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**\$12.5-MILLION BNP PARIBAS OPEN**  
**At The Indian Wells Tennis Garden**  
**Surface: Hard-Outdoor**

**MEN'S SINGLES (second round)**—Philipp Kohlschreiber (26), Germany, d. Tim Smyczek, 6-3, 6-1; Kevin Anderson (16), South Africa, d. Federico Delbonis, Argentina, 7-5, 6-4; Juan Monaco, Argentina, d. Marin Cilic (10), Croatia, 6-4, 6-4; Fernando Verdasco (28), Spain, d. James Duckworth, Australia, 6-2, 7-6 (3); Kei Nishikori (5), Japan, d. Ryan Harrison, 6-4, 6-4; Thanasi Kokkinakis, Australia, d. Guillermo Garcia-Lopez (23), Spain, 7-5, 5-7, 6-3; Ernesto Gulbis (14), Latvia, d. Daniel Gimeno-Traver, Spain, 6-4, 6-1; Andy Murray (4), Britain, d. Vasek Pospisil, Canada, 6-1, 6-3; Adrian Mannarino, France, d. Fabio Fognini (19), Italy, 7-6 (8), 6-3; Albert Ramos-Vinolas, Spain, d. Julien Benneteau (25), France, 6-2, 6-3; Pablo Cuevas (20), Uruguay, d. Jarkko Nieminen, Finland, 4-6, 7-5, 6-0; David Ferrer (8), Spain, d. Ivan Dodig, Croatia, 4-6, 6-1, 7-6 (6); Bernard Tomic (32), Australia, d. Borna Coric, Croatia, 6-3, 6-4; John Isner (18), d. Jurgen Melzer, Austria, 6-3, 6-4; Novak Djokovic (1), Serbia, d. Marcos Baghdatis, Cyprus, 6-1, 6-3.

**WOMEN'S SINGLES (second round)**—Ana Ivanovic (5), Serbia, d. Yulia Putintseva, Kazakhstan, 6-3, 6-1; Sara Errani (11), Italy, d. Zhu Lin, China, 6-0, 4-6, 6-2; Flavia Pennetta (15), Italy, d. Madison Brengle, 6-4, 6-2; Sabine Lisicki (24), Germany, d. Roberta Vinci, Italy, 6-1, 5-7, 6-4; Belinda Bencic (31), Switzerland, d. Bojana Jovanovski, Serbia, 6-2, 7-6 (2); Caroline Woz-

**NASCAR STOCK CARS**  
**XFINITY Series**  
**Axalta Faster. Tougher. Brighter. 200**  
**At Avondale, Ariz.**  
**Phoenix International Raceway**  
**Track: 1-mile oval**

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# Clustering of Articles by Theme and Sentiment

## Natural Language Processing Term Project Proposal

Courtney Fiala and Anders Maraviglia

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# Motivation

- RCOS project that is working on an app that displays news articles with differing viewpoints on the same theme
- There are sites that present opposing viewpoints for a theme – but they are hand selected
- We will attempt to use an in-depth theme extraction and sentiment analysis approach for the article clustering

# Input and Output

## Input

- A set of articles

## Output

- Graph of articles clustered by theme and viewpoint

## Extended Goal

- Find organizations and people mentioned in the articles using named entity extraction
- Then output each organization's views on all themes in the dataset

# Example

Input:

Fictional Article Summaries

Article 1: CNN says Clinton wins presidential debate

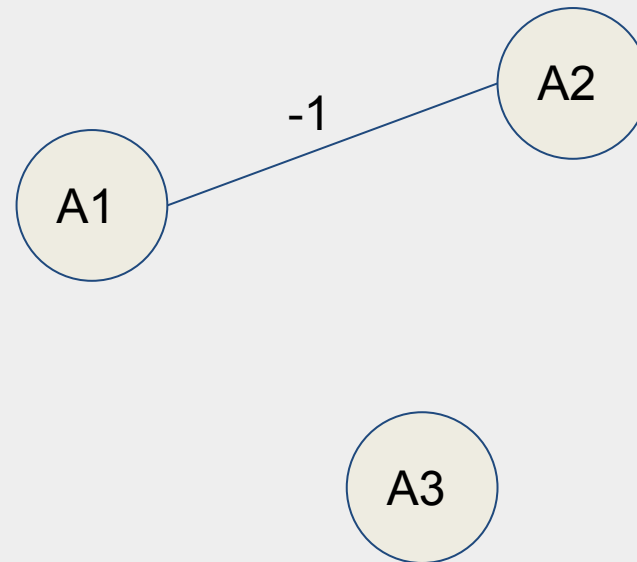
Article 2: Fox News determines Trump won first debate

Article 3: Onion says clown sightings across country increase

Output:

Themes

- presidential debate (A1, A2)
- clowns (A3)



# System Architecture and Approach

1. Determine best theme extraction and sentiment analysis tools (Alchemy API, nltk, Cloud Natural Language API (Google))
2. Write tool to determine the theme in an article
3. Write tool to determine the sentiments of an article towards it's topics
4. Combine tools into module to cluster set of articles by theme and sentiment
5. Use named entity extraction to find organizations and people mentioned in articles
6. Write tool to extract the viewpoints of these organizations and people

# Time Table

1: Decide on outside tools and architectures

10/13 (1 week)

2: Theme extraction module

10/23 (1.5 weeks)

3: Sentiment analysis module

11/03 (1.5 weeks)

4: Combine modules to cluster set of articles

11/17 (2 weeks)

5: Named entity extraction module

11/22 (1 week)

6: Entity viewpoint extraction

12/06 (2 weeks)

Thank you!  
Any questions?