

Broadening Participation Serious Games Analytics & AI in interaction



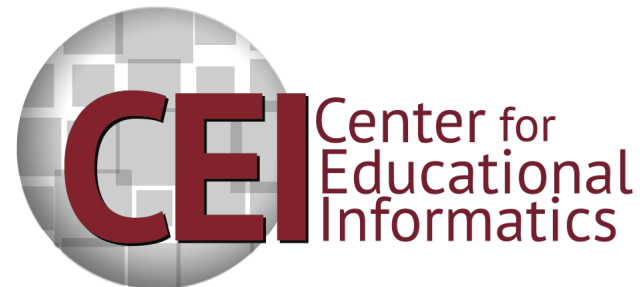
Tiffany Barnes
Associate Professor
Computer Science

1961: The Computers of Tomorrow

- By 2000, man should have a much better comprehension of himself and his system ...
- because he will have learned to use imaginatively the most powerful **amplifier of intelligence** yet devised.

Human-amplifying computing

Computing can amplify compassion, communication, understanding, and creativity – and even transform people and our society.





Broadening Participation w. Regional partnerships Univ-Industry-K12-Prof



The STARS Community of Practice

Advancing innovation and discovery through *regional partnerships* to broaden participation

STARS Leadership Corps

Tiered participation of students, professionals, & educators in research and civic engagement catalyzes regional partnerships



Research, Women's, & Minority Universities

Industry

K-12

Community
Colleges

Community & Professional Organizations



Tiered Participation

The corps provides
stair-step role
models &
mentors

Faculty,
Industry

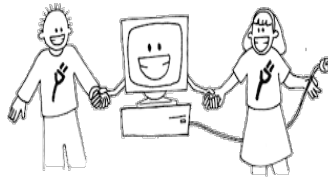
Graduate
students

Undergraduates

K-12 students

Partner to spread good things

- Tekkotsu Robots – with ARTSI Alliance
- REU Preparation – with A4RC Alliance
- Affinity Research Groups – with CAHSI
- CS Unplugged



Video from Florida

- Alice



- Scratch, GameMaker



Alliance for the Advancement of African American Researches in Computing

- Career Mentoring workshops – with CRA-W

- STARS Haiti - *One Laptop per Child* – with Waveplace Foundation and MAC



Computing Scholars of Tomorrow
empoweringleadership.org

- ECEP (Georgia Computes! & CAITE)



- CS Toolkit with Microsoft



MOTHERING ACROSS CONTINENTSSM

ADOPTING DREAMS.
RAISING TOMORROW'S LEADERS.

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1700 STARS students

50 universities/colleges

Celebration: Aug 14-16 @ DC

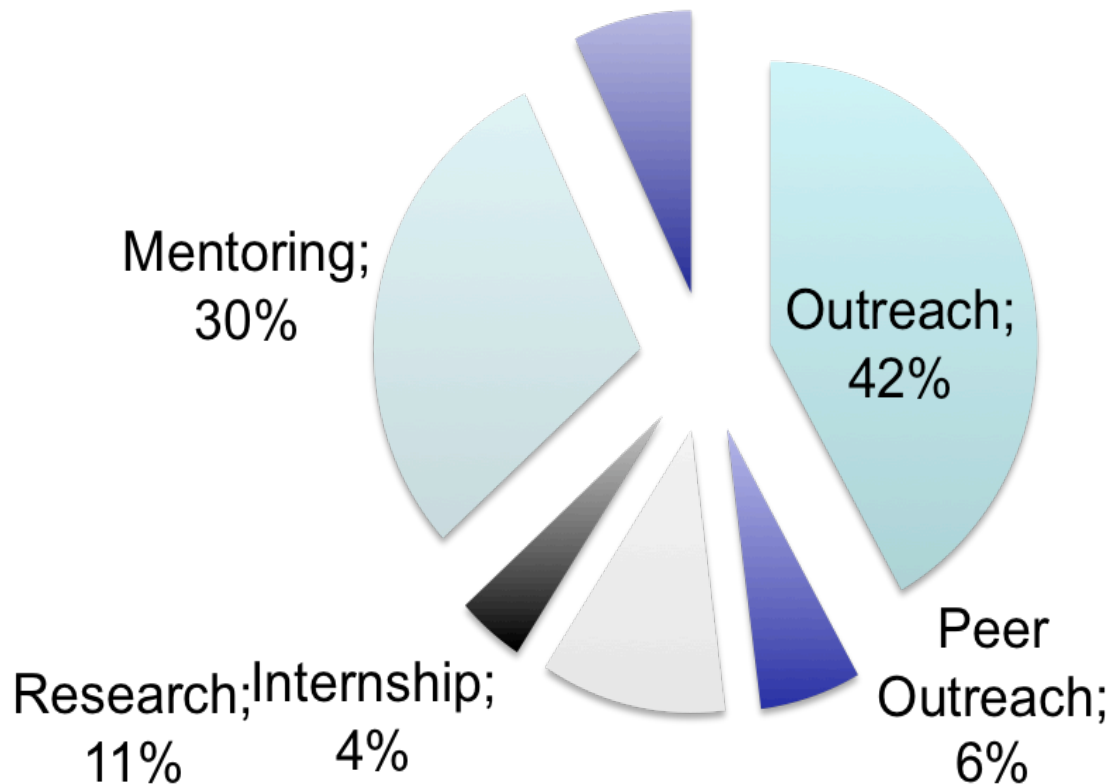


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NC

Service;
7%

STARS Project Types



“[STARS] has helped me map out my career goals ... helped me discover how much I really want to be a professor.” ~ SLC Student

“STARS ... students develop leadership skills and ... participate in socially relevant outreach. [STARS creates] a sense of community ... and resulted in many of them becoming graduate students.” ~ SLC Faculty

Outreach to 77,000 in K12



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Beauty and Joy of Computing

- New CS Principles AP in 2016-2017
- NSF CE21 grant (1138596)
- NCSU+Berkeley collaborative project
- Prepares 172 high school teachers
- CSC 200 Spring 2014 -> future



Score 2 8984.4

move 1

count 3

problems wrong

1 7 X 7 NOT 77

+ length: 1

hits 010

prob # 2

move 2 1.3

problems right

0 X
1 464 =
0

2 4 X 7 =
28

+ length: 2

whats 7 X 7

Score 3765.6

BJC project: Math game



10000

Code

when clicked

setup

```
repeat until
  letter 1 of answer = S or
  letter 1 of answer = s

display question of type type difficulty diff
random x's type m type diff diff
random x's type h type diff diff

if # correct = 10
  broadcast new lv
  set # correct to # correct + 1

if # correct = 12
  set # correct to # correct + -1

if # correct = 25
  broadcast new lv
  set # correct to # correct + 1

if # correct = 27
  set # correct to # correct + -1
```

type can be A D
S OR M for + - x
or/. difficulty will
be s for super
easy 1x1 1x2
1x3 m for
problems
consisting of
number 1-6 for
m and 1-50 for A
and S im still
working out the D

broadcast new lv

stop script

repeat until repete = f

```
if letter 1 of type = a
  if prob# = 0
    set result to v1 + v2
    ask join whats join join v1 + v2 and wait
  else
    if letter 1 of type = s
      if prob# = 0
        set result to v1 - v2
        ask join whats join join v1 - v2 and wait
      else
        if letter 1 of type = d
          if prob# = 0
            set result to v1 / v2
            ask join whats join join v1 / v2 and wait
          else
```



Creative Computing Education

A tiered project to:

Provide creative problem-based learning experiences in computing

Engage computing students in building games to teach introductory computing

A project sponsored by NSF IIS-0757521

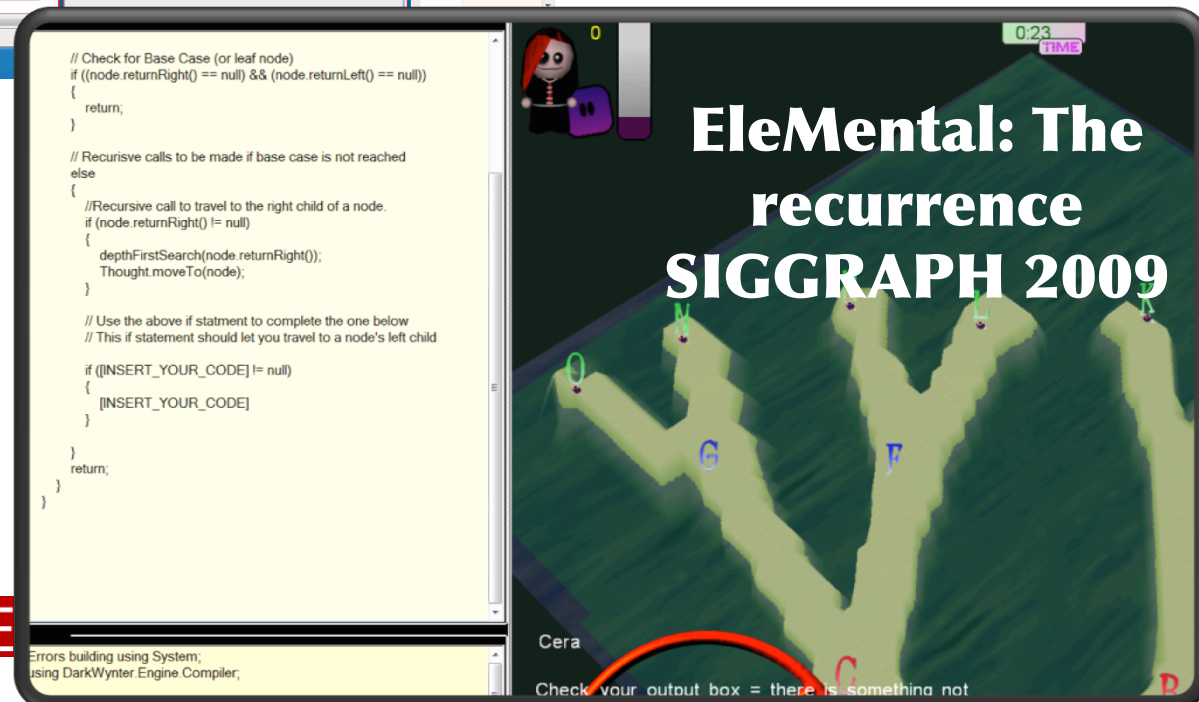




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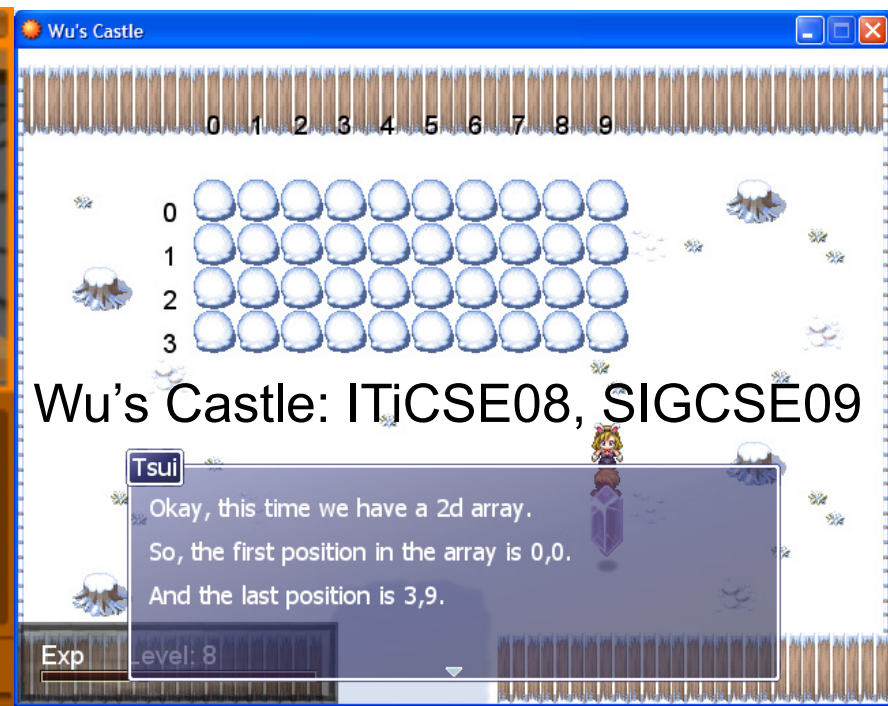
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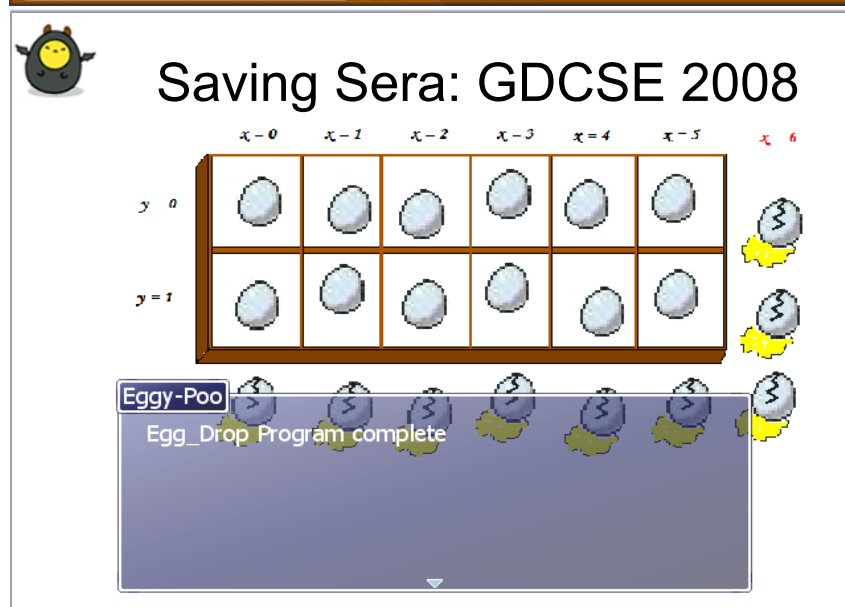
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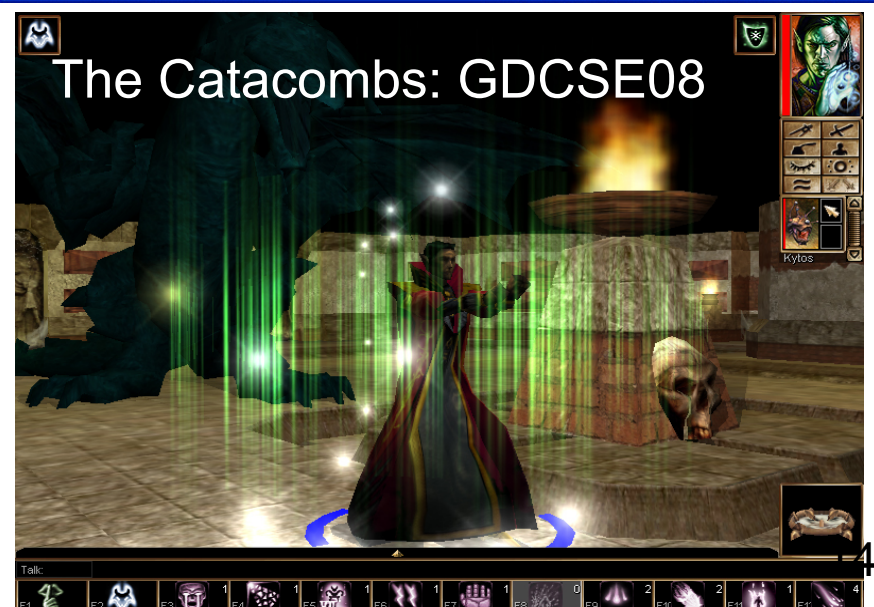
Dance Tool



Wu's Castle: ITiCSE08, SIGCSE09



Saving Sera: GDCSE 2008



The Catacombs: GDCSE08

Bots: learning to program



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1890 Cedars in the Pines

My name is As'ad. I am 15 years old and I live in a small village called Hammana in Mount Lebanon.



