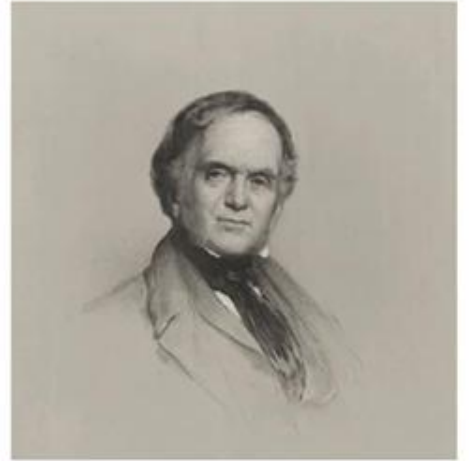


21-The-Data-Ink-Ratio

William Playfair

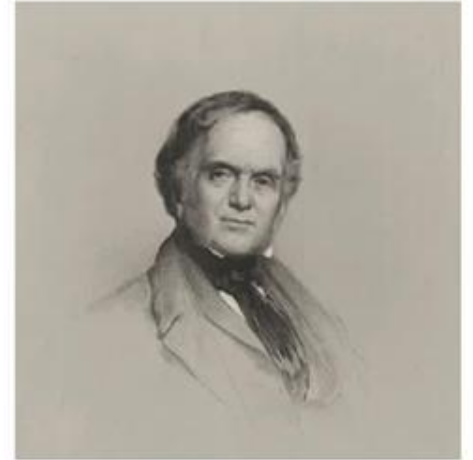
William Playfair (1759–1823)



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Scottish engineer and political economist

Founder of graphical methods of statistics (now called statistical graphics)



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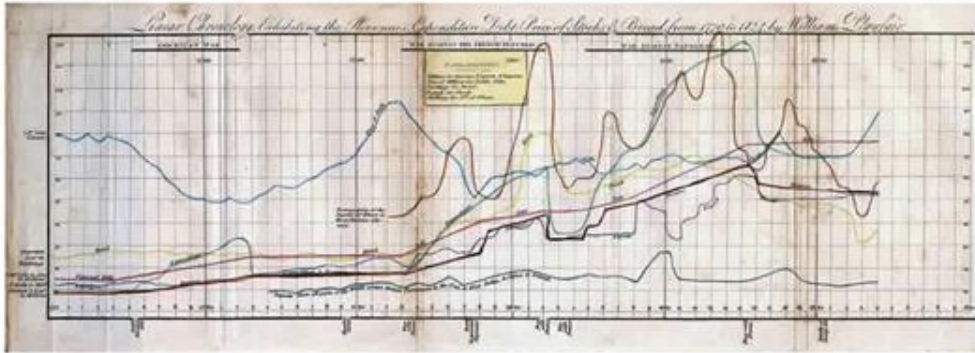
Founder of graphical methods of statistics (now called statistical graphics)

In 1785 he published *The Commercial and Political Atlas* (incl. 40 charts)



William Playfair (1759–1823)

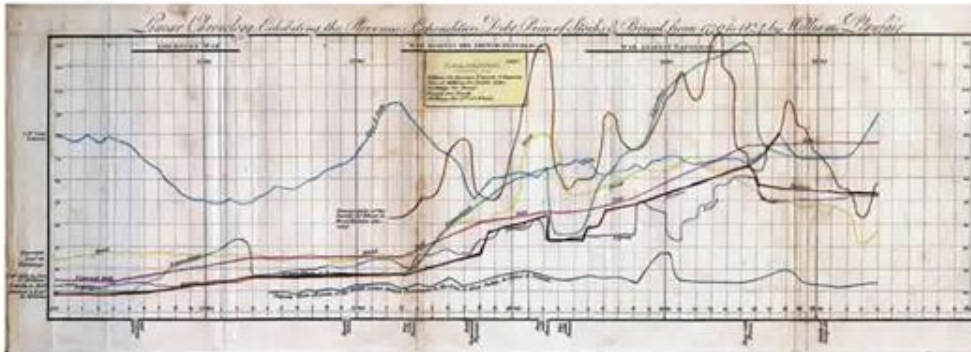
Inventor of several types of diagrams:



