Research Seminar 6.
Solving Extensive Form Games by Computer

TU Delft

What is Gambit?

- a set of software tools for doing computation on finite, noncooperative games.

- These comprise a graphical interface for interactively building and analyzing general games in extensive or strategy form;

- a number of command-line tools for computing Nash equilibria and other solution concepts in games;

- and, a set of file formats for storing and communicating games to external tools.
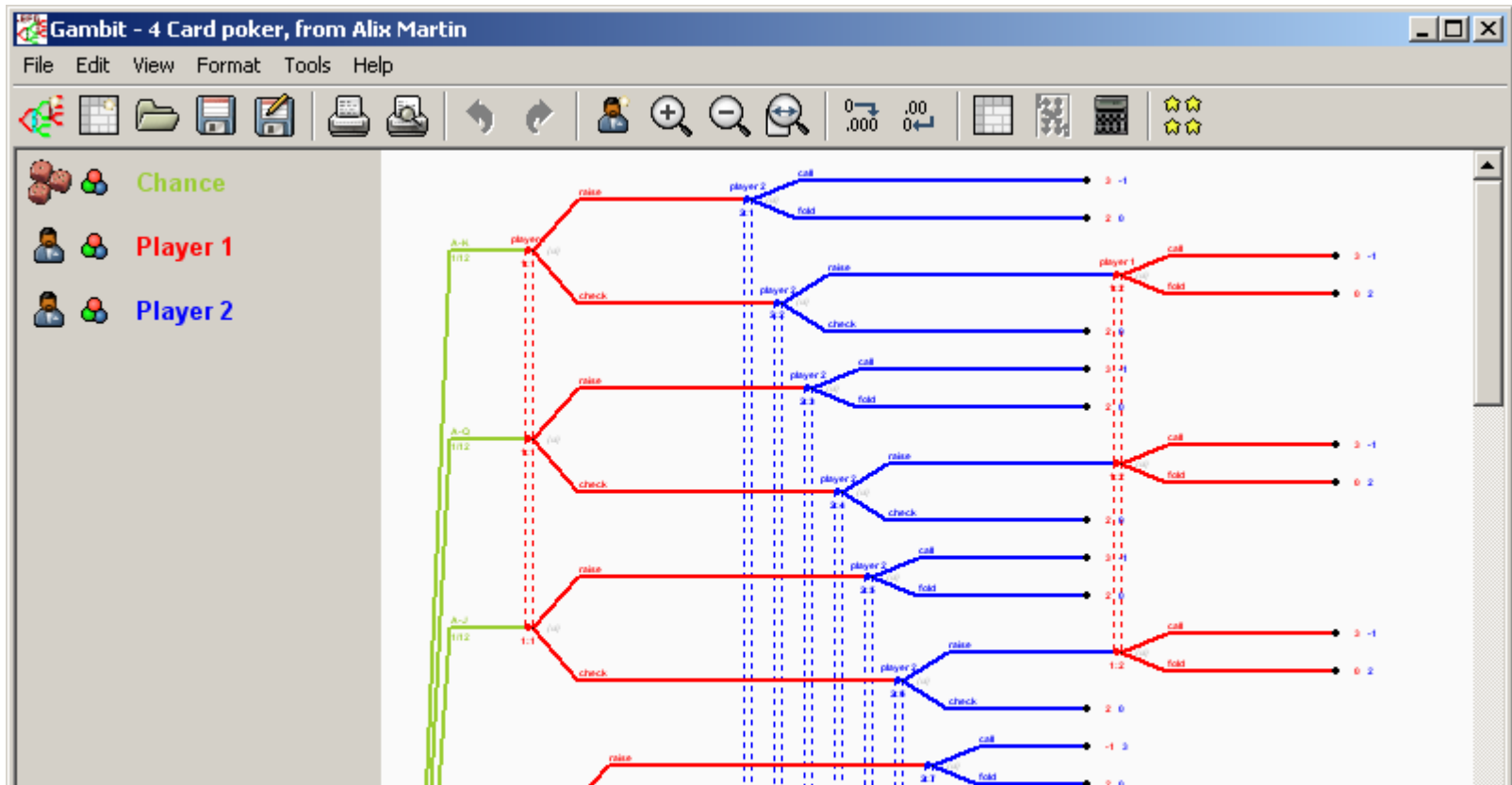
Gambit User Guide, http://gambit.sourceforge.net

