Amplifying Community Content Creation with Mixed-Initiative Information Extraction

Raphael Hoffmann, Saleema Amershi, Kayur Patel, Fei Wu, James Fogarty, Daniel S. Weld
Advanced Interfaces Leverage Structure of Content
Information Extraction

- Information Extraction
- Edits
- Training Data

The process improves with Information Extraction, which increases edits, improving training data, which further improves Information Extraction.
• Collecting training examples expensive and time-consuming
• Error-prone
Community Content Creation

Traffic increases

Edits

Content improves
• Bootstrapping problem
• Overcome work/benefit disparities
Goal: Synergistic Pairing
Outline

• Motivation
• **Background: Intelligence in Wikipedia**
• Designing for the Wikipedia Community
• Search Advertising Deployment Study
• Conclusion
Case Study: Intelligence in Wikipedia

What German physicists taught in the U.S.?
Case Study: Intelligence in Wikipedia

Wernher von Braun (March 23, 1912 – June 16, 1977), a German rocket physicist and astronautics engineer, became one of the leading figures in the development of rocket technology in Germany and the United States. Wernher von Braun is sometimes said to be the preeminent rocket engineer of the 20th century.\(^2\)

In his 20s and early 30s, von Braun was the central figure in Germany’s pre-war rocket development program, responsible for the design and realization of the deadly V-2 combat rocket during World War II. After the war, he and some of his rocket team were taken to the United States as part of the then-secret Operation Overcast. In 1955, ten years after entering the country, von Braun became a naturalized U.S. citizen.

Von Braun worked on the American intercontinental ballistic missile (ICBM) program before joining NASA, where he served as director of NASA’s Marshall Space Flight Center and the chief architect of the Saturn V launch vehicle, the superbooster that propelled the Apollo spacecraft to the Moon.\(^3\) He is generally regarded as the father of the United States space program, both for its technical and organizational skills, and for his public relations efforts on behalf of space flight.\(^4\) He received the 1976 National Medal of Science.

Biography

Early life

Wernher von Braun was born in Wirsitz, Province of Posen, German Empire. He was born second of three sons. His father, the conservative civil servant Magnus Freiherr von Braun (1877–1927), although never a party politician, served as a Minister of Agriculture in the Federal Cabinet during the Weimar Republic. His mother, Emmy von Quistorp (1889–1959), could trace ancestry through both her parents to medieval European royalty. Von Braun also had a younger brother, also named Magnus Freiherr von Braun, born in 1919.\(^5\) Upon Wernher von Braun’s Lutheran confirmation, his mother gave him a telescope, and he discovered a passion for astronomy and the realm of outer space. When Wirsitz was ceded to Poland in 1919, his family, like many other German families, moved. They settled in Berlin, where the 12-year-old von Braun, inspired by speed records established by Max Valier and Fritz von Opel,\(^6\) caused a major disruption in a crowded street by firing off a toy wagon to which he had attached a number of fireworks. The youngster was taken into custody by the local police until his father came to collect him.

Starting in 1905, von Braun attended a boarding school at Elternberg castle near Weimar where at first he did not do well in physics and mathematics. In 1929 his parents moved him to the Hermann-Lietz-Internat (also a residential school) on the East Frisian North Sea island of Spiekeroog, where he acquired a copy of the book Die Rakete zu den Planetenräumen (The Rocket into Interplanetary Space) by rocket pioneer Hermann Oberth. The idea of space travel had always fascinated von Braun, and from that point on he applied himself to physics and mathematics in order to further his interest in rocketry.

Starting in 1930, he attended the Technical University of Berlin, where he joined the Verein für Raumschiffahrt (VR, the "Spaceflight Society") and assisted Hermann Oberth in liquid-fueled rocket motor tests. He also studied at ETH Zürich. Although he worked mainly on military rockets in his later years, space travel remained his primary interest.