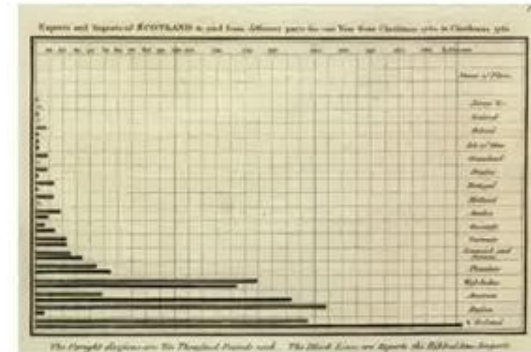
Line plot

William Playfair (1759-1823)

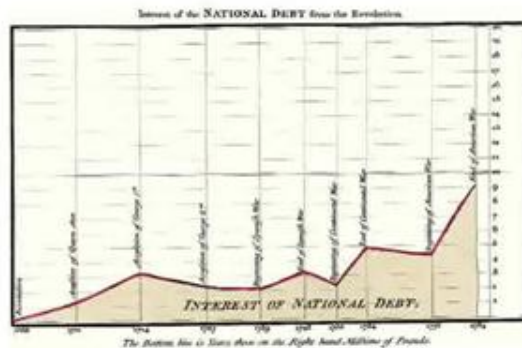
Inventor of several types of diagrams:



Line plot

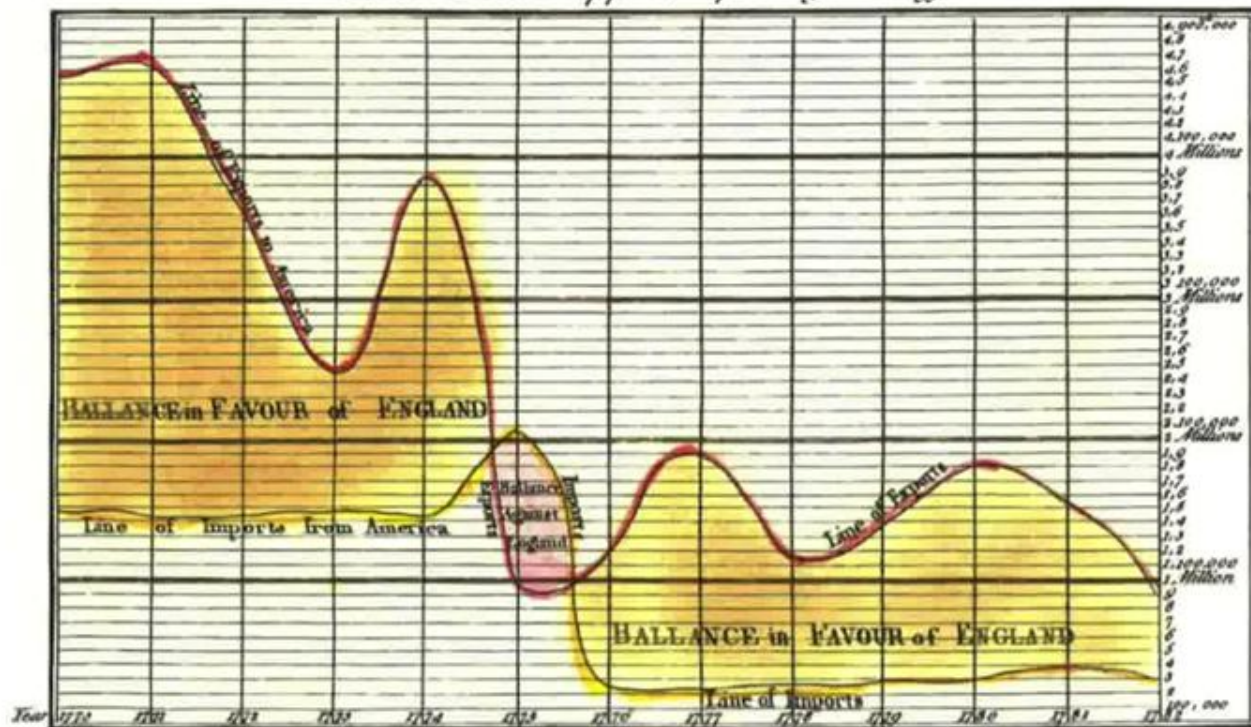


Bar plot



Area plot

*CHART of IMPORTS and EXPORTS of ENGLAND to and from all NORTH AMERICA
From the Year 1770 to 1782 by W. Playfair*



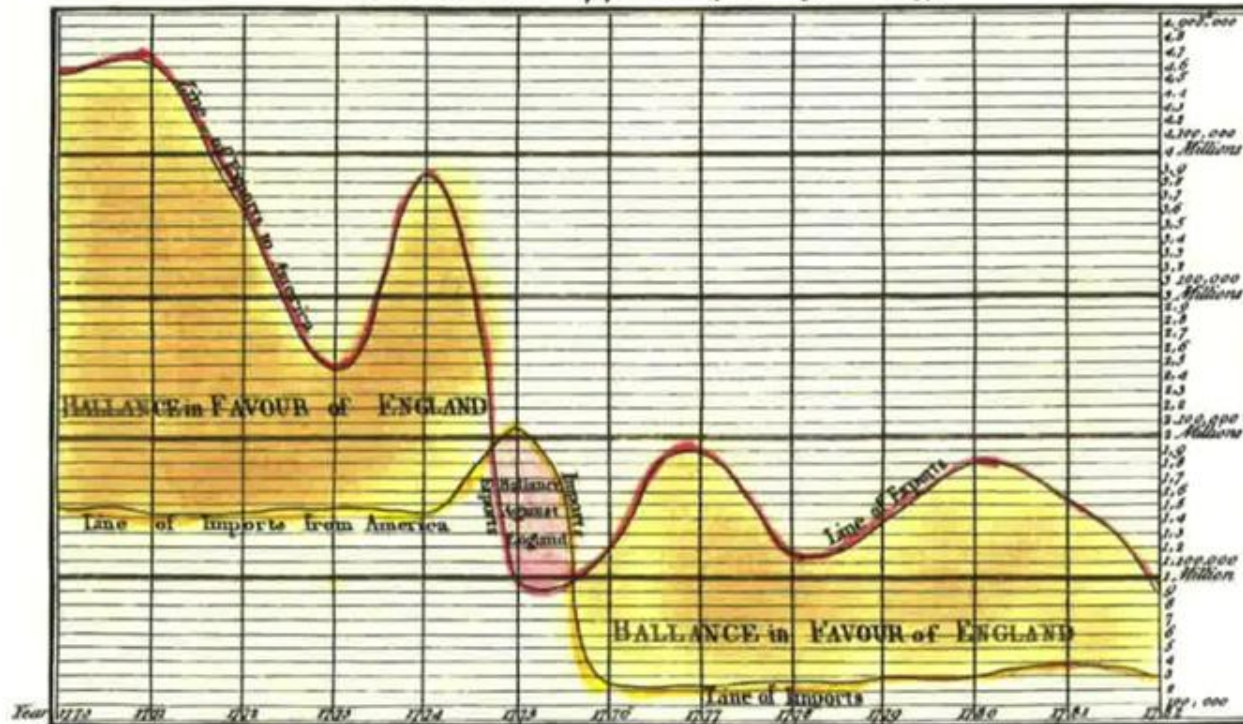
The Bottom Line is divided into Years the right-hand Line into HUNDRED THOUSAND POUNDS

J. Smith Sculp.

Published as the Act directs 20th Aug^r 1785.

