

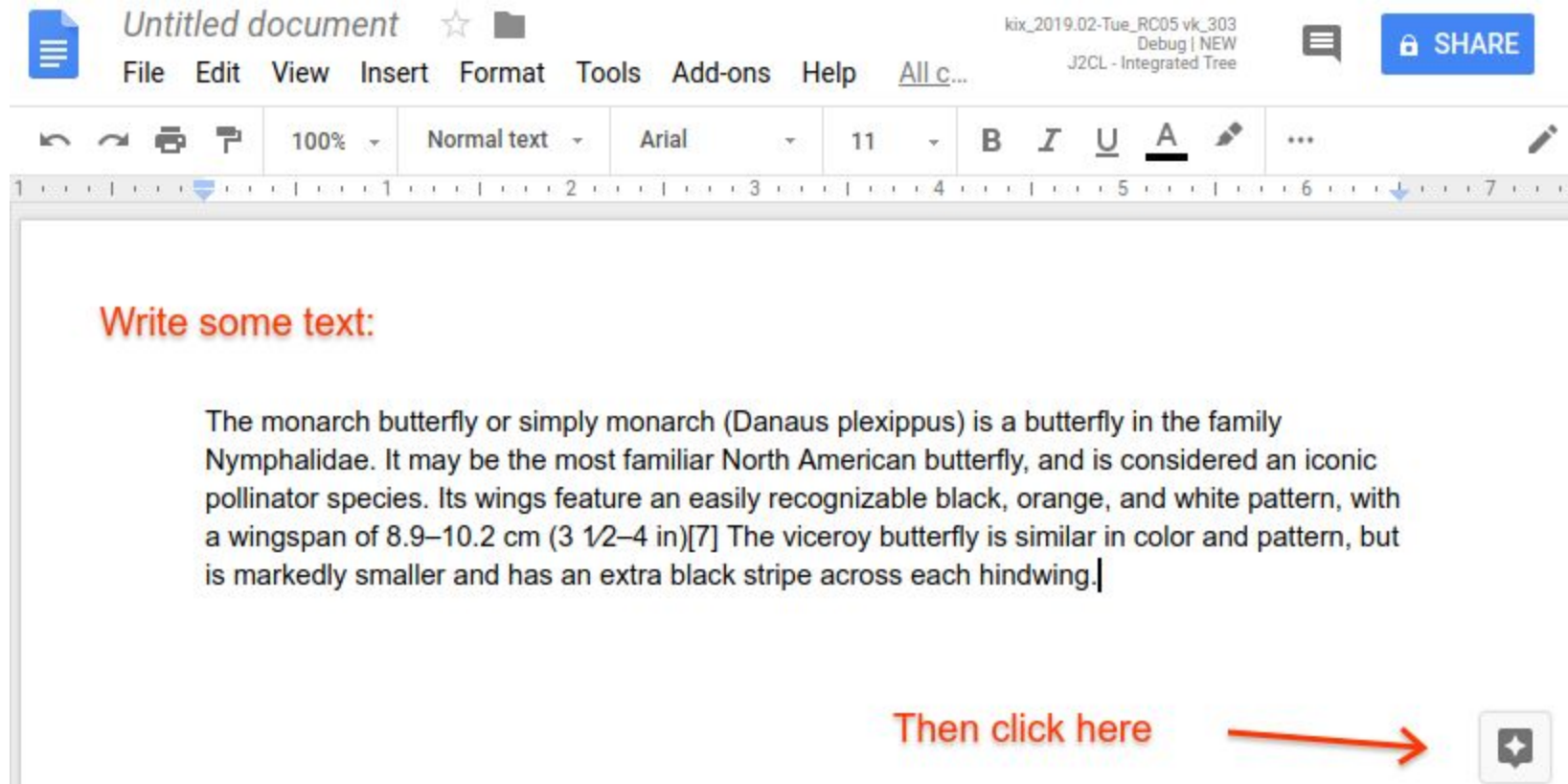


# Explore

## Research Suggestions at Your Fingertips

**Richard Zens**  
**Staff Research Scientist**

# What is Explore?



The screenshot shows a web-based document editor. At the top, there's a header bar with a document icon, the title "Untitled document", and a folder icon. To the right of the title, there's a status bar showing "kix\_2019.02-Tue\_RC05 vk\_303", "Debug | NEW", and "J2CL - Integrated Tree". A blue "SHARE" button is on the far right. Below the header is a menu bar with "File", "Edit", "View", "Insert", "Format", "Tools", "Add-ons", and "Help". A dropdown menu for "All c..." is open. Below the menu bar is a toolbar with icons for undo, redo, print, and a ruler. The ruler shows a scale from 1 to 7. The main editing area contains the text "Write some text:" in red, followed by a paragraph about monarch butterflies. At the bottom right, there's a red arrow pointing to a small icon with a star and a plus sign, with the text "Then click here" above it.

Untitled document

kix\_2019.02-Tue\_RC05 vk\_303  
Debug | NEW  
J2CL - Integrated Tree

SHARE

File Edit View Insert Format Tools Add-ons Help All c...

100% Normal text Arial 11 B I U A

1 2 3 4 5 6 7

Write some text:

The monarch butterfly or simply monarch (*Danaus plexippus*) is a butterfly in the family Nymphalidae. It may be the most familiar North American butterfly, and is considered an iconic pollinator species. Its wings feature an easily recognizable black, orange, and white pattern, with a wingspan of 8.9–10.2 cm (3 1/2–4 in)[7] The viceroy butterfly is similar in color and pattern, but is markedly smaller and has an extra black stripe across each hindwing.

Then click here

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Search your docs and the web

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**Milkweed** (Plants)  
*Related to Monarch butterfly*

**Monarch butterfly** (Insect)  
*You wrote about this*

**Brush-footed butterflies** (Insect)  
*You wrote about this*

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**How to Tell the Difference Between a Mon...**  
