



# THE AESTHETICS OF KNOWLEDGE CONSUMPTION:

[A Study of Textual and Graphical Forms in Online Science Communication]

Project Proposal

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# RESEARCH QUESTION

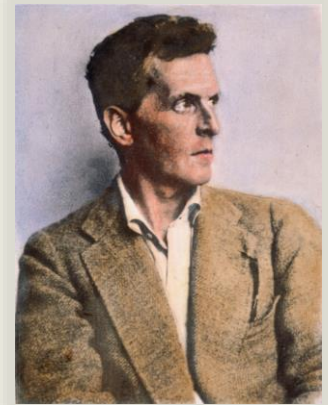
- Can **aesthetic measures** of science web articles predict the **readership** and **linger time** of the publication/website that the articles belong to? (Observational)

...and/or:

- Can aesthetic measures on web articles predict readers' **ratings of scientific content/websites**, and their **interest in the aforementioned content**? (Survey/Experimental)

# FOUNDATIONS

- “Ethics and Aesthetics are one.”/”Knowledge is in the end based on acknowledgement.” – Ludwig Wittgenstein (1914 - 1916, 1953)
  - **Value and Aesthetics are inextricable** (Gombrich, 1960)
  - *Build on previous studies in HCI (Human-Computer Interaction) and knowledge aesthetics*
- Defining and Quantifying “Aesthetics”
  - “Formal notions” relating a reader to the content
    - Form and Function
  - **Text Aesthetics:** Semantic Consistency (Tang, Qin and Liu, 2015)
  - **Layout Aesthetics:** HCI/UX Literature – Pixel Fields, Screen Balance, Entropy, Complexity, Gestalt Unity, Edge Density, etc. (Machado et. al 2015, Rigau et. al 2007, Ngo et. al 2000 and others)



# BITS AND PIECES

- Text Aesthetics: Semantic Consistency
- Layout Aesthetics (+Color Distribution, +Edge Density):

$$M_D(r) = 1 - \text{avg}_{1 \leq i < j \leq r} \{NID(i, j)\}$$

Kolmogorov Complexity

$$(x_c, y_c) = \left( \frac{\sum_i a_i x_i}{\sum_i a_i}, \frac{\sum_i a_i y_i}{\sum_i a_i} \right)$$