TU Delft

Gambit: Where to Get It

• Gambit is open source software

• Downloads available from Sourceforge (see link) a leading mirror of open source software

• Available for Windows and Macintosh

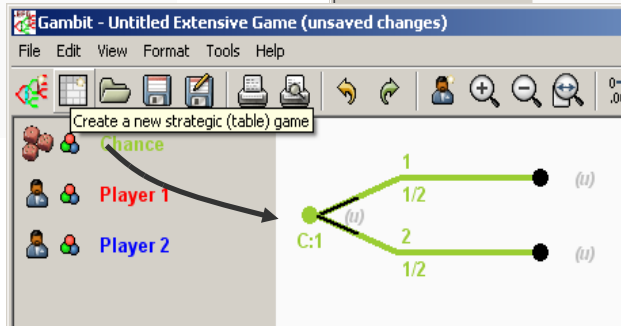• Includes an "application programmning interface" to the language Python
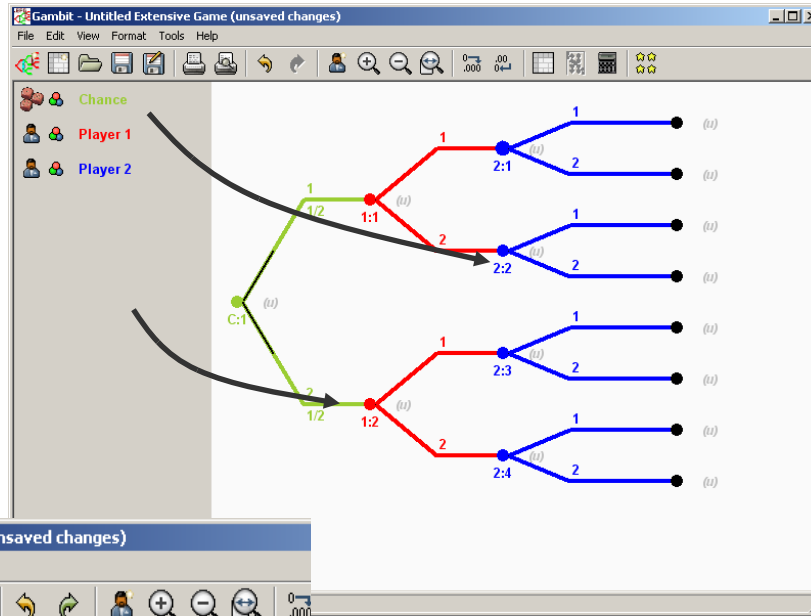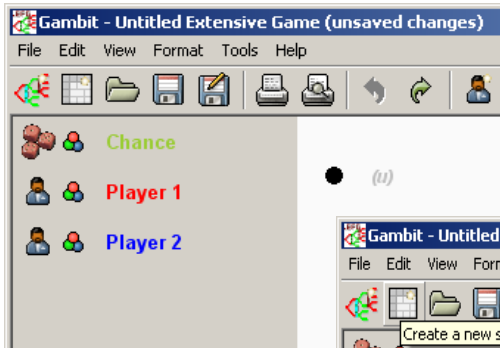
Sample Game: Four Card Poker