I am the eldest of my parents' seven children.



My father works on a silk farm. We don't have much. But we get by.



Father says that the price of silk is falling. But food costs more money than ever.

We talk often of America and all the wealth there.

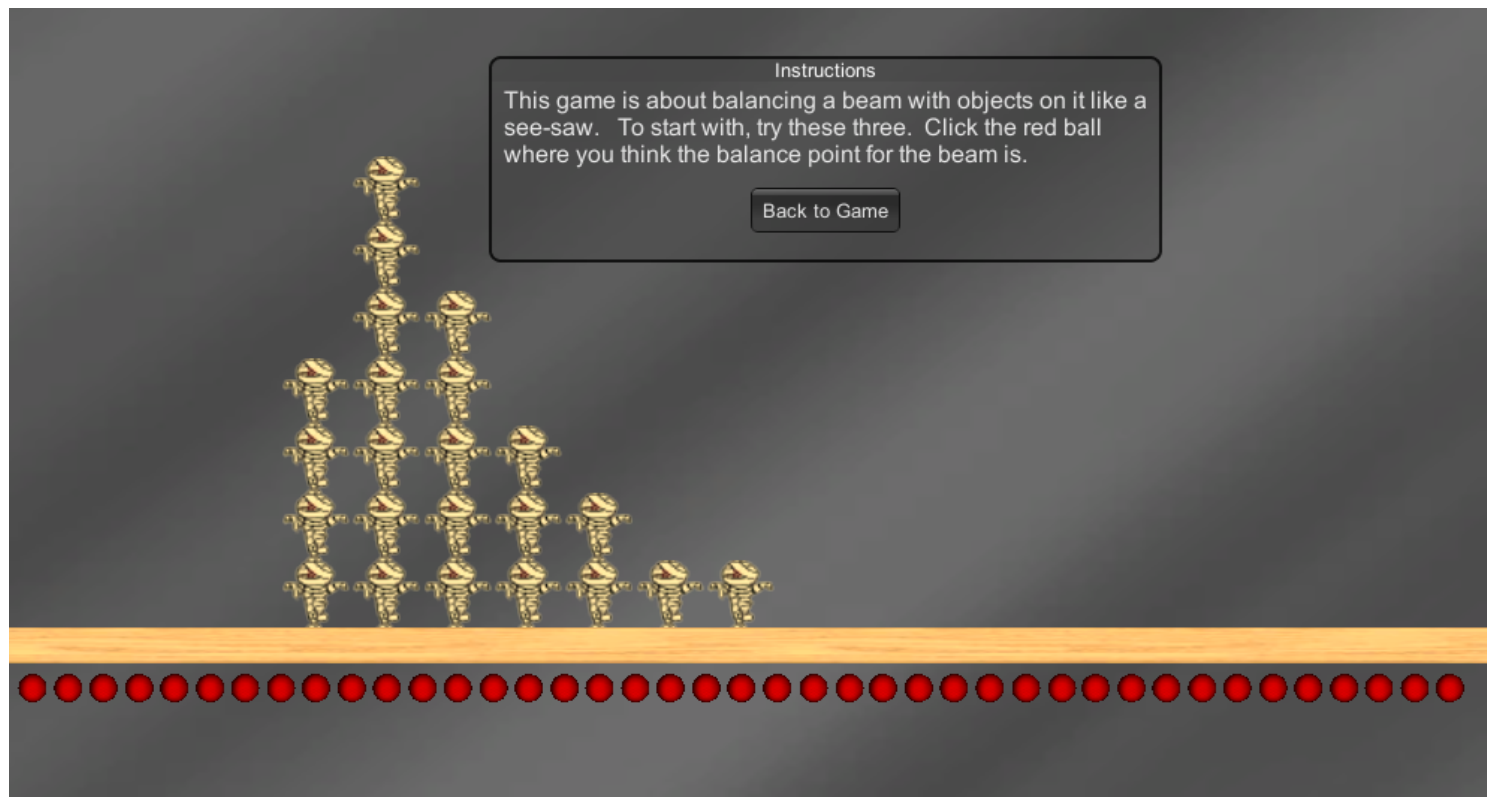
They say the streets are paved with gold.

Today, I became a deacon in the Maronite Church. Soon I will be old enough to work with my father.

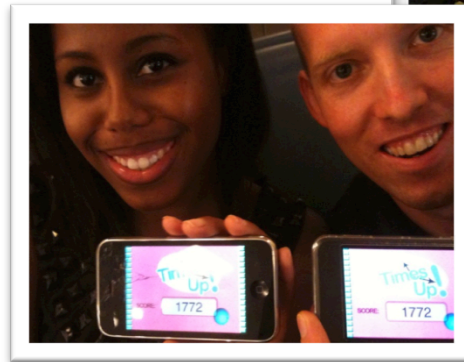
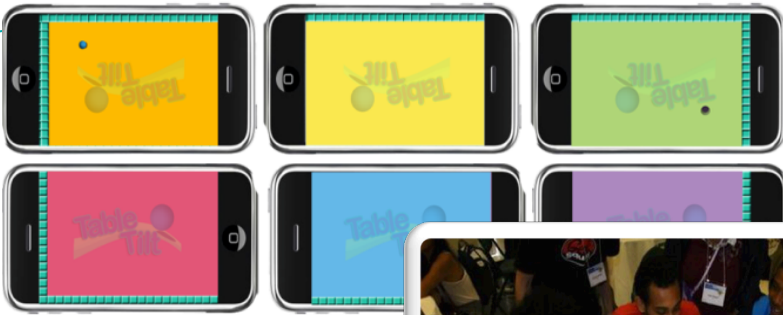


Continue

Teaching math



Mobile games



- Table Tilt
- a 2- to 6- player iPhone game
- Get the ball in the hole!
- Promotes team building

- World of Workout
- Promotes walking
- Gets heart rate up!

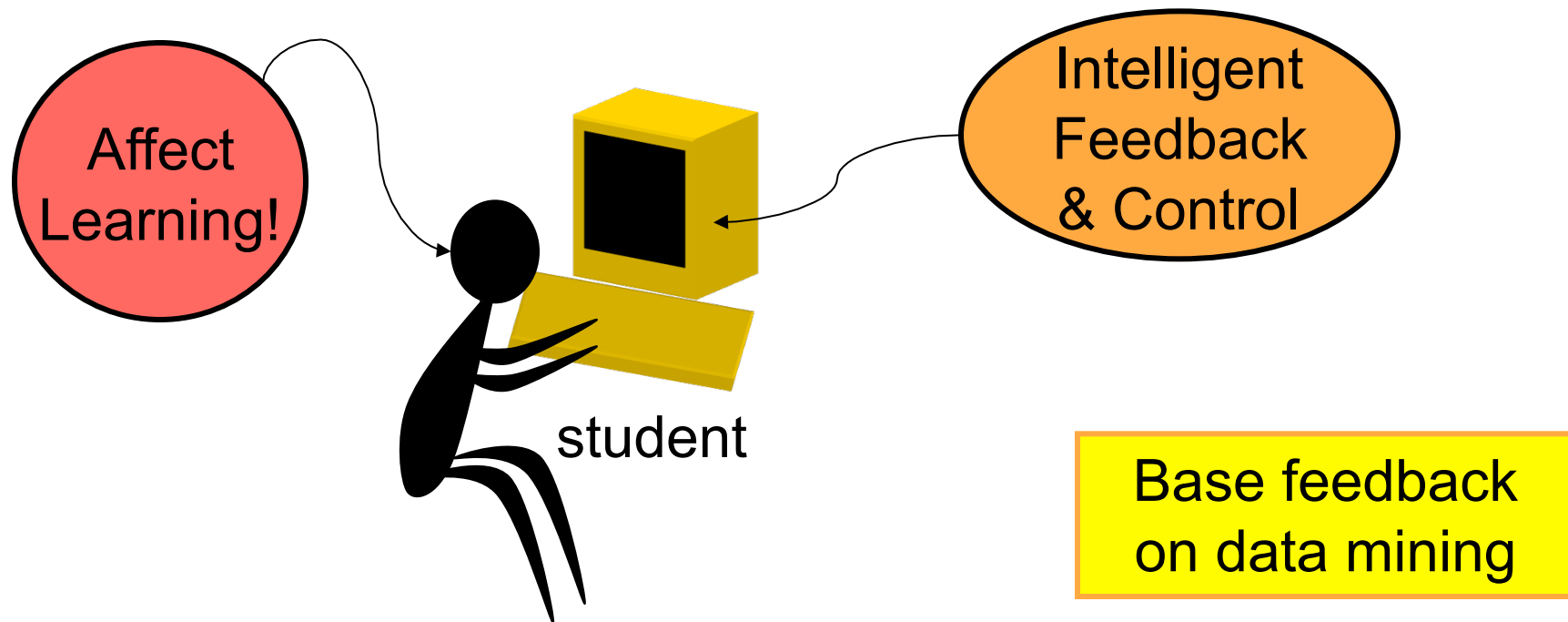
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Games for exercise



