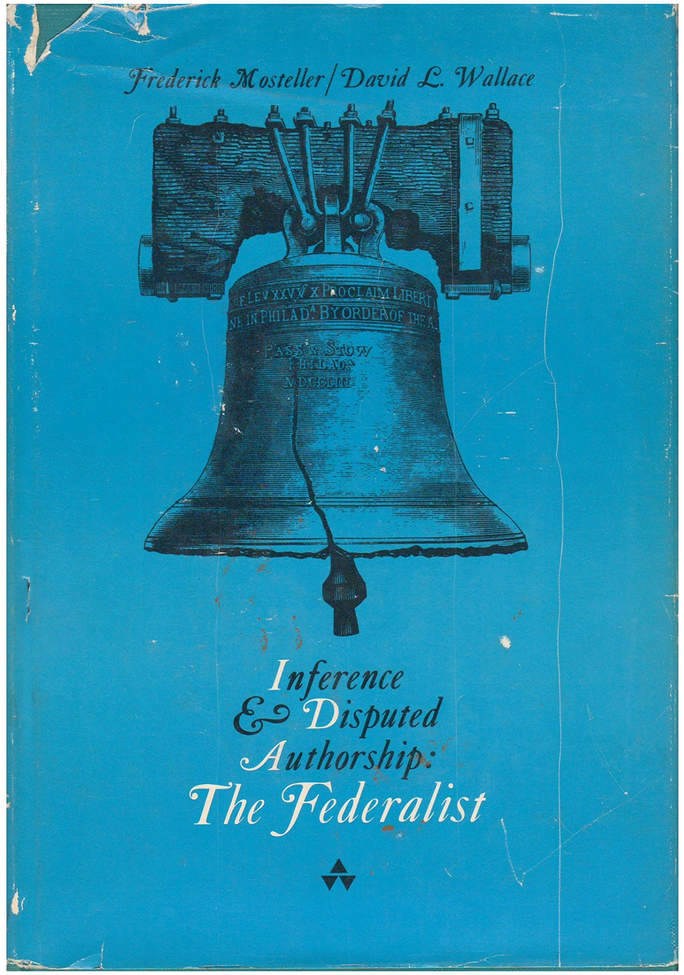
Quantitative Text Analysis

Meeting 3

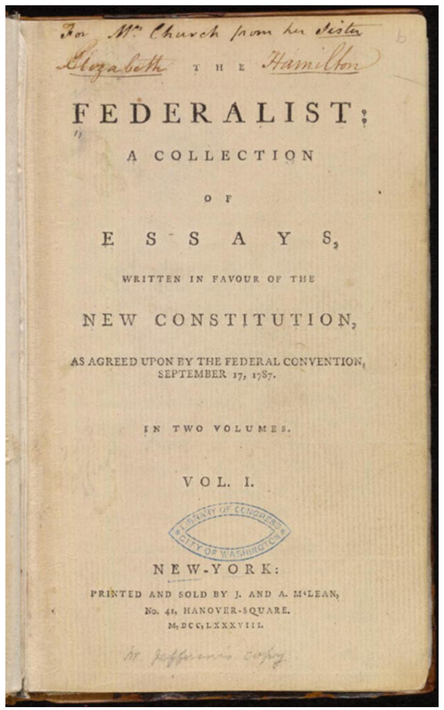
Petro Tolochko

Inference and Disputed Authorship: The Federalist



Frederick Mosteller &
David L. Wallace, 1963

One of the first (if not the first) text-as-data study



For Mrs Church from her sister
Elizabeth THE Hamilton

FEDERALIST:

A COLLECTION

OF

ESSAYS,

WRITTEN IN FAVOUR OF THE

NEW CONSTITUTION,

AS AGREED UPON BY THE FEDERAL CONVENTION,
SEPTEMBER 17, 1787.

IN TWO VOLUMES.