German career

The Prussian rocketeer

(Wernher von Braun, birthdate, “March 23, 1912”)
(Wernher von Braun, birthplace, “Wirsitz, German Empire”)
(Wernher von Braun, spouse, “Maria Luise von Quistorp”)
Lack of Structured Content in Wikipedia
Community-based Validation of Extractions

DEMO
Ray Bradbury

From Wikipedia, the free encyclopedia

Ray Douglas Bradbury (born August 22, 1920) is an American literary, fantasy, horror, science fiction, and mystery writer best known for The Martian Chronicles, a 1950 book which has been described both as a short story collection and a novel, and his 1953 dystopian novel Fahrenheit 451. He is widely considered to be one of the greatest and most popular American writers of speculative fiction during the twentieth century.

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Beginnings

Bradbury was born in Waukegan, Illinois, to a Swedish immigrant mother and a father who was a power and telephone lineman. [1] His paternal grandfather and great-grandfather were newspaper publishers. [2]

Bradbury was a reader and writer throughout his youth, spending much time in the Carnegie Library in Waukegan. He used this library as a setting for much of his novel Something Wicked This Way Comes, and depicted Waukegan as "Green Town" in some of his other semi-autobiographical novels — Dandelion Wine, Farewell Summer — as well as in many of his short stories. [3]

He attributes his lifelong habit of writing every day to an incident in 1932 when a carnival entertainer, Mr. Electrico [4], touched him with an electrified sword, made his hair stand on end, and shouted, "Live forever!"

The Bradbury family lived in Tucson, Arizona, in 1926-27 and 1932-33 as his father pursued employment, each time returning to Waukegan, and eventually settled in Los Angeles in 1934, when Ray was thirteen.

Bradbury graduated from the Los Angeles High School in 1936 but chose not to attend college. Instead, he sold newspapers at the corner of South Norton Avenue and Olympic Boulevard. He continued to educate himself at the local library, and having been influenced by science fiction heroes like Flash Gordon and Buck Rogers, he began to publish science fiction stories in fanzines in 1938. Ray was invited by Forrest J Ackerman to attend the now legendary Clifton's Cafeteria Science Fiction Club. Here Ray met the writers Robert A. Heinlein, Emil Petaja, Fredric Brown, Henry Kuttner, Leigh Brackett, and Jack Williamson. Launching his own fanzine in 1939, titled Futura Fantasia, he wrote most of its four issues, each limited to under a hundred copies. Bradbury's first paid piece was for the pulp magazine Super Science Stories in 1941, for which he earned $15. [5] He became
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Bradbury was born in Waukegan, Illinois, to a Swedish immigrant mother and a father who was a power and telephone lineman.[1] His paternal grandfather and great-grandfather were newspaper publishers.

Bradbury was a reader as a child. He was a regular patron of the Carnegie Library in Waukegan. Bradbury wrote, "It was in the library that I first began to develop a love for words—especially the word 'wicked'—as well as in many of his short stories.[3]

He attributes his love of doing magic tricks with his uncle and a mischievous practical joker in his novel Something Wicked This Way Comes as the inspiration for his career.[4] He also has a fascination for carnival entertainers, Mr. Electrico[5], touched him with an electrified sword, made his hair stand on end, and shouted, "Live forever!"

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Beginnings

Bradbury was born in Waukegan, Illinois, to John and Grace Noyes Bradbury. He had two younger brothers: John, who was born in 1936, and Kevin, who was born in 1939. Bradbury was a reader and writer from an early age, and when he was ten years old, he had a brief stint as a newspaper publisher.

Bradbury was a reader at the Waukegan Public Library in Waukegan. He was inspired by the semi-autobiographical novel Wicked This Way Comes, which was written by his friend and fellow writer, Paul Grondahl.

He attributes his lifelong love of the stage and television to his experience working as a publicity agent for various variety shows in Chicago. "Live radio was the TV of its time," he said, adding that "it was a pleasure to work with actors, who were essentially performers in the theater tradition."

The Bradbury family lived in Waukegan, where Ray was employed, each time he moved with the family to new homes. In 1934, when Ray was three years old, his family moved to Los Angeles.