SOURCE: WILLIAM PLAYFAIR, THE COMMERCIAL AND POLITICAL ATLAS, 1785,
VIA THE VISUAL DISPLAY OF QUANTITATIVE INFORMATION, E. TUFT

*CHART of IMPORTS and EXPORTS of ENGLAND to and from all NORTH AMERICA
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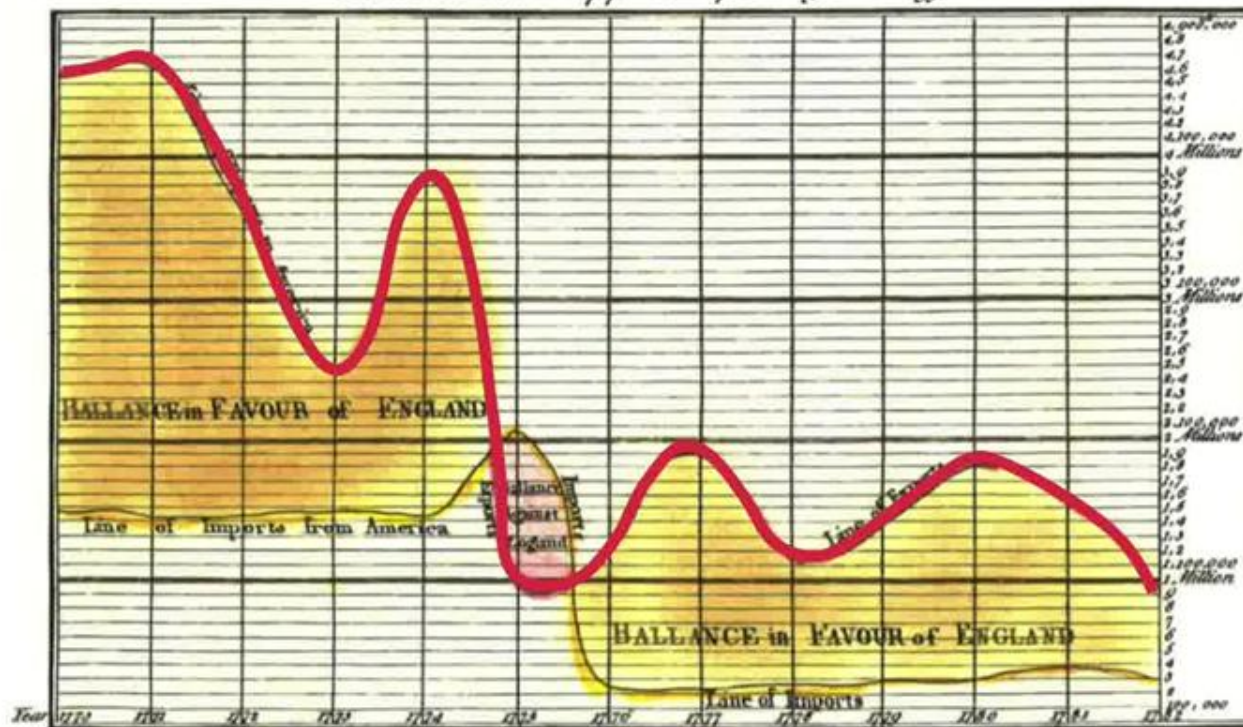
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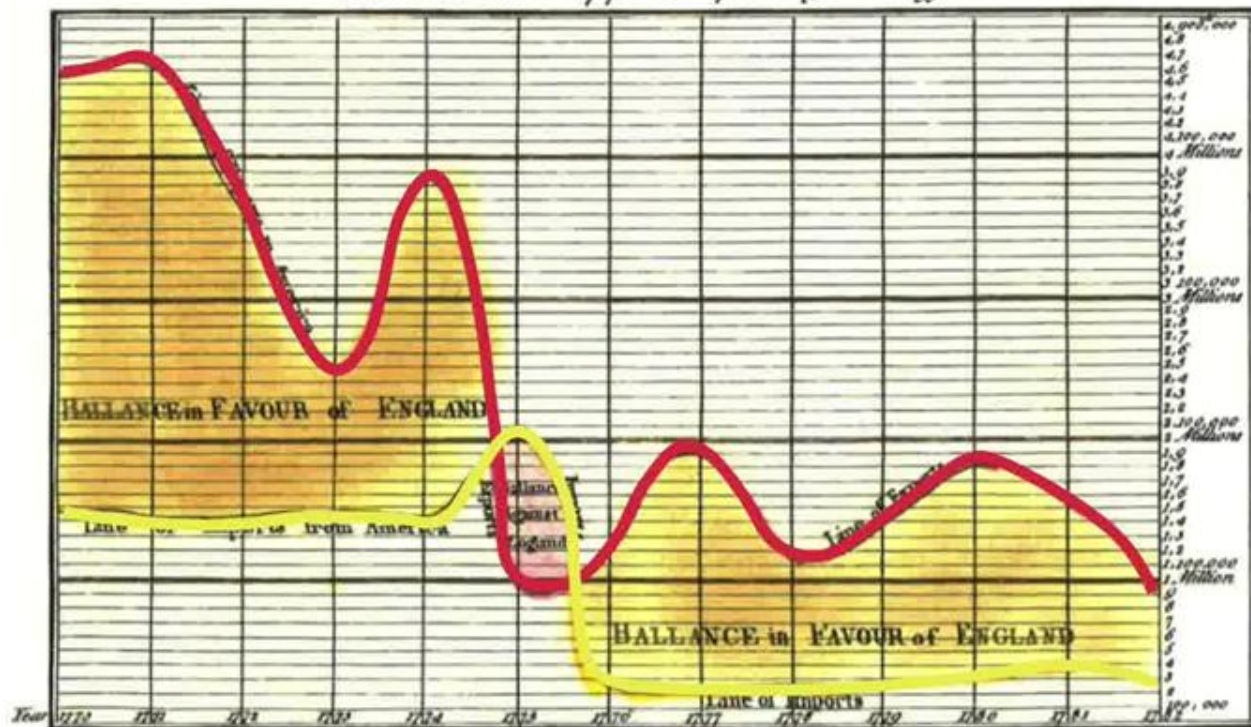