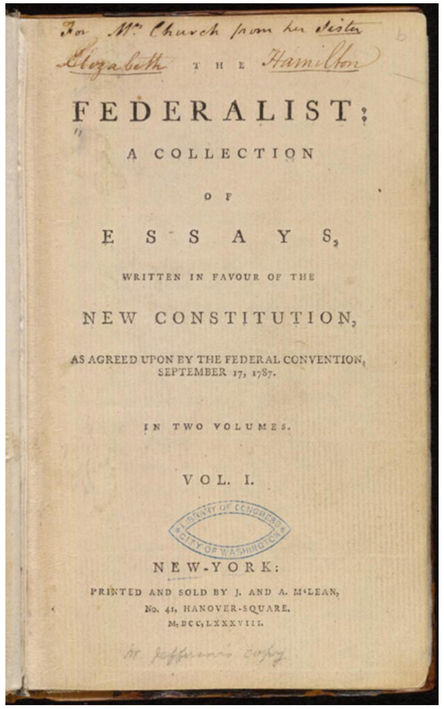
VOL. I.

NEW-YORK:

PRINTED AND SOLD BY J. AND A. M'LEAN,
No. 41, HANOVER-SQUARE.
M, DCC, LXXXVIII.

Mr Jefferson's copy

One of the first (if not the first) text-as-data study


For Mrs Church from her sister
Elizabeth THE Hamilton

FEDERALIST:

A COLLECTION

OF

ESSAYS,

WRITTEN IN FAVOUR OF THE

NEW CONSTITUTION,

AS AGREED UPON BY THE FEDERAL CONVENTION,
SEPTEMBER 17, 1787.

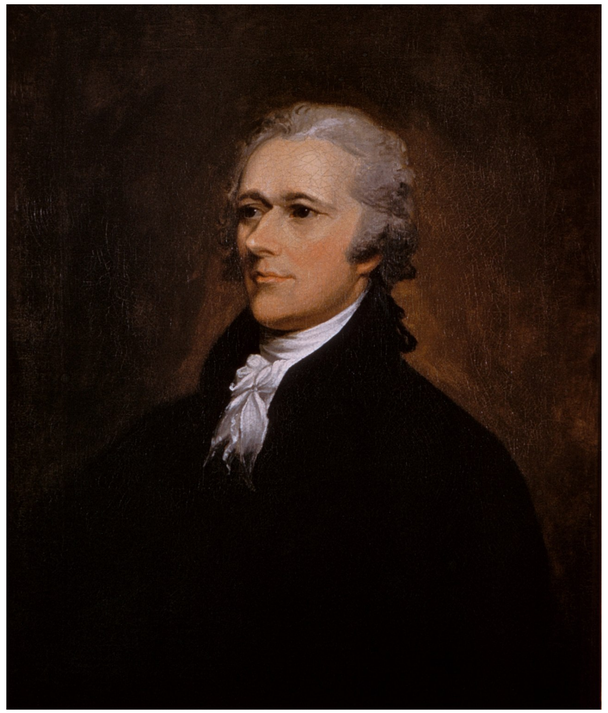
IN TWO VOLUMES.

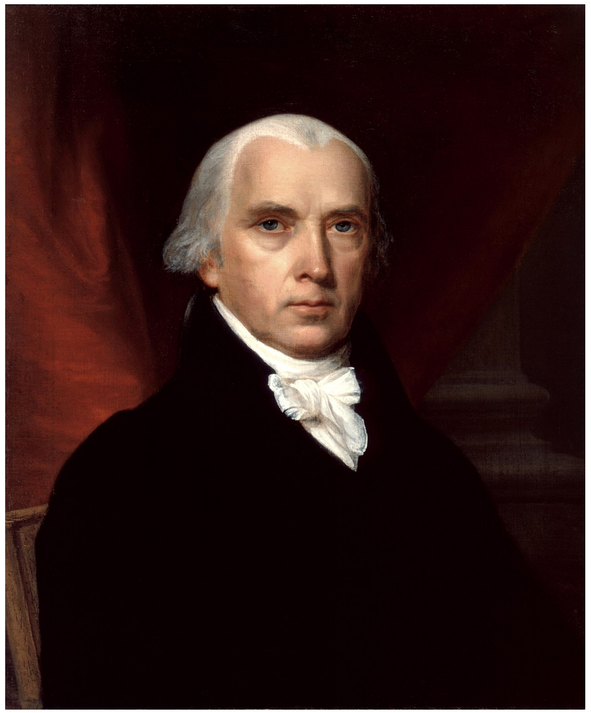
VOL. I.

NEW-YORK:

PRINTED AND SOLD BY J. AND A. M'LEAN,
No. 41, HANOVER-SQUARE.
M, DCC, LXXXVIII.