CAREER: Educational Data Mining for Student Support in Interactive Learning Environments

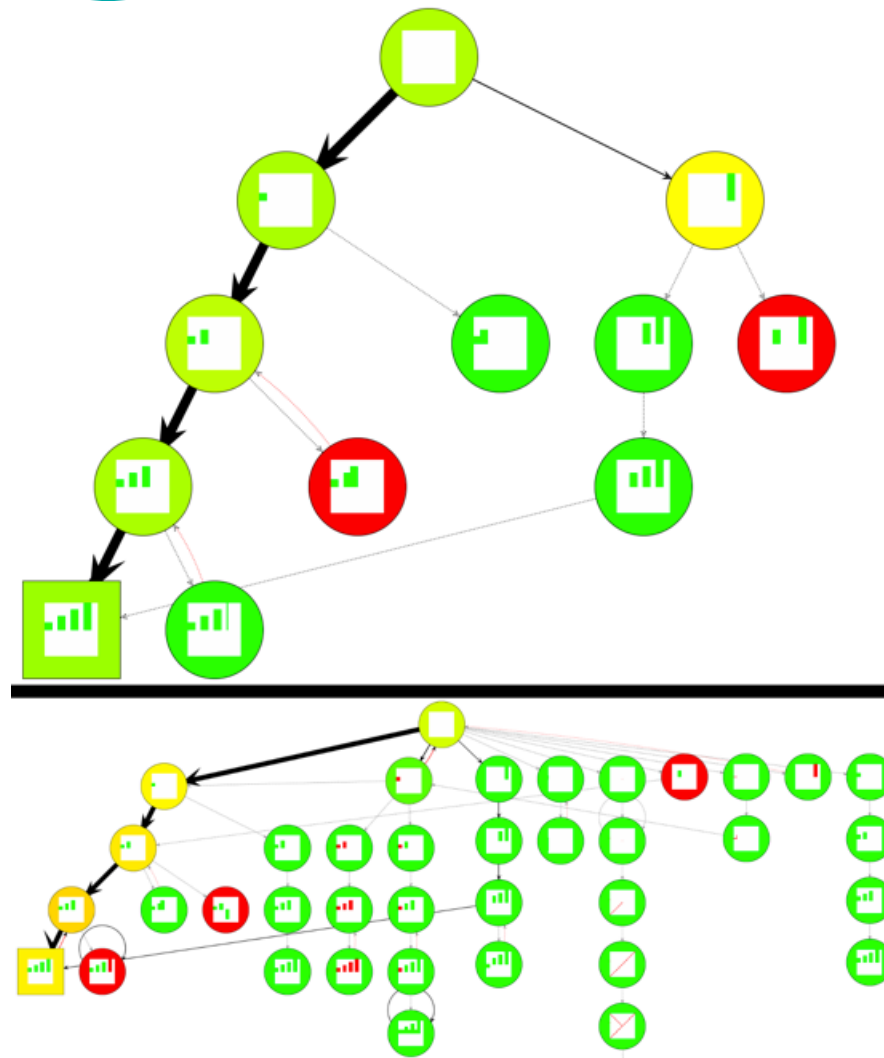


Interaction Networks show learning

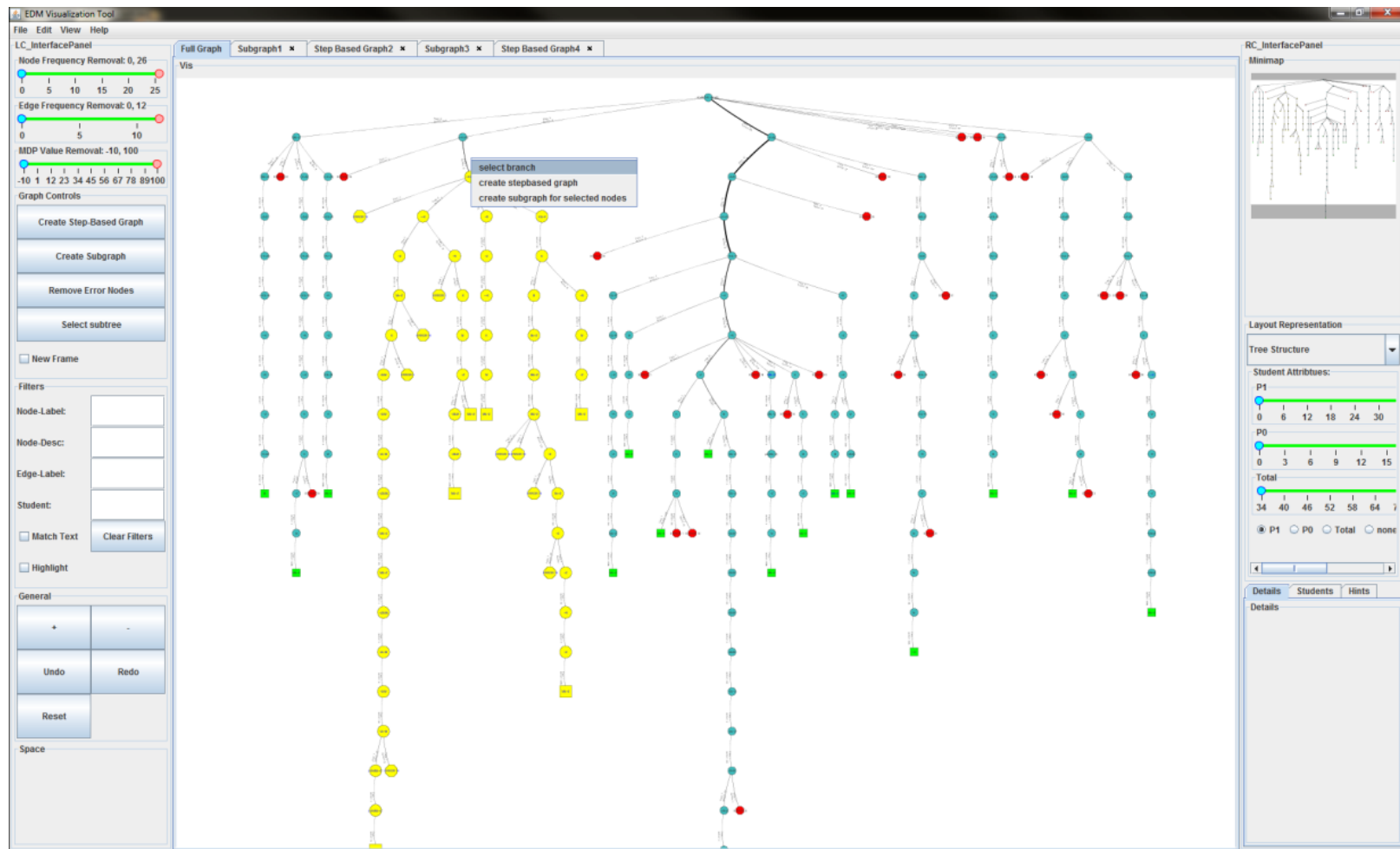
Day 3 at the top

Day 1 at the bottom

Less space exploration -> more
expert students



InVis: View INs



Generating hints

The interface displays a logic puzzle with the following components:

- Top Row:** Three boxes containing the expressions $Q \equiv V$, $\sim Q \supset \sim K$, and $\sim V \equiv \sim K$.
- Derivation Tree:**
 - Root: $\sim V \equiv \sim K$
 - Level 1: $(\sim V \supset \sim K) \& (\sim K \supset \sim V)$ (labeled EQUIV)
 - Level 2: $\sim V \supset \sim K$ (labeled SIMP) and $\sim K \supset \sim V$ (labeled SIMP)
 - Level 3: $V \supset K$ (labeled TRANS, derived from $\sim K \supset \sim V$)
- Hint Dialog:**

Hint

 - 1: Try to derive if N then T working forward.
 - 2: Highlight if not T then not N to derive it.
 - 3: Click on rule Transitive (TRANS)
 - 4: Highlight if not T then not N and click on Transitive (TRANS) to get if N then T

LAST HINT FOR THIS STEP

OK

Java Applet Window
- Rules Panel:**

Options: [Dropdown]

Rules:

MP	MT
DS	ADD
SIMP	CONJ
HS	CD
DN	DEM
IMPL	TRANS
EQUIV	
COM	ASSOC
DIST	ABS
EXP	TAUT

Instantiate
- Bottom Bar:**

NC TOTALS Level 1: 0 / 5 Level 2: 0 / 6 Level 3: 0 / 7 CURRENT 3-6

New Deep Thought Tutor

Deep Thought 2.0
eliza.csc.ncsu.edu/DeepThought/index.php?certificate=50975-2gg-gguhw-30947g
GMail Facebook Twitter SECU Google News CNN Wikipedia AV Club IMDb Blu-Ray IGN Joystiq Zero Punctuation Other Bookmarks

$\neg(P \vee R)$
 $\neg R \rightarrow (\neg S \vee Q)$
 $Q \rightarrow T$
 $S \rightarrow T$

$\neg(S \rightarrow T)$ NOC
 $\neg(\neg S \vee T)$ Impl
 $\neg\neg S \wedge \neg T$ DeM
 $S \wedge \neg T$ DN

Contradiction

Rules

MP Modus Ponens
DS Disjunctive Syllogism
Simp Simplification
HS Hypothetical Syllogism
DN Double Negation
Impl Implication
Equiv Equivalence
Comm Commutative
Dist Distributive
Exp Exportation

MT Modus Tollens
Add Addition
Conj Conjunction
CD Constructive Dilemma
DeM DeMorgan's
Contra Contrapositive
Contradiction
Assoc Associative
Abs Absorption
Taut Tautology

	Expression	Lines	Rule Applied
1	$\neg(P \vee R)$		Given
2	$\neg R \rightarrow (\neg S \vee Q)$		Given
3	$Q \rightarrow T$		Given
4	$S \rightarrow T$		Conclusion
5	$\neg(S \rightarrow T)$		Negation of Conclusion
6	$\neg(\neg S \vee T)$	5	Implication
7	$\neg\neg S \wedge \neg T$	6	DeMorgan's
8	$S \wedge \neg T$	7	Double Negation
C	\perp		

Current Level: undefined Problems Remaining This Level: undefined Levels Completed: undefined/7

Problem Code: undefined

Message Box

Representation

☒ Symbolic
☐ English

Delete Node
Get Hint

Change to Direct Proof
Restart Current Problem
Skip Current Problem

Deep Thought

A Logic Proof Tutor

Version 2.0

September 21, 2013

North Carolina State University

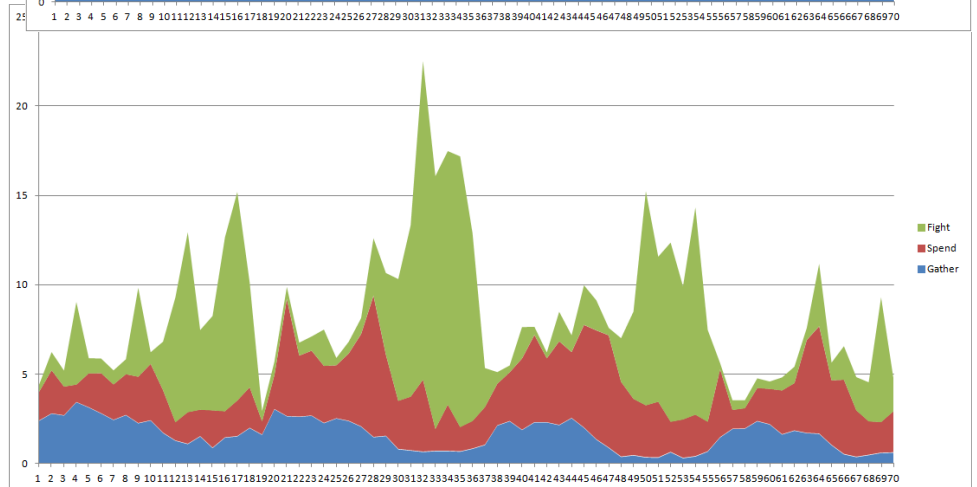
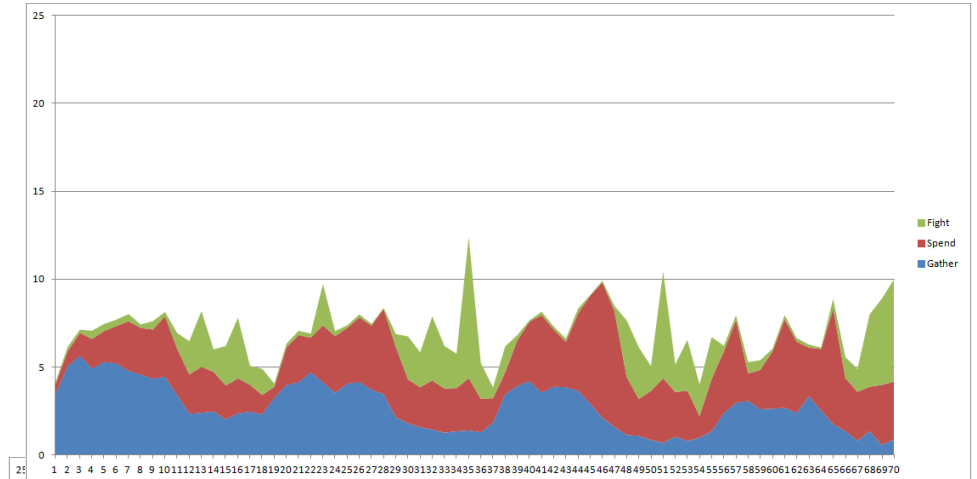
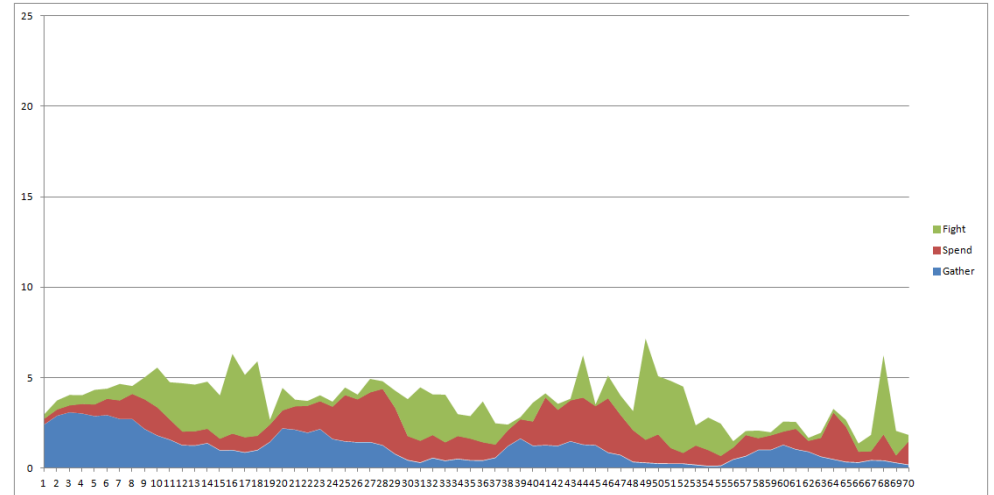
Instructions
Window Information
Contact/Version Information