The average **butterfly** watcher may wonder how to tell the difference between **monarch** and **viceroy species**.  
[sciencing.com](#) · Jul 27, 2018

ential

gle

Not mentioned in the text!

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## TOPICS

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### **Milkweed** (Plants)

*Related to Monarch butterfly*

### **Monarch butterfly** (insect)

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### **How to Tell the Difference Between a Mon...**

The average **butterfly** watcher may wonder how to tell the difference between **monarch** and **viceroy species**.

[sciencing.com](https://www.sciencing.com) · Jul 27, 2018

Untitled document

File Edit View Insert Format Tools Add-ons Help

All changes saved i...

100% Normal text Arial 11

German input text

Der Monarchfalter (Danaus plexippus) oder Amerikanische Monarch ist ein auffällig orange und schwarz gezeichneter Schmetterling (Tagfalter) aus der Familie der Edelfalter (Nymphalidae).

Explore

Search your docs and the web


TOPICS

Milkweed (Plants)  
Related to Monarch butterfly

Monarch butterfly (Insect)  
You wrote about this

Lepidoptera (Insect)  
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Neophasia and a palatable control spe...  
refused to eat unpalatable butterflies...  
D. plexippus and Heliconius charithoni...  
(Lepidoptera: Nymphalidae).  
www.mdpi.com · Oct 29, 2018

Why?

# Why?

- Users
  - More than 80 million G Suite for Education users
  - More than 40 million teachers and students use Google Classroom
- Pain points
  - Background research is hard, elicits strong negative feelings [1, 2]
  - Web search is great, but only if you know what to look for [3]
- Suggestions
  - **novel** content
  - content the user **would not find**

[1] David Smith and Jennifer Campbell. 1999. The impact of students' approaches to essay writing on the quality of their essays. *Assessment & Evaluation in Higher Education*, 24(3):327.

[2] Carol C. Kuhlthau. 1990. Inside the search process: Information seeking from the users perspective. *Journal of the American Society for Information Science*, 5(42):361–371.