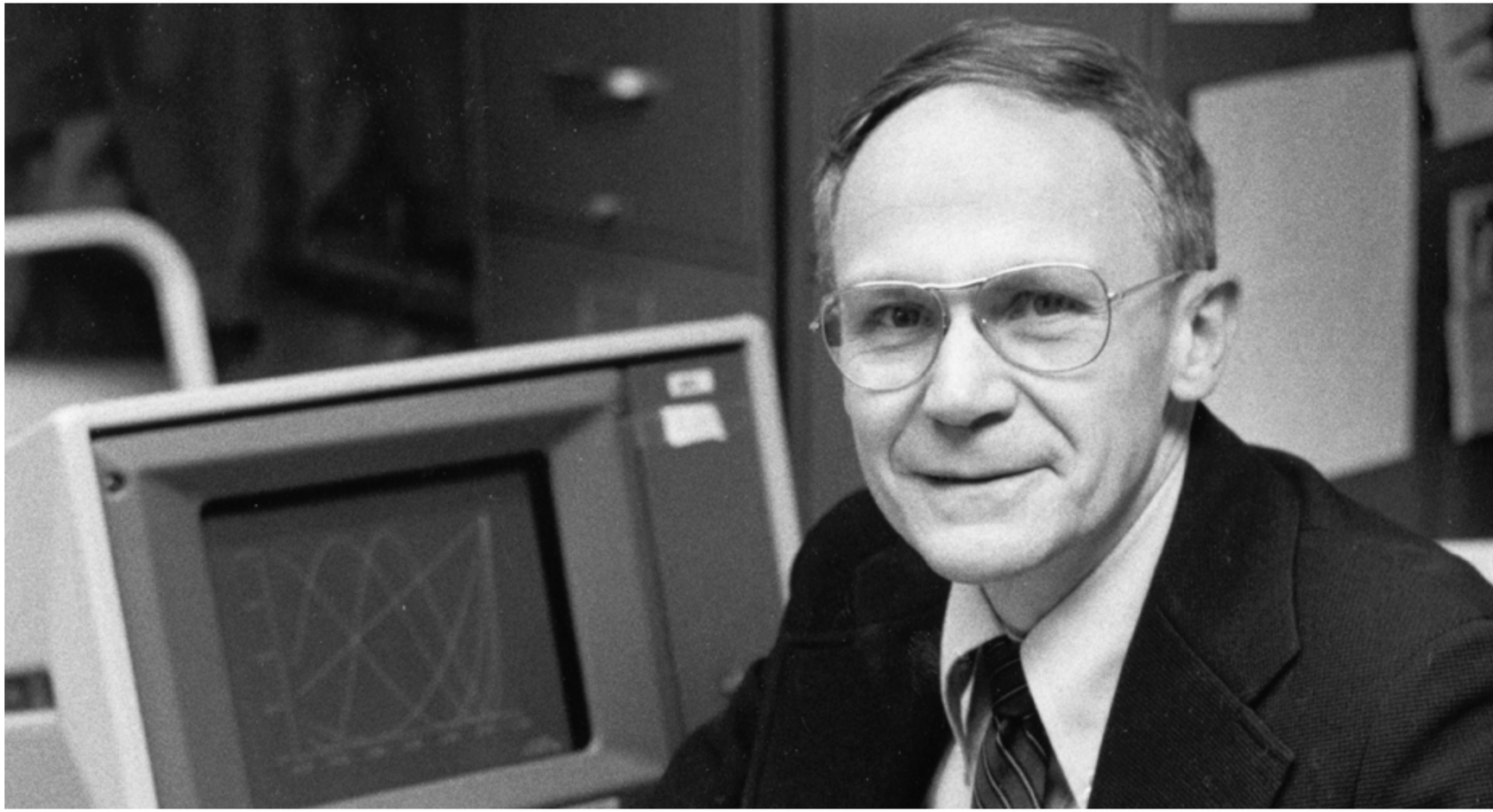
Mr Jefferson's copy





Who wrote them?

- 71 of the essays have a fairly certain authorship
- 12 are disputed
- Big historical debate as to how to ascribe authorship



Computer-assisted text analysis!

Computer-assisted text analysis…?

Dimension Reduction

- Remove all the stop-words!

Dimension Reduction

- Remove all the stop-words!
- Still… too many words!
-

Dimension Reduction

- Remove all the stop-words!
- Still… too many words!
- Remove all the words BUT the stop-words

Dimension Reduction

- Remove all the stop-words!
- Still… too many words!
- Remove all the words BUT the stop-words

- Maybe there is information in them!