Game analytics

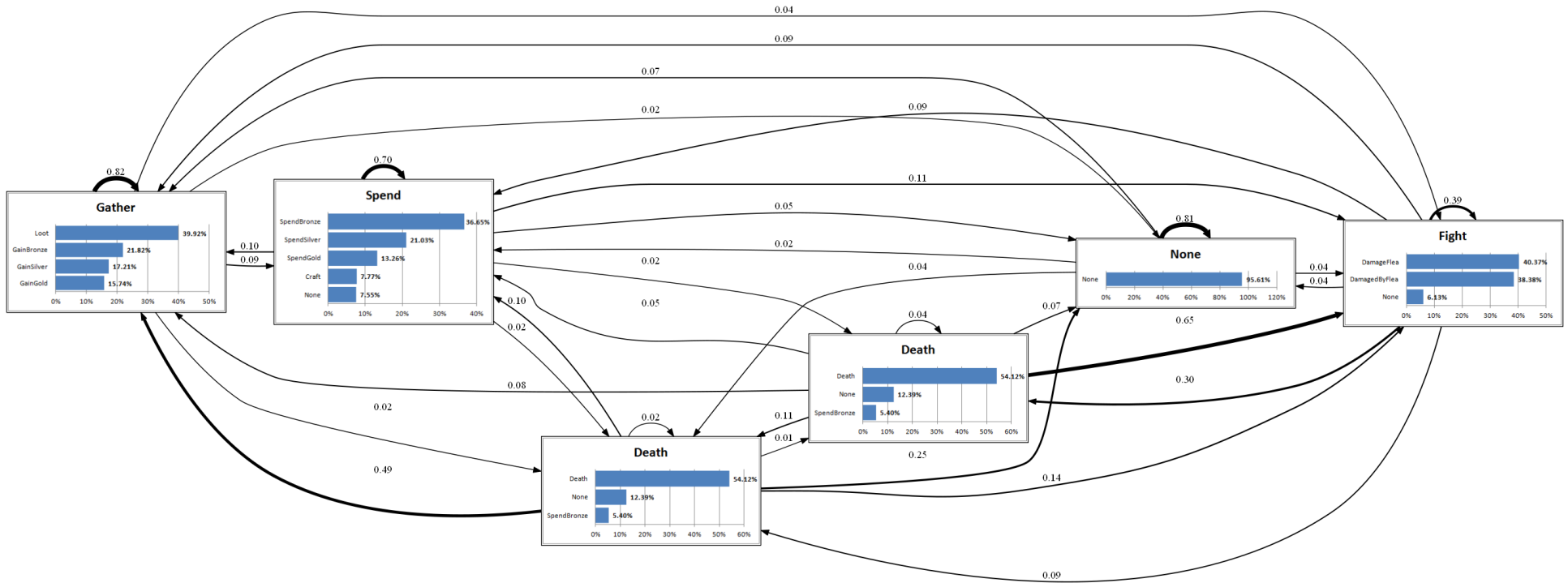
- Collaboration with local game company
- Provided data to class
- Class team explored data
- Created visualizations of user behavior

User Clusters

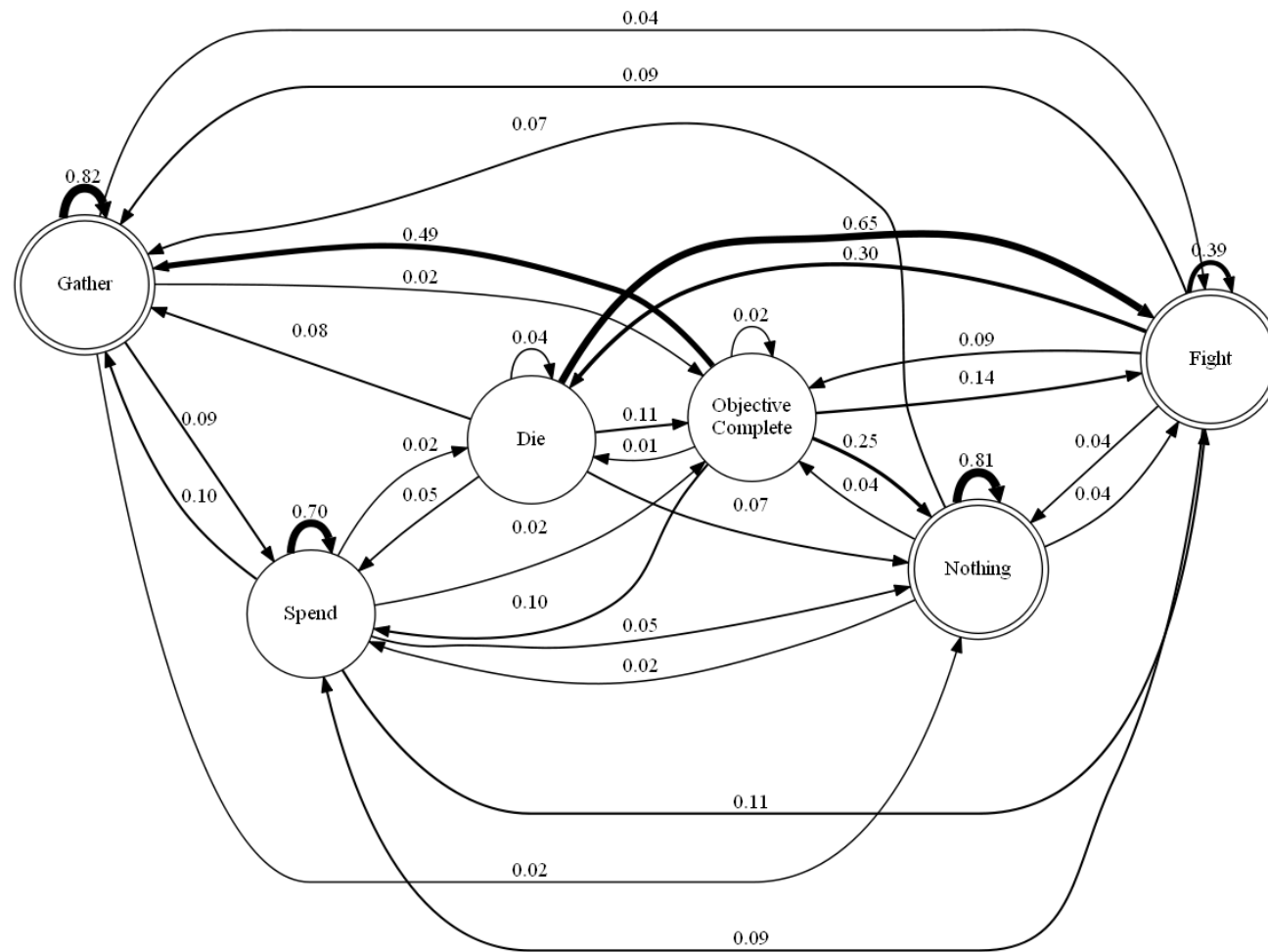
- C0: mostly idle (white!)
- C1: Gathering \$\$ (blue)
- C2: Fighting (green)



