

Example: The Dishonest Casino

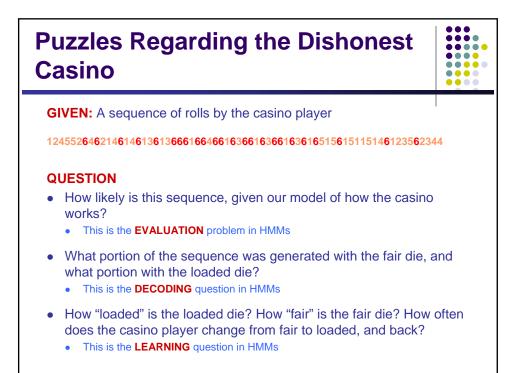
A casino has two dice:

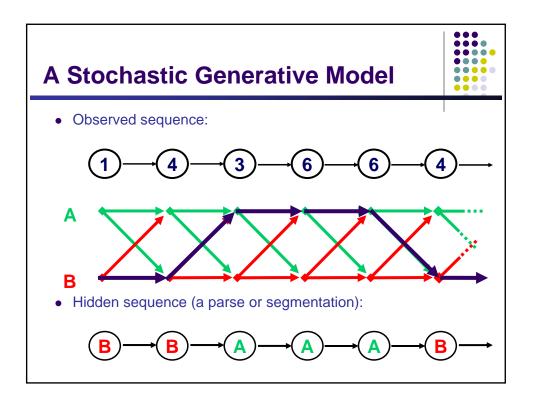
- Fair die
 - P(1) = P(2) = P(3) = P(5) = P(6) = 1/6
- Loaded die P(1) = P(2) = P(3) = P(5) = 1/10
 - P(1) = P(2) =
 - P(6) = 1/2
- Casino player switches back-&-forth between fair and loaded die once every 20 turns

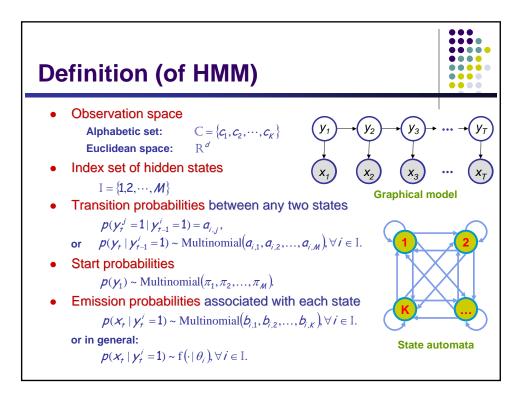
Game:

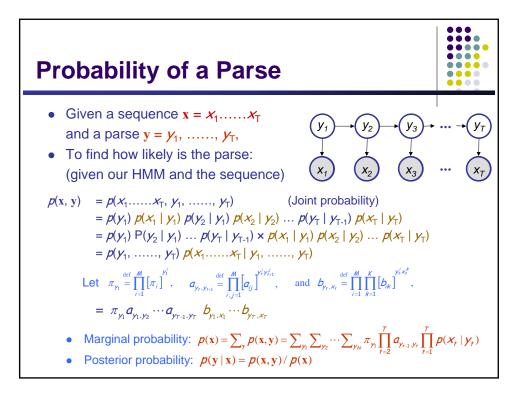
- 1. You bet \$1
- 2. You roll (always with a fair die)
- 3. Casino player rolls (maybe with fair die, maybe with loaded die)
- 4. Highest number wins \$2

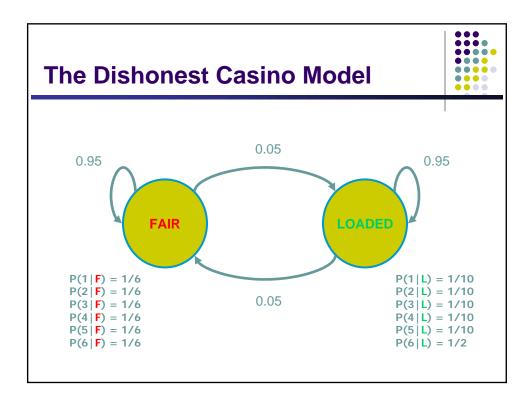


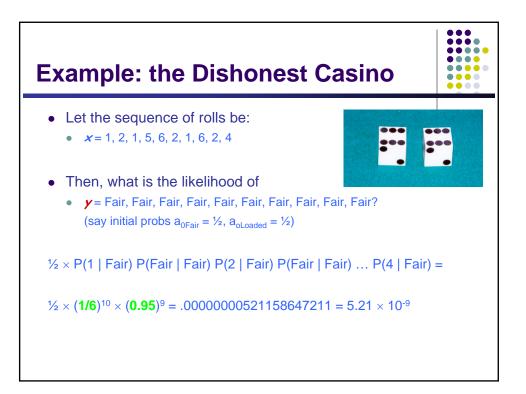


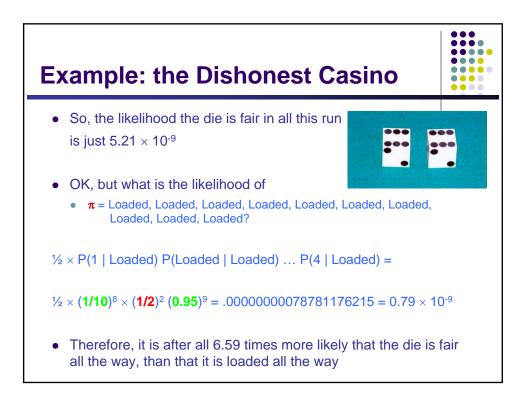


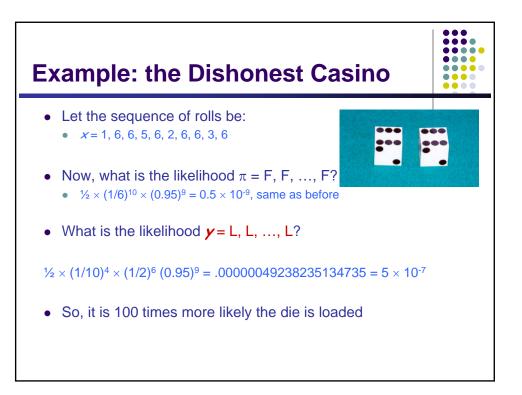












Three Main Questions on HMMs			
1. Evaluatio	n		
GIVEN FIND ALGO.	an HMM <i>M</i> , Prob (<i>x</i> <i>M</i>) Forward	and a sequence <i>x</i> ,	
2. Decoding)		
GIVEN FIND	an HMM M , and a sequence x , the sequence y of states that maximizes, e.g., $P(y x, M)$, or the most probable subsequence of states		, M),
ALGO.	Viterbi, Forward-backward		
3. Learning			
GIVEN	an HMM M , with unspecified transition/emission probs., and a sequence x ,		
FIND ALGO.	parameters $\theta =$ Baum-Welch (E	$(\pi_{i}, a_{ij}, \eta_{ik})$ that maximize $P(\boldsymbol{x} \mid \theta)$	