Simplified example from Grimmer et al., 2022

- Focus on:
  - “Man”
  - “By”
  - “Upon”
- The rates with which the authors use these words may indicate authorship

Word Rates

	man	by	upon
Hamilton	102	859	374
Madison	17	474	7
Jay	0	82	1

Word Proportions

	man	by	upon
Hamilton	.076	.643	.28
Madison	.034	.952	.014
Jay	0	.988	.012

Word Proportions

Multinomial Model of Language

	man	by	upon
Hamilton	.076	.643	.28
Madison	.034	.952	.014
Jay	0	.988	.012

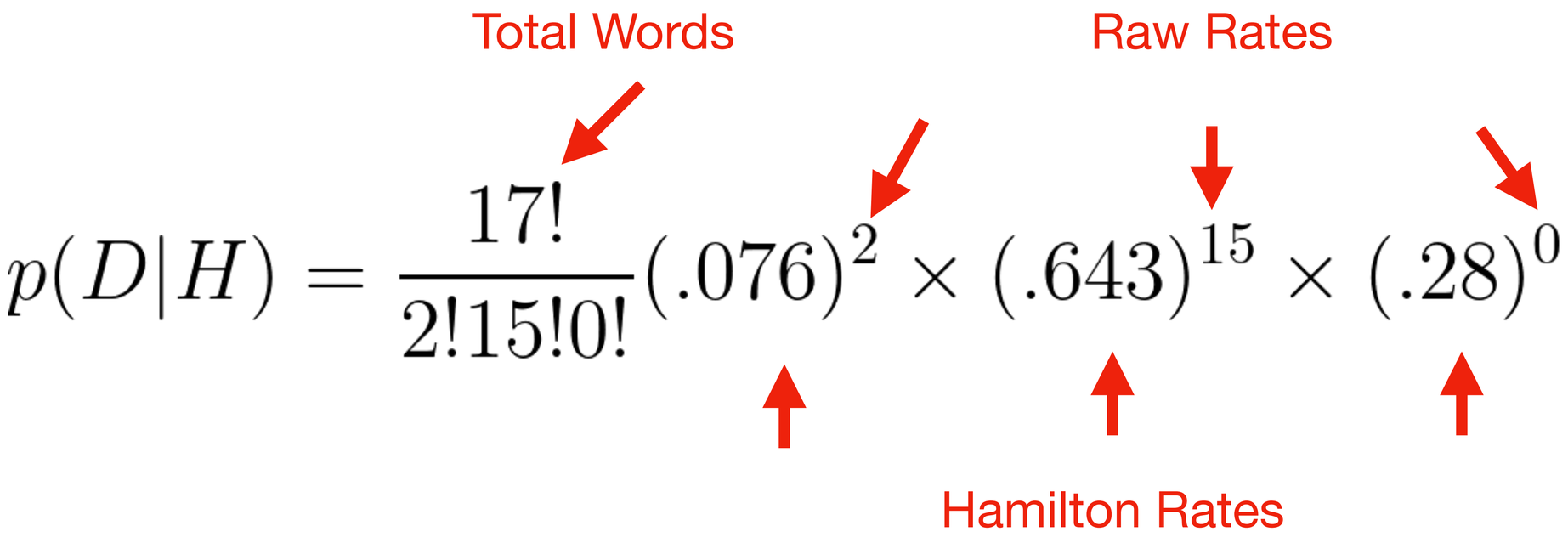
Disputed Paper

	man	by	upon
Disputed	2	15	0

Disputed Paper

$$p(D|H) = \frac{17!}{2!15!0!}(.076)^2 \times (.643)^{15} \times (.28)^0$$

Disputed Paper



Calculate Jay and Madison

$$p(D|H) = \frac{17!}{2!15!0!}(.076)^2 \times (.643)^{15} \times (.28)^0 = .001$$

$$p(D|M) = \frac{17!}{2!15!0!}(.034)^2 \times (.952)^{15} \times (.014)^0 = .076$$

$$p(D|J) = \frac{17!}{2!15!0!}(0)^2 \times (.988)^{15} \times (.012)^0 = 0$$

Federalist Vector Space Model (And More!)

- In the Markdown file…