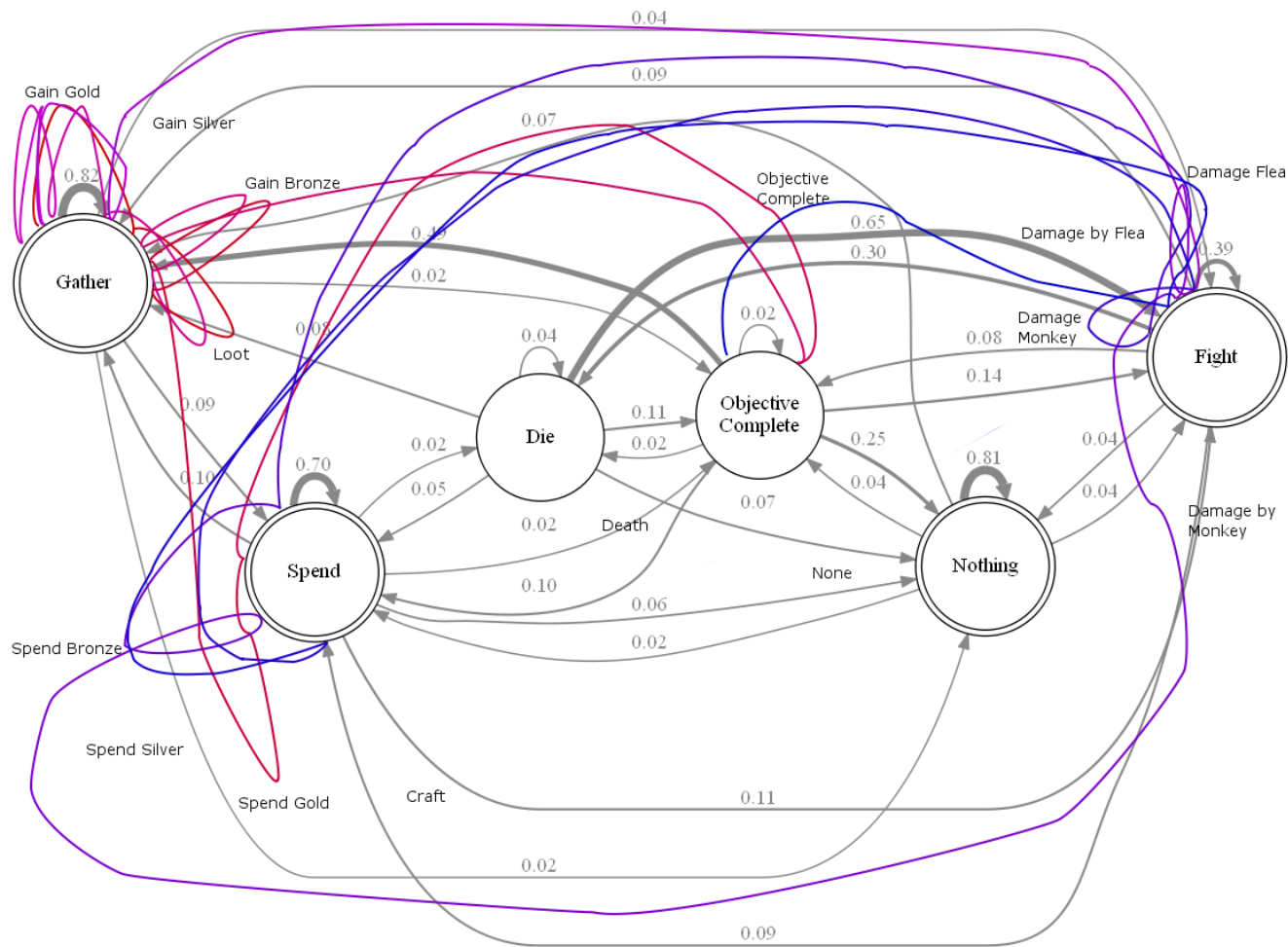
HMMs



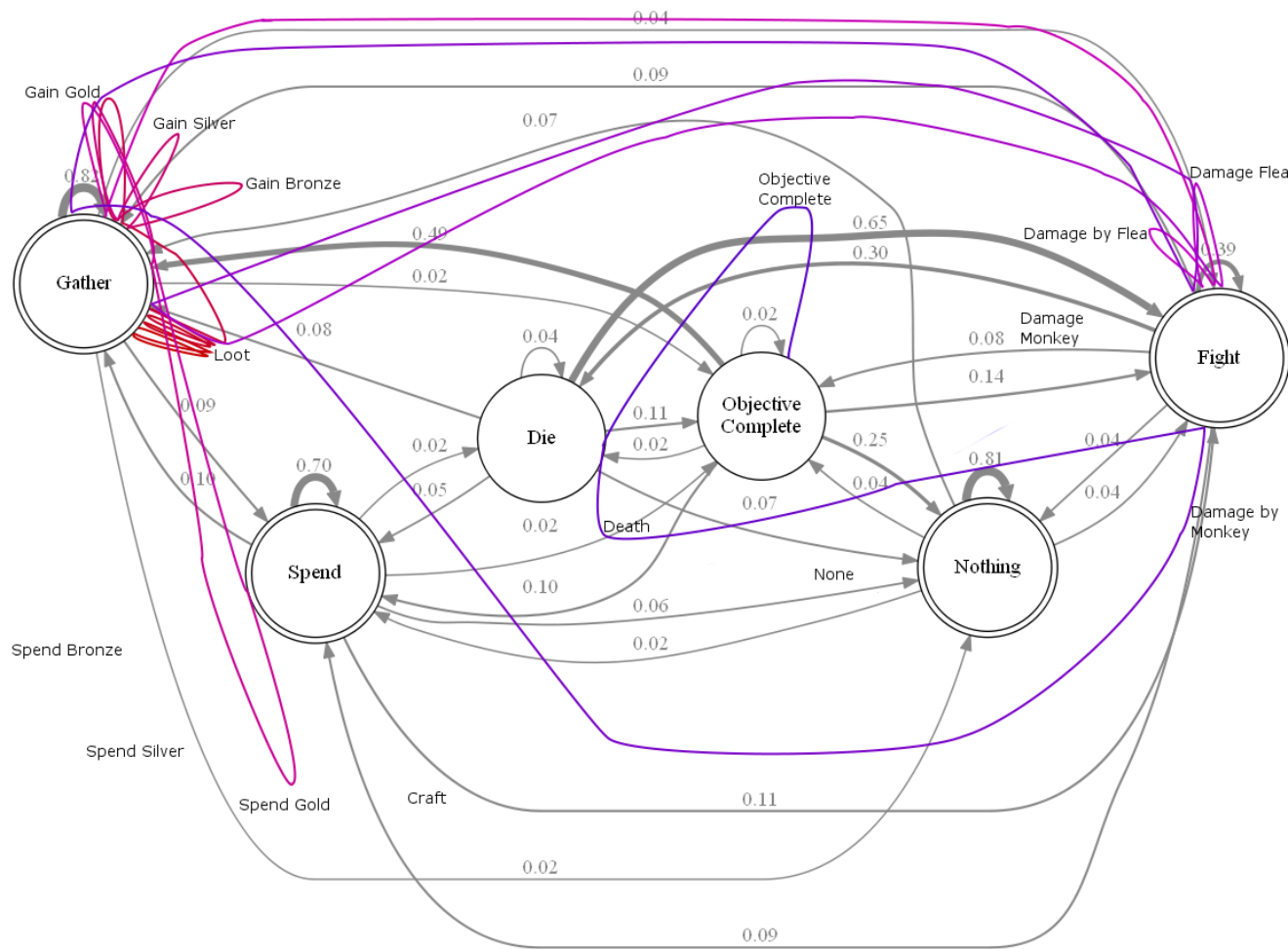
HMM



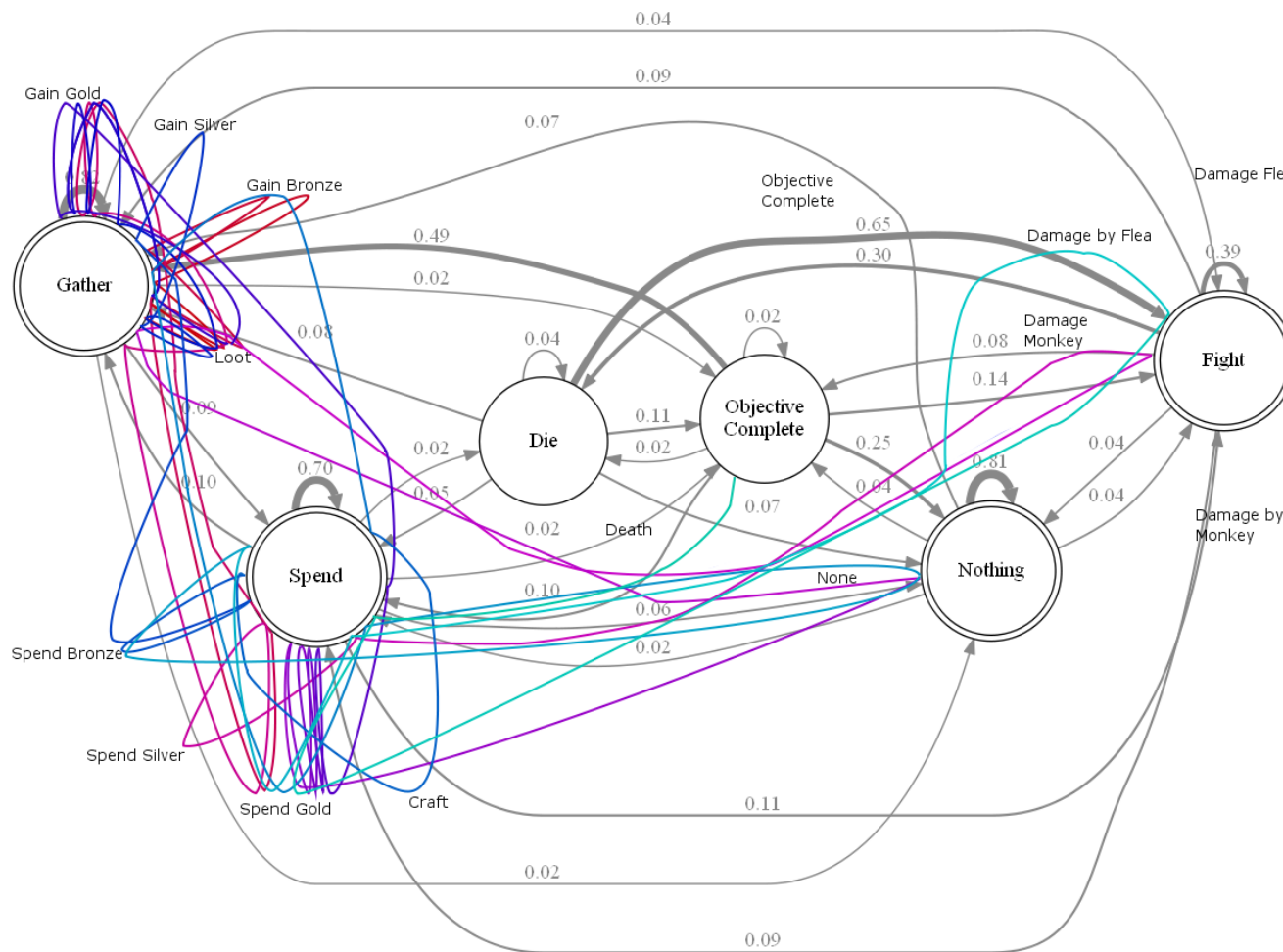
HMM-user 1



HMM- user 2



HMM-user 3



Undergraduate Research

- Honors Program @ NCSU
- CRA-W Distributed Research Experiences for Undergrads
- NOW: REU Sites 2006-2015

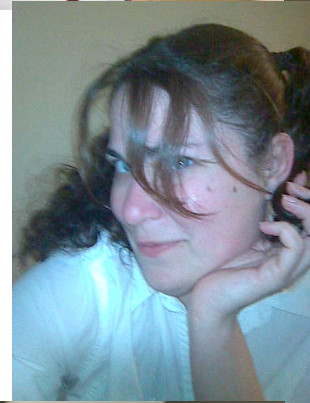
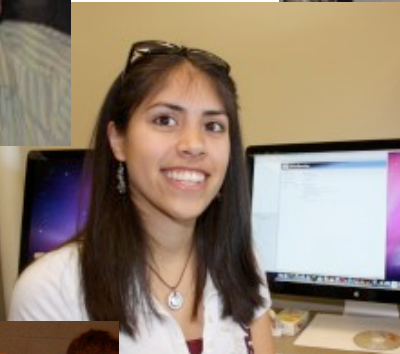
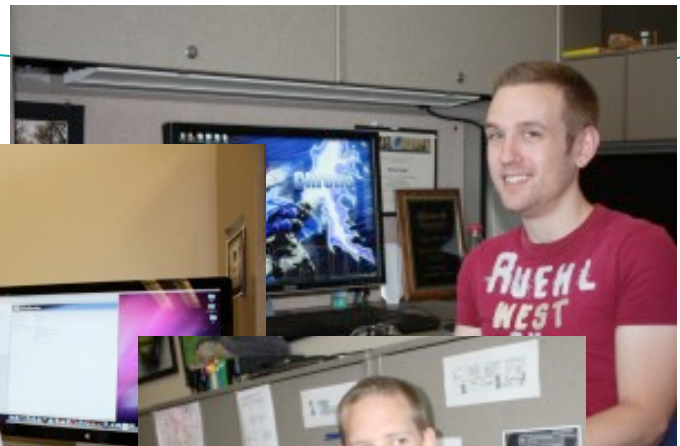


Ways to collaborate

- For 1 semester (3 months)
 - Provide data for analysis
 - Mentor a team
 - Email me (Tiffany.Barnes@gmail)
- For an outreach event
