CS 145 – Foundations of Computer Science

Professor Eric Aaron

Lecture – M W 10:30am
Lab – F 3:10pm

Lecture Meeting Location: SP 105
Lab Meeting Location: SP 309

Business

• HW6 due May 1 / May 2

• (Please bring exams to class until we can finish going over them!)

• Reading: Makinson, Ch. 5 and Ch. 6
  – We may not cover all the material in chapter 6, but it’s worth reading anyway

• Labs 5 and 6 due by end of the day April 28
• Lab 7 on Friday, April 29; due by the end of the day Sunday, May 1
  – (Idea is to have Lab 7 completed before HW7 is out on May 2)
Business, pt. 2

- Visiting Speaker tomorrow, April 28
  - Title: Referring to objects in interactive virtual environments
  - Speaker: Kristina Striegnitz, Union College
  - Place: SP 105
  - Time: 4:35pm

Counting Cards

- What’s the number of 5-card hands can be dealt from a standard 52-card deck (standard 4 suits, 13 cards each; no jokers)?

- Number of 5-card hands with 4 of a kind?

- Number of 5-card hands with a full house (i.e., a 3 of a kind and a pair for its 5 cards)?

- Number of 5-card hands with a flush (i.e., all cards having the same suit)?
Counting Cards

• What’s the number of 5-card hands can be dealt from a standard 52-card deck (standard 4 suits, 13 cards each; no jokers)?

• Number of 5-card hands with 4 of a kind?

• Number of 5-card hands with a full house (i.e., a 3 of a kind and a pair for its 5 cards)?

• Number of 5-card hands with a flush (i.e., all cards having the same suit)?

Counting Cards

• Number of 5-card hands with 3 of a kind and nothing more (i.e., having 3 of a kind but not 4 of a kind or a full house)?

• Number of 5-card hands with 2 pair and nothing more?

• Number of 5-card hands with a straight (i.e., in rank order)?

Which 5-card hand is more common, a straight or a flush? Did we just figure that out, in the last two slides?

• How about the number of 8-card hands with 2 pair and one 3-of-a-kind (but no 4-of-a-kind)?
• In the game of poker, there are several kinds of hands with a pair or better… how do they rank relative to each other?

   **Kinds of poker hands:**
   - 1 pair; 2 pair; 3 of a kind; 4 of a kind; full house
   - Straight; flush; straight flush; royal flush

   - On what basis *should* one kind of poker hand be a winner over a different kind?

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**Ranking of Poker Hands**

• In the game of poker, there are several kinds of hands with a pair or better… how do they rank relative to each other?

   - On what basis *should* one kind of poker hand be a winner over a different kind?
   - To the right, on this slide, is the standard rank ordering of poker hands.
   - Do we think the standard ordering is right? How would we confirm it?

   - How would we compute the probability for each of the kinds of hands?
Counting Full Houses

• What’s the number of 5-card hands can be dealt from a standard 52-card deck (standard 4 suits, 13 cards each; no jokers)?
  – \( \binom{52}{5} = \frac{52!}{5! \cdot 47!} = 2598960 \)

• Number of 5-card hands with a full house?
  – One way to think of it: choose rank \( r_1 \) for the triple, then choose 3 cards for it; then choose rank \( r_2 \) for the pair, then choose 2 cards for it
    • So: \( 13 \cdot \binom{4}{3} \cdot 12 \cdot \binom{4}{2} = 13 \cdot 4 \cdot 12 \cdot \frac{(4 \cdot 3)}{2} = 3744 \)

• Probability of a 5-card hand being a full house?
  – \( \frac{\text{(number of full houses)}}{\text{(number of 5-card hands)}} = \frac{3744}{2598960} \)