Coupling Story to Visualization:
Using Textual Analysis as a Bridge Between Data and Interpretation

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The story of your DATA
Narrative Text + Visual Evidence
INDIANAPOLIS -- Miami found out an eight-man rotation might be just as effective as a full bench.

Sometimes, it can even be better.

Goran Dragic scored 20 points and backup Wayne Ellington made the decisive 3-pointer with 25.5 seconds left Wednesday night to help the Heat fend off a late charge to hold on for a rare 114-106 victory at Indiana.

"None of these wins are going to come easy, but I think it just says a lot about how tough we are," Josh Richardson said after scoring 14 points and shooting 3 of 4 from 3-point range. "Every night, we have to scratch and claw for everything and it's paying off."

This game might have been their most impressive yet.

With four players sitting out because of injuries, Tyler Johnson not expected to dress and James Johnson suspended by the league for throwing punches in a victory over Toronto, the Heat showed up at Bankers Life Fieldhouse expecting only seven players to be available for their second road game in two nights.

Tyler Johnson, it turns out, managed to play through a sprained left shoulder giving coach Erik Spoelstra one more body to divvy up the minutes.

And he needed every one.

Ellington, Johnson and Bam Adebayo all played more than 30 minutes, all scored 15 points off the bench and all made key plays throughout the game as Miami won its sixth in a row and snapped a 10-game road losing streak against the Pacers.

Hassan Whiteside added 16 points and 15 rebounds.
Some Have Prospered

Residents from Iran, Syria and Libya, who are more likely than the population as a whole to be managers, engineers and teachers, make close to or above the median income for the entire American population.

Somalis and Sudanese are overrepresented in blue-collar jobs in manufacturing and transportation, and make less. The median income of Somalis is less than half the United States average.
Integrating narrative text with visual evidence is widely used.
Narrative text and visual evidence are often independently presented.
Los Angeles Lakers 19-39, 7:15 Away 108

Chicago Bulls 18-31, 11-13 Home 103

1/27/2018 - Associated Press

Lakers blow big lead, rally late for 108-103 win over Bulls

Brandon Ingram scored 25 points, including eight in the final 3:18, and the Los Angeles Lakers rallied late for a 108-103 victory over the Chicago Bulls on Friday night after losing a 12-point, fourth-quarter lead.

Game Flow

Win Probability
Limitations:

Interpret the narrative in context

Interpret the story from visualization
Narrative Text \rightarrow Visual Evidence
Deep coupling of narrative text and visualization
Deep coupling of narrative text and visualization
Identifying Story Elements

- Who
- When
- Where
- What

Story
Identifying Story Elements

- Who
- When
- Where
- What

Story
Identifying Story Elements

Who

Story

When

Where

What
Identifying Story Elements

- Who
- When
- Where
- What

Story
Identifying Story Elements

Who

When

Where

What

Story
The Warriors trailed by six with three minutes left before Durant, criticized for leaving Oklahoma City last summer to chase a championship, brought them back, scoring 14 in the paint.
Identifying Story Elements: Who

Named Entity Recognition (NER) and existing database for team name, player name, coach name, referees in the league
Identifying Story Elements: When and Where

Regular Expression and Grammar Rules
Identifying Story Elements: What

Story Grammar

Labeled sentences from 13 story posts

SVM Classifier

98% accuracy on 150 test sentences
Identifying Story Elements: What

Story Grammar → Labeled sentences from 13 story posts

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Identifying Story Elements: What

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Identifying Story Elements: What

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Deep coupling of narrative text and visualization

Narrative Text → Text Processing
  - Natural Language Processing
  - Quantitative Narrative Analysis

Who, What, When, Where → Coupler → Narrative Visualization

Supporting Evidence
Durant's dagger 3 lifts Warriors over Cavs in Game 3

CLEVELAND -- Kevin Durant released his deep shot, the one he always makes in his dreams.

As the ball hung in the air, his plan to win a championship, Golden State's grip on the series, Cleveland's last-gasp attempt to defend its title, all of it was on the line.

Perfect.

Durant drained the shot of his professional life -- a 3-pointer over LeBron James with 45.3 seconds left -- and scored 31 points as the Warriors, pushed harder than they have been throughout their playoff postseason, moved within one win of a title and payback by rallying to beat the Cleveland Cavaliers 118-113 on Wednesday night to take a 3-0 lead in the NBA Finals.

The Warriors trailed by six with three minutes left before Durant, criticized for leaving Oklahoma City last summer to chase a championship, brought them back, scoring 14 in the fourth.

"He took over," Warriors coach Steve Kerr said. "You can tell, he knows this is his moment. He's been an amazing player in this league for a long time, and he senses this is his time, his moment, his team."

With their 15th straight win, the Warriors now have the longest postseason streak for any team in the four major professional sports.

But that means little to Golden State's players, who with a victory in Game 4 on Friday night can exorcise those haunting demons from last June when the Warriors blew a 3-1 lead in The Finals to the Cavaliers.

No team has ever overcome a 3-0 deficit, and it doesn't appear any team is equipped to hang with these Warriors.
Interaction Design: visual element to narrative text

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**Warriors Stats**

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**Cavaliers Stats**

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Interaction Design: linking visual elements
Case Study

Domain expert with 5 years experience as a media producer
Case Study

“I love the idea of being able to experience the article, but really dial-in on a specific part of it myself”
“If the writer emphasized the number of points Curry had from the paint, I’d be interested in seeing that visually, and also exploring for myself where else he may have scored from.”
Case Study

“It would be useful if the text highlighted the types of elements - player, stats, times, etc., with different colors”
Implications

Create exploratory interaction mechanisms for readers.

- More granular analysis
- Social media
Implications

Reinforce author communication for writers.

• Fact checking
• Idea generation
Discussion

- Generalizability
- Evaluation
Conclusion

We have presented a novel approach to automatically couple narrative text to visualizations for data-rich stories and demonstrated the approach in the basketball story domain.
Questions?

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