TUDelft

Dragging and Dropping Player Nodes

Drag and drop player nodes to create a tree

You can also create games in strategic form

TUDelft

Adding Information Sets

Labelling Nodes and Moves

Setting Payoffs and Probabilities
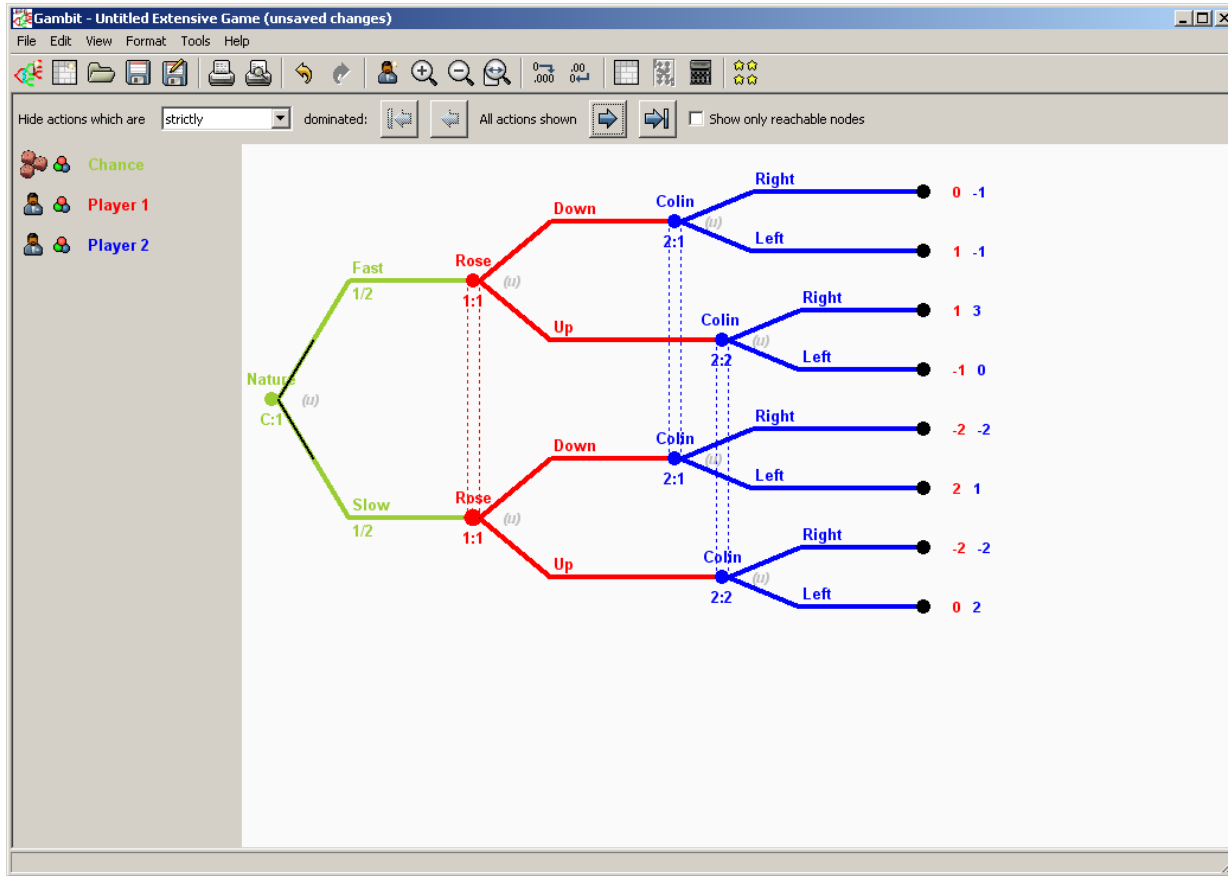
Computing Nash Equilibrium

Four equilibria

Click on equilibria to display the payoffs and play of the game

Computing Nash equilibria

The computation has completed.   Number of e

#	1: 1	1: 2	2: 11	2: 12	2: 21	2: 22
1	1	0	0	0	1	0
2	1	0	0	0	0	1
3	0	1	0	1	0	0
4	0	1	0	$\frac{4}{5}$	0	$\frac{1}{5}$

Gambit – Untitled Extensive Game (unsaved changes)