Bradbury graduated from the Los Angeles High School in 1938 but chose not to attend college. Instead, he sold newspapers at the corner of South Norton Avenue and Olympic Boulevard. He continued to educate himself at the local library, and having been influenced by science fiction fandom, Bradbury began to publish science fiction stories in fanzines in 1936. Ray was invited by Forrest J. Ackerman to join his science fiction club, the Brooklyn Futurists, in 1936.
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Beginnings

Bradbury was born in Waukegan, Illinois, and telephone lineman. His paternal grandparents had emigrated from Germany to Indiana, and his maternal grandparents were Irish. He was the first of eight children in a Catholic family.

Bradbury was a reader and writer from a young age. His family owned the local library, and he would help deliver books to local homes. He later used this experience as a plot device in his novel Comets Are Comets, in which the protagonist, Mr. Electrico, touches him with an electric current and helps make him a walking encyclopedia. Bradbury also lived in the shadow of the explosion at the nearby Chicago World's Fair in 1933, which he later used as inspiration for his novel Dandelion Wine, Farewell Summer, and the story "Homecoming." He attributes his lifelong habit of writing in his head to the experience. Bradbury's father was killed in a plane crash due to a typhoon in the Pacific War in 1943, and Bradbury was later sent to Holy Cross College, where he was an outstanding student. Bradbury was able to work his way through college by writing and selling short stories.

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Community-based Validation of Extractions

- Lower barrier to contribution
- Contribution as a non-primary task
Search Advertising Deployment Study

Ray Bradbury - Wikipedia
Get enhanced Wikipedia content for Ray Bradbury.
intelligent-wikipedia.org

2,000 ads
2,500 clicks

“ray bradbury”
<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Icon</th>
<th>Highlight</th>
<th>Popup</th>
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<td>30/73 (41%)</td>
<td>23/58 (40%)</td>
<td>24/52 (46%)</td>
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<tr>
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<td>3.3</td>
<td>3.5</td>
<td>3.5</td>
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<tr>
<td>Willing to Use</td>
<td>11/33 (33%)</td>
<td>49/72 (68%)</td>
<td>34/57 (60%)</td>
<td>33/50 (66%)</td>
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The graph illustrates the relationship between contribution likelihood (%) and reported intrusiveness. The x-axis represents the reported intrusiveness scale, ranging from 1 (very unintrusive) to 5 (very intrusive). The y-axis shows the contribution likelihood in percentage. Three points are marked: Popup, Highlight, and Icon, which are positioned above the baseline, indicating a higher contribution likelihood for more intrusive elements. The baseline represents the contribution likelihood for non-intrusive elements.
Information Extraction improves Training Data

Traffic increases Edits

Edits improves Content

Content improves Information Extraction
Users are conservative

- Of extractions that visitors marked as correct, 90.4% were indeed valid
- Of extractions that visitors marked as incorrect, 57.9% were indeed incorrect

![Image](image.png)
Improvement in AUC after Retraining

Mixed-Initiative Labels Added to 5 Existing Examples

\[ F(1, 94) = 85.9, \quad p < .001 \]
Improvement in AUC

Mixed-Initiative Labels Added to 5 Existing Examples
F(1, 94) = 85.9, p < .001

Mixed-Initiative Labels Added to 10 Existing Examples
F(1, 94) = 42.3, p < .001

Mixed-Initiative Labels Added to 25 Existing Examples
F(1, 94) = 16.7, p < .001

Mixed-Initiative Labels Added to 50 Existing Examples
F(1, 94) = 7.4, p ≈ .008

Mixed-Initiative Labels Added to 100 Existing Examples
F(1, 94) = 5.6, p ≈ .020
Conclusions

• Novel synergistic method for jointly amplifying CCC and IE:
  – Significantly increased likelihood of contribution
  – Significantly improved quality of automatic extraction

• Demonstrated the use of search advertising services to evaluate interfaces as a non-primary task
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