Screen Equilibrium

$$M_I(r) = \frac{I(X_l, \hat{Y}_r)}{H(X_l)}$$

Shannon Entropy

$$sqm = (p, d)$$

Screen Sequence

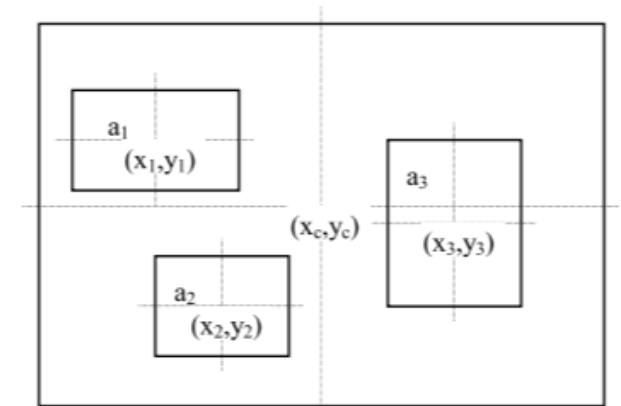


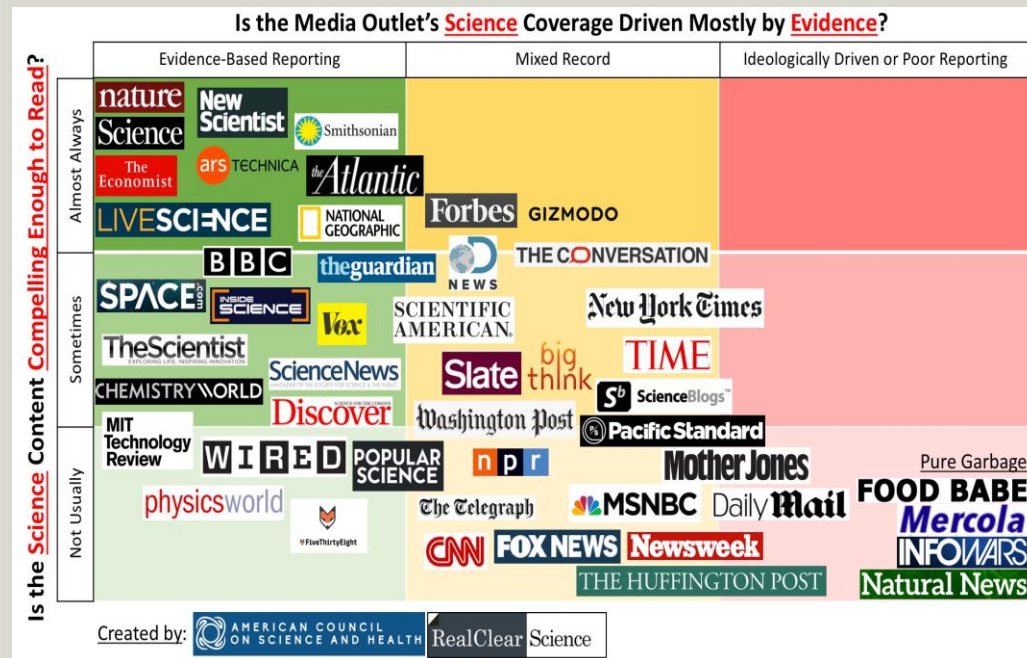
Fig. 2. A screen layout in equilibrium.

Gravitational model of screen equilibrium (Ngo and others 2000, 2002)

# DATA SOURCE(S)

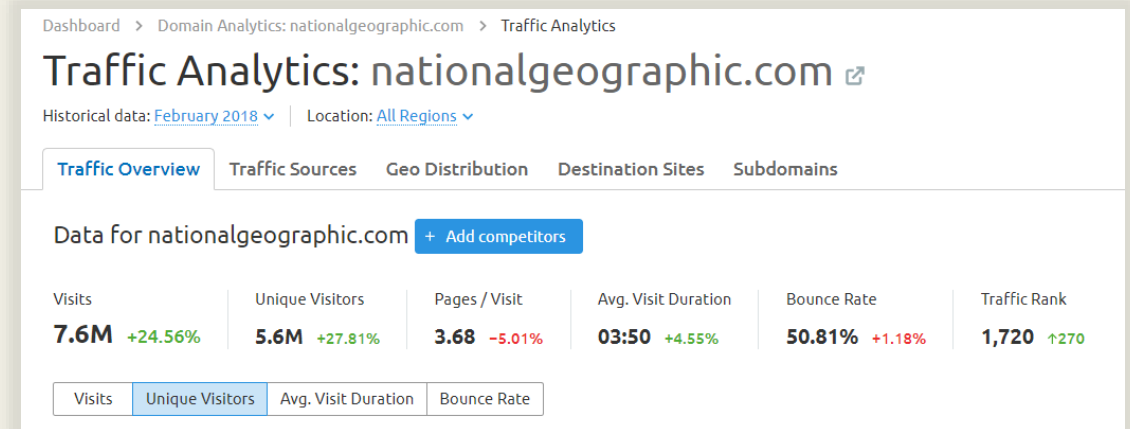
- **Aesthetics:** Science Website Article Layouts and Text Content
  - *Popular American web publications – National Geographic, BBC Earth, Nature, WIRED, New Scientist, etc. (Include global publications?)*
  - *Layouts: **PhantomJS** to scrape screenshots of article pages*
- **Readership, Linger Time:** Website Metrics
  - *Domain Data*
  - *Estimated Data (SimilarWeb, SEMRush)*

# DATA SOURCES



American Council on Science and Health, RealClearScience (2017)

