Automated Story-based Commentary for Sports

Greg Lee, Vadim Bulitko, Elliot Ludvig
Outline

- Objective
- Motivation
- Problem Formulation
- Related Work
- Our Method
- Empirical Work
- Discussion and Conclusions
Objective

- Automate storytelling
- in structured settings
- sports commentating
Motivation

- Storytelling is a cognitively rich activity
- Automating it may be a step towards AI
- Practical applications
Context

• Colour Commentary in Sports
• Making events more entertaining
• Can be done via storytelling
Example
Example
Applications

- NFL on ESPN contract: $8.8B
- MLB on Fox contract: $5.4B
- John Madden made $7.5M/year
- Fans bring radios/TVs/phones
- Dedicated devices
Problem Formulation

- Storytelling
  - as a colour commentary to a sports game
  - via story selection
  - game state ---> story from a library

“Bob Feller, the retired pitcher, went out recently to make a TV commercial…”
Problem Formulation

**Game State**

- Balls: 2
- Strikes: 1
- Outs: 1
- Team 1: Chicago Cubs
- Runner on 3rd: No

**Story Library**

- Story 1
- Story 2
- Story 3
- ...Story M

**Game State matches Story 22 best**
Related Work

- AI play-by-play commentary
- Interactive drama
- Sports video-game colour commentary
SCoReS

- Ranker
  - ranks stories for a game state
- Evaluator
  - evaluates state-story match
- Contextualizer
  - regulates story output
Training Data

Training Input

Game Features  Story Features

Similarity Features

Desired Output

Score

Score

\{0,1,2,3,4\}
Machine Learning a Ranker

- AdaRank [Xu and Li, 2007] (based on AdaBoost [Freund Schapire, 1995])
- Combines “weak” rankers to form a “strong” ranker
  - Weak rankers: sort training data by one feature, with optional tiebreak features
  - Confidence value for each weak ranker
- One game state per iteration
- Re-weigh training data at each iteration
Machine Learning Evaluator

- Given a state, Ranker ranks the stories
- No indication how good the match is
- Bad match ---> don’t tell a story

Evaluator
- machine learn via regression
- decision trees in SCoRES
Evaluation

- User studies

- Demonstration to professional commentators
User Studies

- Footage from AAA baseball
- April 7, 2011 regular season game
  - Buffalo Bisons vs Syracuse Chiefs
- July 15, 2009 AAA All-Star game
  - International League vs Pacific Coast League
- Clips were between 3 and 5 minutes long
- Questionnaire after each clip
User Studies

- 88 - 110 stories
- Rob Neyer’s Big Book of Baseball Legends
- Baseball Eccentrics by Bill “Spaceman” Lee and Jim Prime
- Wikipedia

Commentators

- Len Hawley, Jim Prime and Greg Lee
Types of Commentary

- **No Commentary**

- **Original commentary**: play-by-play and non-story colour

- **SCoReS commentary**: play-by-play and colour featuring SCoReS-selected story

- **Mismatch commentary**: play-by-play and colour featuring mismatch story
Questionnaire

1-7 scale

- I found this viewing experience enjoyable
- I learned something watching this clip
- I found the video clip easy to follow
- I enjoyed the commentary in this clip
- Viewing this clip made me more interested in watching baseball
Results

SCoReS Improvement vs. No Commentary

Metric

Enjoyment
Learned
Follow
Commentary
Watch

*** p < 0.001
Results

Metric

Enjoyment
Learned
Follow
Commentary
Watch

SCoReS Improvement

vs. Original
vs. Mismatch

***
*
^

* p < 0.05
*** p < 0.001
^ p < 0.1
Demo to Commentators

- Four clips shown to each commentator
- Three SCoReS selected stories shown at end of each clip
- Commentators were asked if they’d tell any of the stories
- Also asked their thoughts on SCoReS overall
Commentators

- Mark Lee and Kevin Weekes
  - Play-by-play and colour commentators for Hockey Night in Canada
- Dan Robertson
  - Play-by-play and executive producer for Eastlink Sports
- Len Hawley
  - Play-by-play for Acadia Axemen Hockey
Results

- Each commentator said they would tell a SCoReS suggested story 2 of 4 times.
- Robertson and Hawley had conditions
- Weekes and Lee did not

- All commentators said they would love to have a system like SCoReS at their disposal
Summary

- SCoReS outperforms Original Commentary in terms of learning and making baseball more watchable.
- SCoReS outperforms Mismatch Commentary in terms of overall enjoyment.
- SCoReS is positively evaluated by professional commentators.
Future Research + Applications

- Facts in addition to stories
- Combination with automated play-by-play
- Sports video games
- Personalized commentary
- Storytelling in Real-Time Strategy Games
Conclusion

- Created the first AI storyteller for commentary
- Storytelling is a cognitively rich task
  - Not every human can do it well, or even competently
- We took a step towards automating storytelling
- SCoReS is a step towards Artificial Intelligence