What is the danger with recoloring?

(A) If the recoloring is too weak, not all errors removed
(B) If the recoloring is too strong, new errors created
(C) Both (A) and (B)
(D) None of the above
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Course Registration

• $m$ students, each registers for $n$ classes Spring 2016.
• classes are MWF or TTh
• students don’t want all MWF or all TTh

Question: Is there a way to schedule courses MWF or TTh so no student has all courses on same day?
Basic Method

Uniformly color classes **MWF** or **TTh**

**BADs**: all courses of student **S** are **MWF** or all **TTh**.

- \( \Pr[\text{BADs}] = 2 \cdot 2^{-n} \)
- \#students = \( m \)
- union bound:
  \[ \Pr[\text{BAD}] \leq m2^{-(n-1)} \]
- want: \( \Pr[\text{BAD}] < 1 \)

**Conclusion**: If \( m2^{-(n-1)} < 1 \) then there is schedule so no student has all classes on same day.
Alterations

(1) First, generate uniform coloring
   • assign each class MWF or TTh
(2) Second, recolor
   • if class registered by m-c student,
     change color w/prob p
(3) return class schedule

Question: What can go wrong? When can we get monochromatic students?
Let \( A_S \) be event that

(i) student \( S \) was monochromatic after first coloring

(ii) none of \( S \)'s courses changed during recolor.

What is \( \Pr[A_S] \)?

(A) \( \Pr[A_S] \leq 2^{-n}p^n \)
(B) \( \Pr[A_S] \leq 2^{-n}(1-p)^n \)
(C) \( \Pr[A_S] \leq p^n(1-p)^n \)
(D) \( \Pr[A_S] \leq 2*2^{-n}(1-p)^n \)
(E) None of the above
Clicker Question

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(D) \( \text{Pr}[A_S] \leq 2*2^{-n}(1-p)^n \)

(E) None of the above
The Probabilistic Method

some of us see the world in terms of expected value. We are very different from the rest of you.

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