 - Professionals + our students help the community (K12, clubs, etc)
 - Email Veronica.Catete@gmail

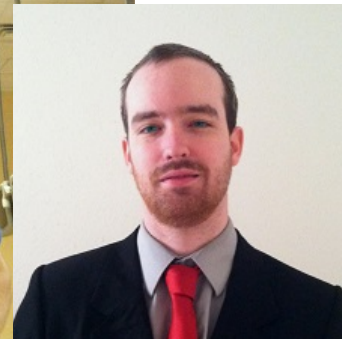
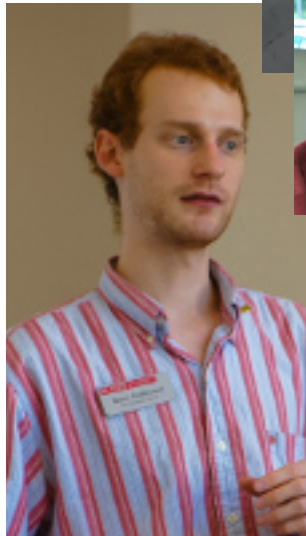
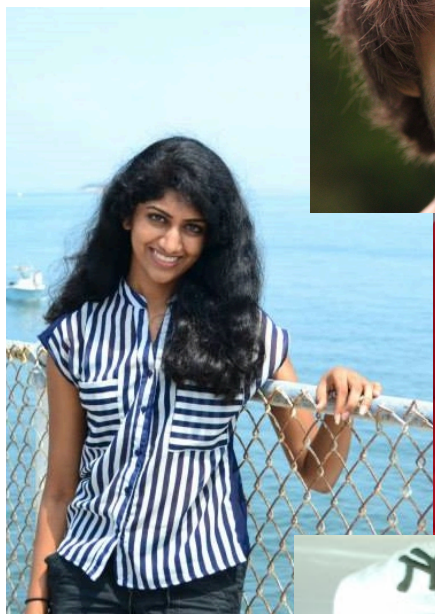
Ways to collaborate

- Provide an internship or co-op
 - Through NCSU co-op program
- Sponsor a project
 - 1 summer REU: \$10K, 1 student
 - 1 senior project: \$5K
- Fund a PhD student
 - Build a partnership
 - Student works with you/your data – then for you when they graduate



NC STATE U

game2learn



NC STATE U

Thank you!



Tiffany.Barnes @ gmail