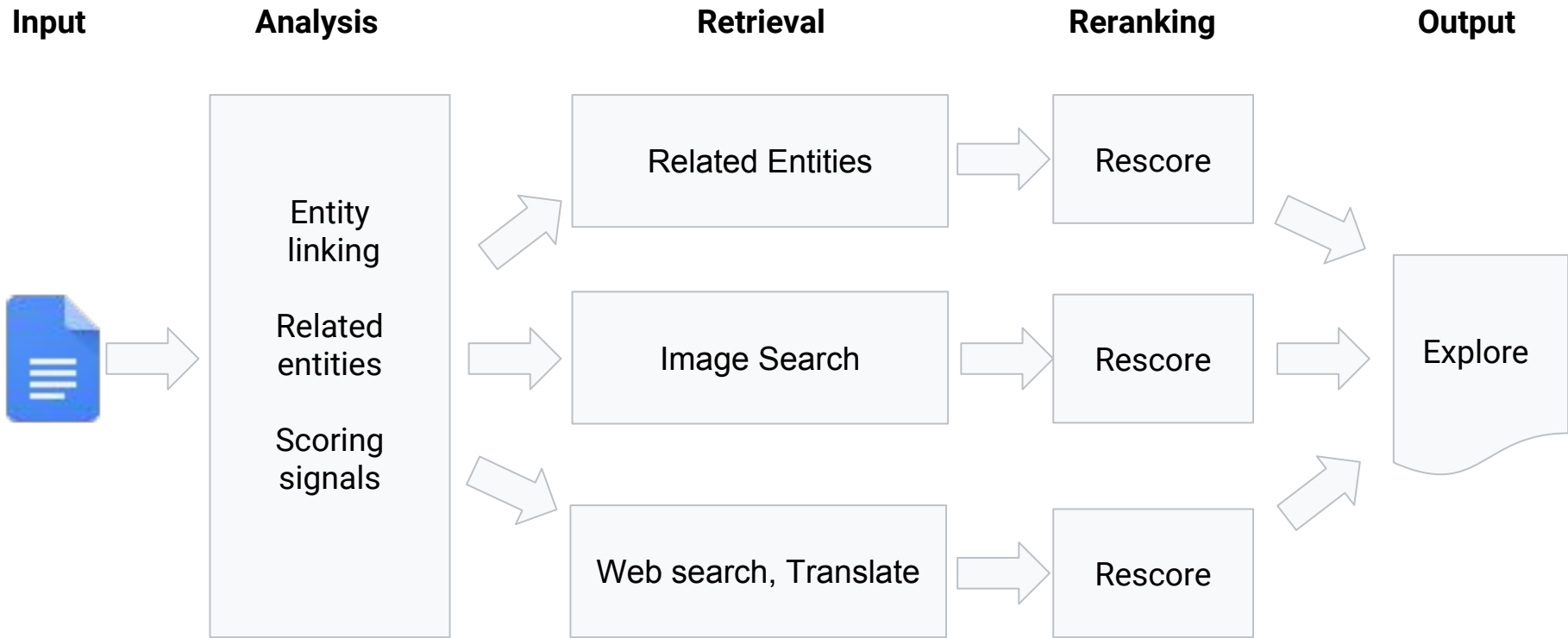
[3] Nicolas Marie. 2014. Linked data based exploratory search. Theses, Universite Nice Sophia Antipolis





# How?

# Architecture



# Experimental Results (Topics)

| Model            | NDCG@3 | Model Size |
|------------------|--------|------------|
| Linear           | 22.8   | 4.7G       |
| Feed Forward NN  | 32.2   | 1.8G       |
| Convolutional NN | 33.4   | 1.8G       |
| Random Forest    | 34.9   | 150.0G     |

Train: 10M web docs, Dev: 10k web docs, Test: 10k web docs

Michal Lukasik, Richard Zens. Content Explorer: Recommending Novel Entities for a Document Writer. In *Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing (EMNLP)*, Brussels, Belgium, October/November 2018.

# Conclusions

# Conclusions

- What?
  - Exploratory search
  - Assist students with background research
- Why?
  - Background research is hard & painful
  - Web search is not enough
- How?
  - Build on Google's strengths (NLP tools, data, search...)
- Result
  - Suggest novel content
  - Suggest content the user wouldn't have found

# User quotes

*"It **helps me get ideas** while writing."*

*"I could look things up at the tips of my finger."*

*"It's a **really easy way** to find helpful resources for what I'm working on."*

*"I like that it makes researching a particular thing more convenient. Everything is all in one place."*

***"The very concept is wonderful.**  
Let's me research without leaving my doc. Makes it nice for quick searches and helps me stay focused on my writing instead of getting lost on the web. :-)"*

# Thank You