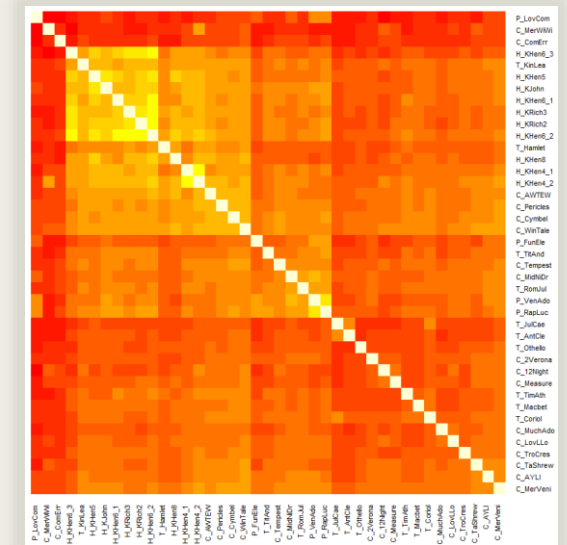
33 articles x 30 publications = 990 data points



SEMRush.com

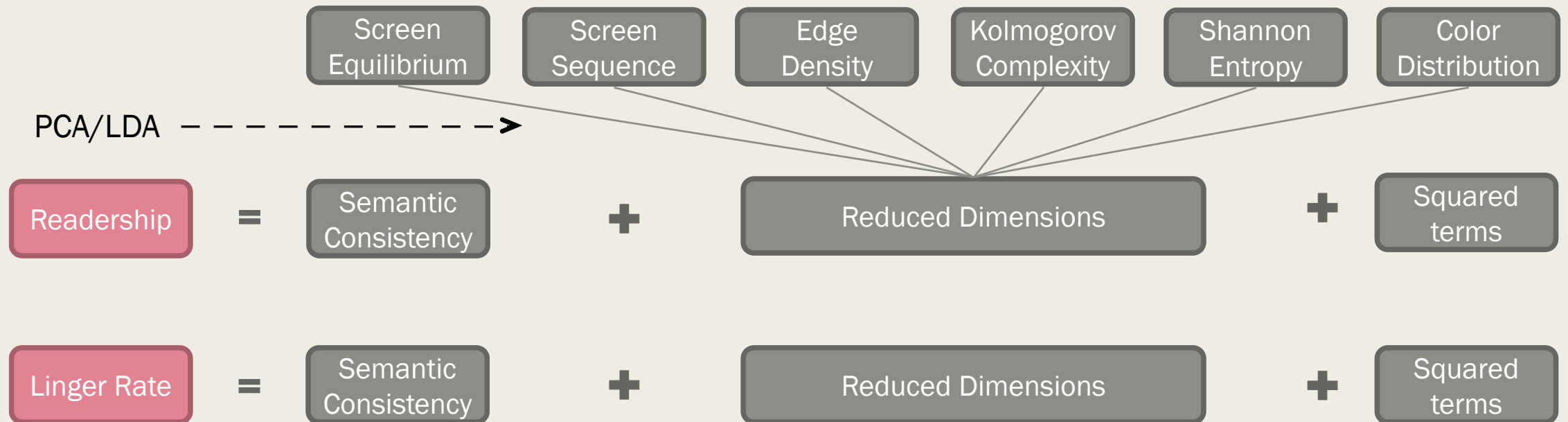
# METHODS

- **Article Text Consistency: Gensim + Doc2Vec/Word2Vec**
  - *Trained vector space of documents* from each individual science media outlet used to calculate individual article similarity
  - *‘Document Congruence’* for each science article formulated as the inverse of the document distance from the vector space
  - Other models: Cosine Similarity, WMD (Word Mover’s Distance)
- **Article Webpage Aesthetics:**
  - *EBImage* in R for pixel analysis, *scikit-image* for clustering, *OCRopus* for layout analysis, *OpenCV* for almost everything else



# METHODS

- Supervised Learning





# EXPECTED FINDINGS

- Model should be able to predict readership relatively well, maybe not as well for linger rate
  - *While observing that higher aesthetic scores are usually correlated with higher readership and longer visit duration*
- Survey/Experimental: Aesthetic scores based on HCI and UI principles should predict readers' ratings of content/websites and initial interest level well

Virtue alone cannot save the world. Only actions will.

**VIRTUE** ALONE CANNOT SAVE THE  
WORLD. *ONLY ACTIONS* WILL.

Knowledge

Presentation/Representation

This presentation was presented at:  
Saieh 247, The University of Chicago  
Chicago, Illinois  
United States of America  
Earth  
The Solar System  
The Milky Way  
The Local Group  
Virgo Supercluster  
The Known Universe

