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Secret Hitler and Bayes' Theorem

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Secret Hitler 1

- ▶ Assume that you are a liberal Chancellor in a game with an odd number of players. The a priori probability that the President is a fascist is $1/2$. However, we will show that if you receive two Fascist laws, the probability that the President is a fascist goes up to $3/4$.
- ▶ The probability that they drew 3F is

$$\frac{11}{17} \frac{10}{16} \frac{9}{15}.$$

However, if they drew 2F1L, they could have drawn the liberal card as the first, second or third card, so the probability that they drew 2F1L is twice as big, namely

$$3 \frac{11}{17} \frac{10}{16} \frac{6}{15}.$$

Bayes' Theorem 1

- ▶ Bayes' Theorem converts conditional probabilities

$$P(B|A) = \frac{P(A|B)P(B)}{P(A)} = \frac{P(A|B)P(B)}{P(A|B)P(B) + P(A|B^c)P(B^c)}$$

- ▶ If we set $P(3F) = p$ we get

$$\begin{aligned} & P(\text{Pres. is F} | \text{You get 2F}) \\ &= P(\text{You get 2F} | \text{Pres. is F})P(\text{Pres. is F}) / P(\text{You get 2F}) \\ &= \frac{(P(3F) + P(2F1L)) \cdot 1/2}{(P(3F) + P(2F1L)) \cdot 1/2 + P(3F) \cdot 1/2} \\ &= \frac{3p}{3p + p} = 3/4 = 0.75. \end{aligned}$$

Number of Cards 1

- ▶ If there had been 12 fascist cards, then $P(2F1L)/P(3F) = 3 \cdot 6/10$, which is less than 2.
- ▶ If there were $12 + 6 = 18$ cards, we would have drawn all the cards in the first 6 rounds, which is another reason for not having 12 fascist cards.
- ▶ With an even number of players, we get the following table.

Players	Before	After
6	$2/5 = 0.4$	$2/3 = 0.67$
8	$3/7 = 0.43$	$9/13 = 0.69$
10	$4/9 = 0.44$	$12/17 = 0.71$

Historical Background 1

- ▶ During the Weimar Republic (1918 – 1933), there were 8 elections before the Nazis took power and 16 chancellors (including Hitler).
- ▶ Article 48 of the constitution of the Weimar Republic allowed the president to promulgate decrees to take emergency measures without the consent of the Reichstag.
- ▶ Under President Paul von Hindenburg, Article 48 was called on more and more often to bypass a politically fractured and dysfunctional parliament.
- ▶ After Hitler became Chancellor in 1933, he used decrees issued by President Hindenburg to create a totalitarian dictatorship by legal means.