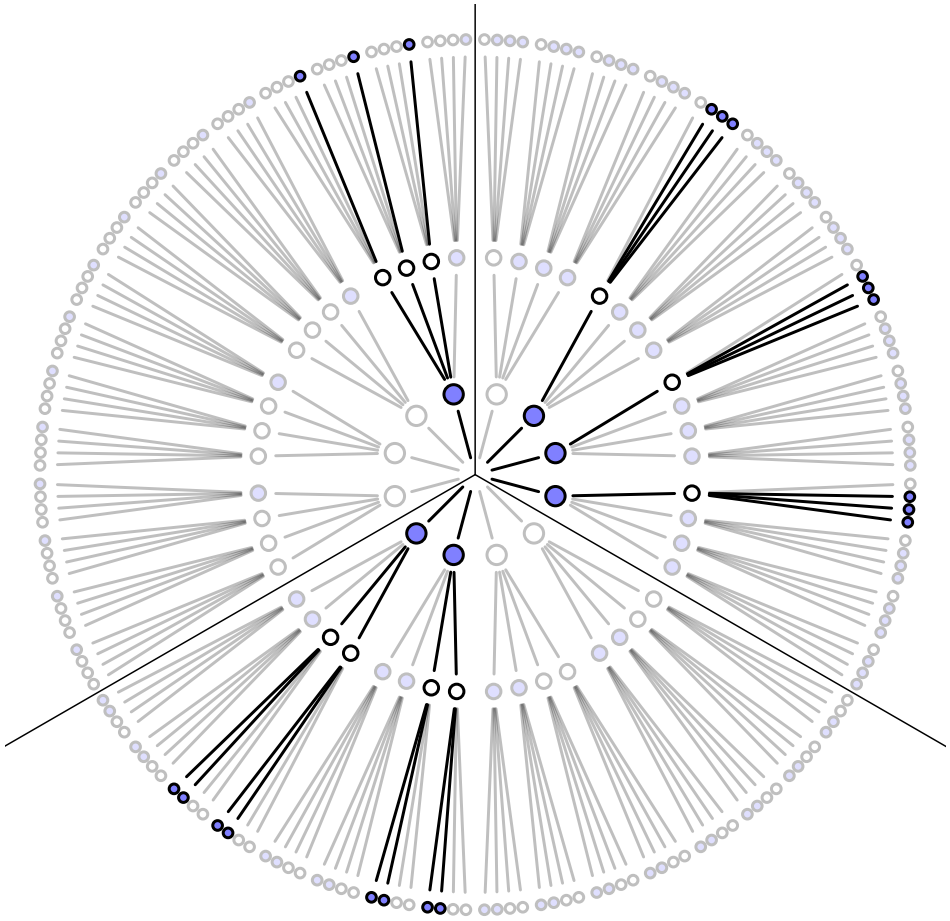

3 ways


3 ways
8 ways


3 ways
9 ways
8 ways

Garden of Forking Data

Conjecture	Ways to produce ●○●
[○○○○]	$0 \times 4 \times 0 = 0$
[●○○○]	$1 \times 3 \times 1 = 3$
[●●○○]	$2 \times 2 \times 2 = 8$
[●●●○]	$3 \times 1 \times 3 = 9$
[●●●●]	$4 \times 0 \times 4 = 0$



Updating

Another draw from the bag: 

Conjecture	Ways to produce	Previous counts	New count
[○○○○]	0	0	$0 \times 0 = 0$
[●○○○]	1	3	$3 \times 1 = 3$
[●●○○]	2	8	$8 \times 2 = 16$
[●●●○]	3	9	$9 \times 3 = 27$
[●●●●]	4	0	$0 \times 4 = 0$

Using other information

Factory says:  marbles rare, but every bag contains at least one.

Conjecture	Factory count
[○○○○]	0
[●○○○]	3
[●●○○]	2
[●●●○]	1
[●●●●]	0

Using other information

Factory says: ● marbles rare.

Conjecture	Prior ways	Factory count	New count
[○○○○]	0	0	$0 \times 0 = 0$
[●○○○]	3	3	$3 \times 3 = 9$
[●●○○]	16	2	$16 \times 2 = 32$
[●●●○]	27	1	$27 \times 1 = 27$
[●●●●]	0	0	$0 \times 0 = 0$

Counts to plausibility

Unglamorous basis of applied probability:

Things that can happen more ways are more plausible.

Possible composition	p	ways to produce data	plausibility
[○○○○]	0	0	0
[●○○○]	0.25	3	0.15
[●●○○]	0.5	8	0.40
[●●●○]	0.75	9	0.45
[●●●●]	1	0	0

Counts to plausibility

Possible composition	p	ways to produce data	plausibility
[○○○○]	0	0	0
[●○○○]	0.25	3	0.15
[●●○○]	0.5	8	0.40
[●●●○]	0.75	9	0.45
[●●●●]	1	0	0

R code 2.1

```
ways <- c( 3 , 8 , 9 )
ways/sum(ways)
```

```
[1] 0.15 0.40 0.45
```