444 Lecture 4.1 - Information Sets

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Plan

To discuss how we introduce uncertainty into the theory of games.

Reading

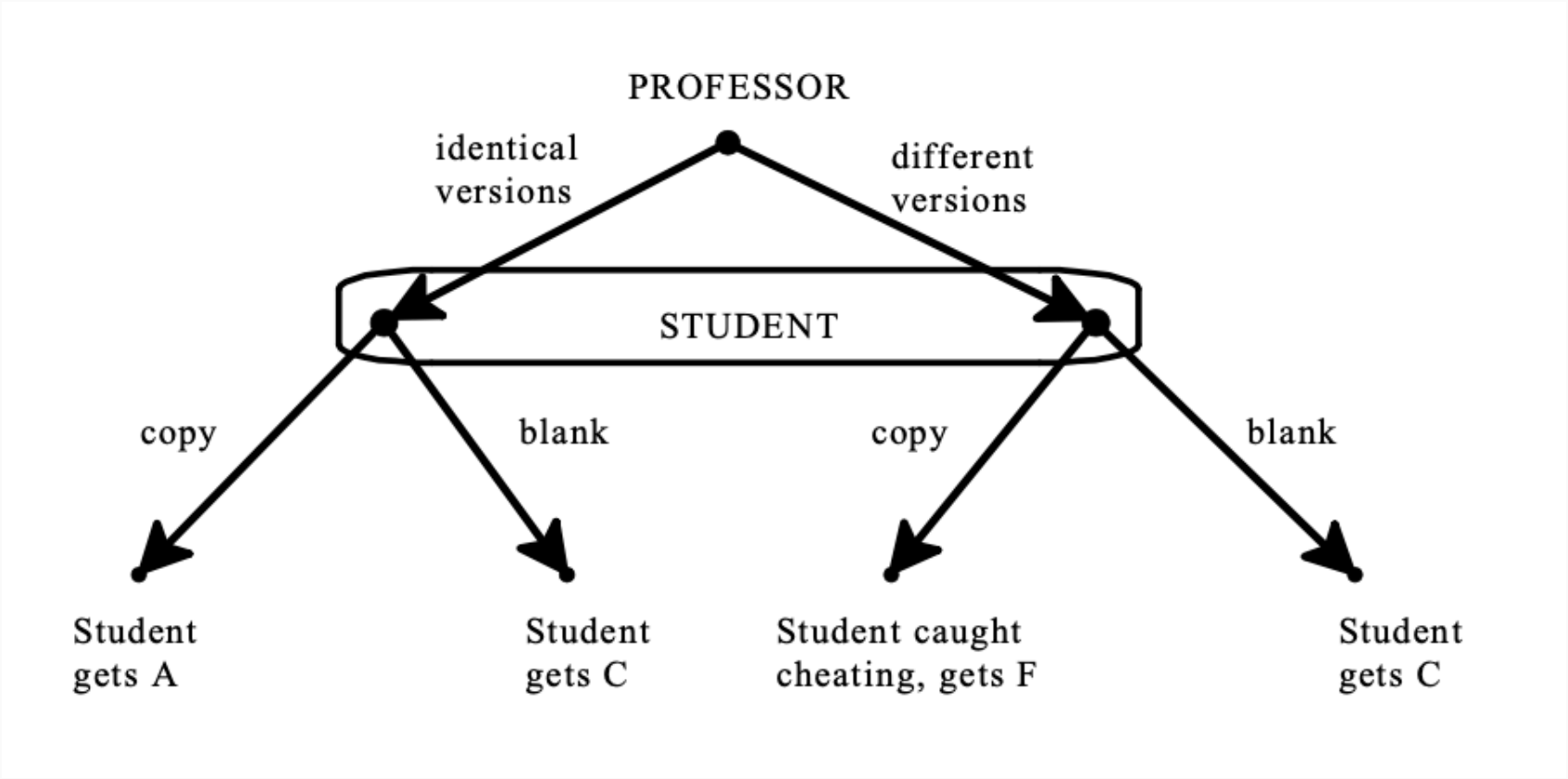
Bonanno, section 4.1; the slide numbers and the section numbers have joined for now.

Basic Idea

- Sometimes when a player has to make a choice, they know they are at one of a set of nodes in the tree, but they don't know which one.
- We will illustrate this by drawing a circle around the nodes.
- The circle means that the player making a choice knows that they are in that circle somewhere, but the rules of the game don't guarantee that they know which point they are in.

Cheating Game

- Professor decides to either give every student the same exam, or give different exams to different students.
- Student doesn’t know what professor did, and has to decide whether to copy off (known to be good at the course) neighbour.



Payoff tree for cheating game

How To Read Tree

- Professor makes a choice.
- Then student makes a choice.
- When student chooses, there is a fact about where in the tree we are.
- But student isn't told that fact - they are just told that we are at one of the nodes in the circled set.

Circles Everywhere

- We don’t normally draw them, but you should imagine these circles everywhere on the tree.
- If a node doesn’t have a circle around it, that means that its circle just contains itself.

Information Set

- We will call the circle associate with each point its **information set**.
- Each node is in precisely one information set.
- That set may be a singleton; it might just be that node.
- But that's not the general case.

Constraints on Information Sets - Outputs

Every node in an information set must have the same outputs.

- You can't have an information set where the Player has three options from one node, but only two from another.
- The player knows how many options they have.
- So if the options were different, they could figure out which node they were at.

Constraints on Information Sets - Inputs

Every node in an information set has the same history of moves by the player whose turn it is.

- We assume everyone knows what moves they have made.
- It is an interesting fact that some real life board games rely on the falsity of this assumption.
- But as on previous slide, if the nodes have a different history for this player, that means the player knows which node they are at.

For Next Time

- We will look at some assumptions about information sets that game theorists usually take for granted, but which seem philosophically problematic.