e Edit View Format Tools Help

✓ Dominance
  Equilibrium
  Qre

de actions which are strictly dominated: All action

Chance

Player 1
Payoff: -1/2
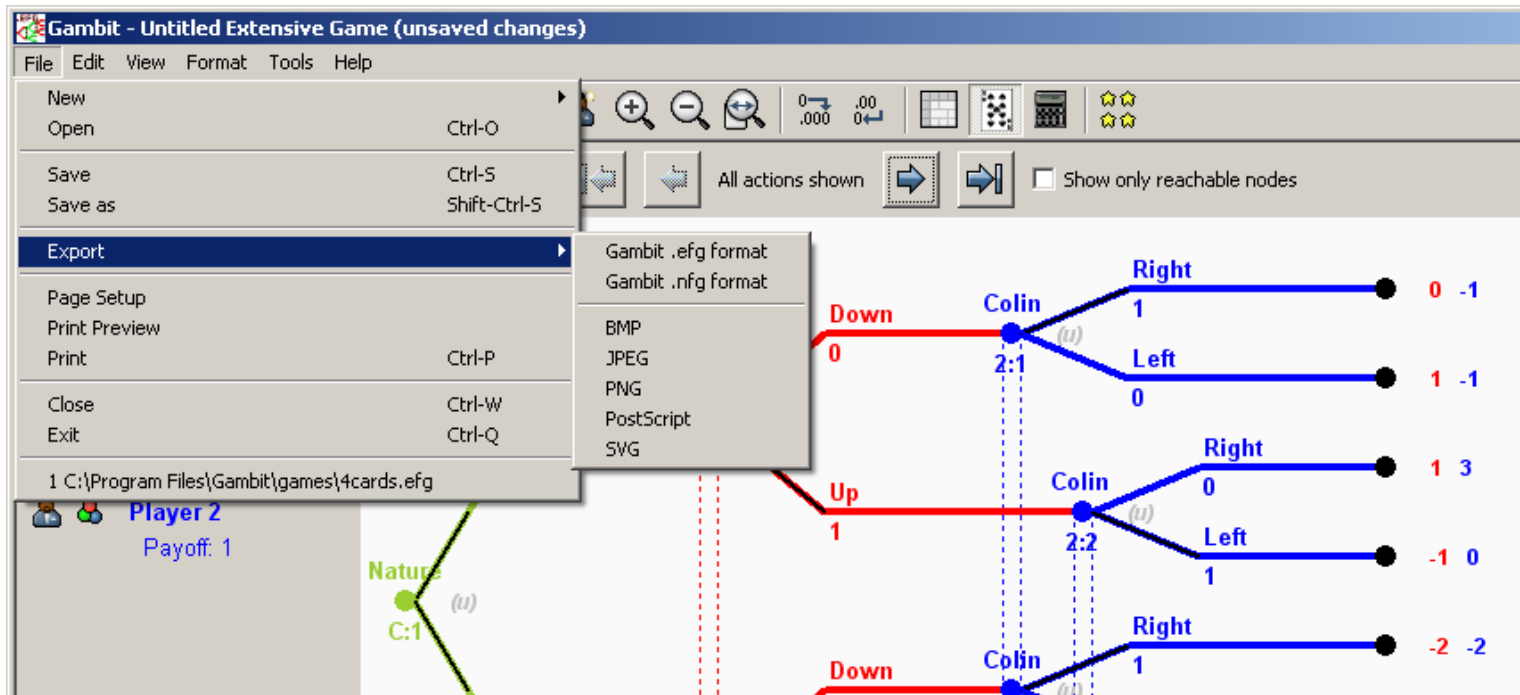
Player 2
Payoff: 1

Fast
1/2

Rose
1:1

Nature

T̃U Delft

Discussion of Equilibria

- Two solutions found by both Gambit and us
  - Rose "Down" and Colin "Left"
  - Rose "Down" and Colin "Left if Down"
- Two solutions found only by Gambit
  - Rose "Up" and Colin "Left if Up"
  - Rose "Up" and Colin mixed "Left" and "Left if Up"
- We eliminated weakly dominated solutions; Gambit did not

Exporting Trees to Gambit Files or Graphics

TUDelft

Other Features and Bugs

- Quantal Response Equilibrium: Gambit includes an evolutionary mechanism for computing equilibria which involves players trying out strategies, and doing more of those which work the best

- Dominated Strategies: This feature of Gambit doesn't seem to work for extensive form games, resulting in errors and maybe even crashes

TU Delft