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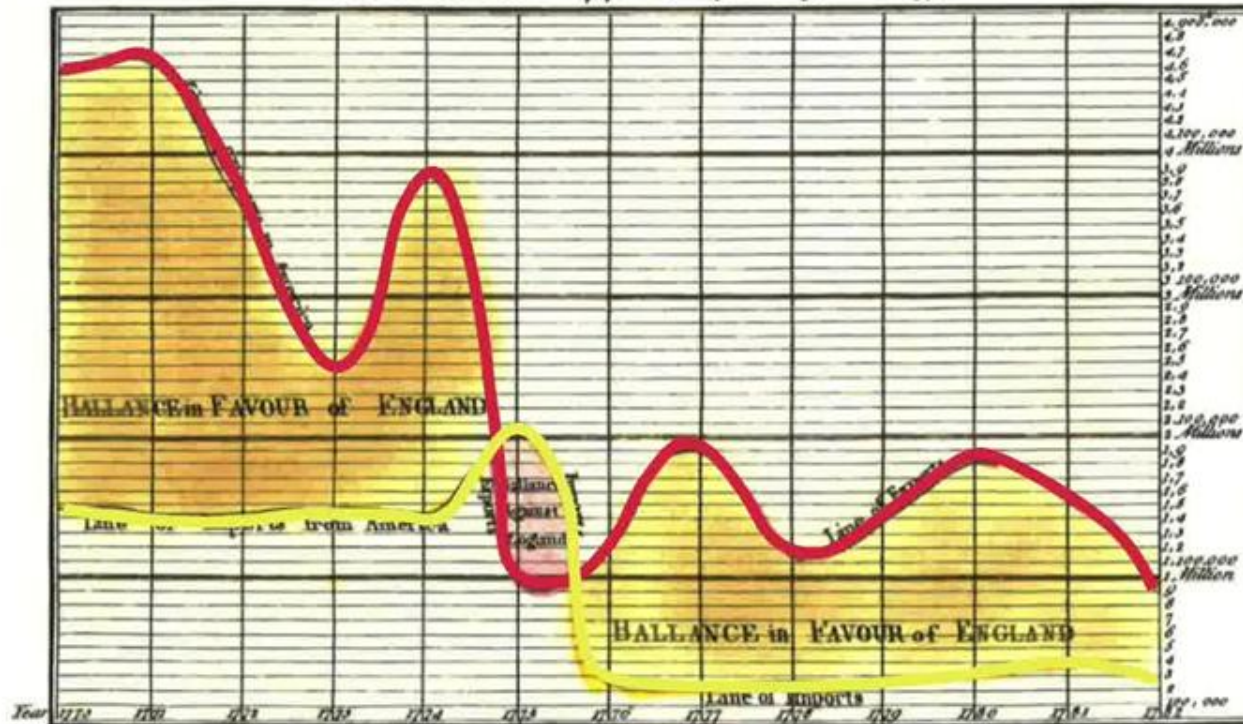
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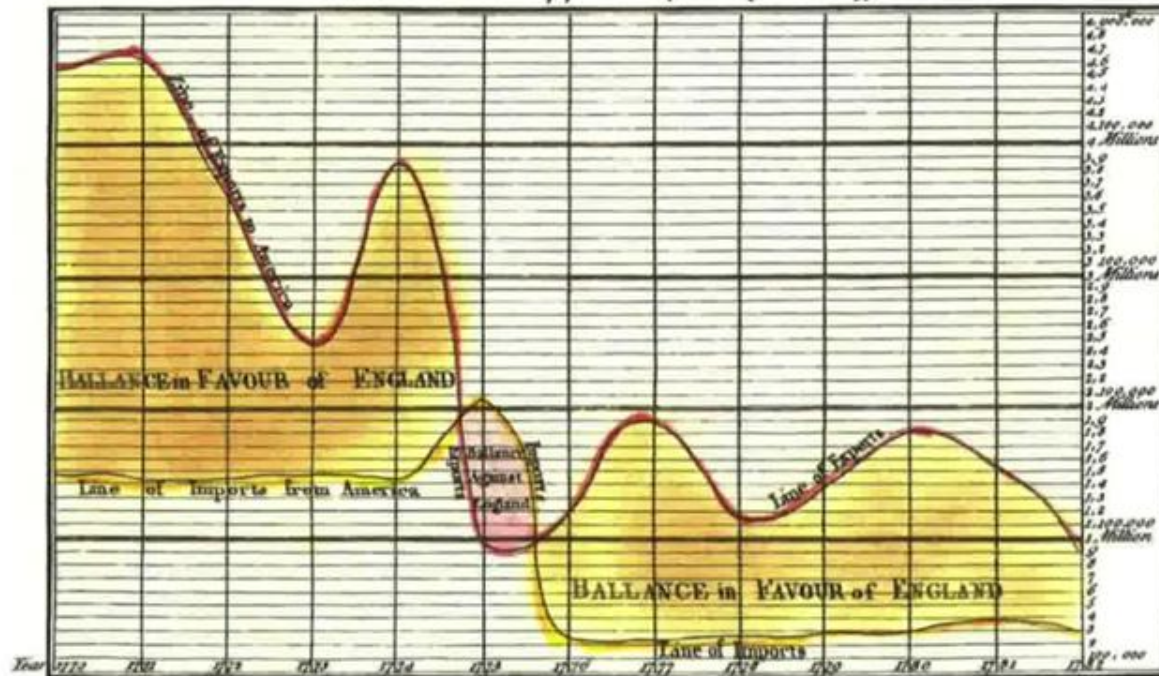
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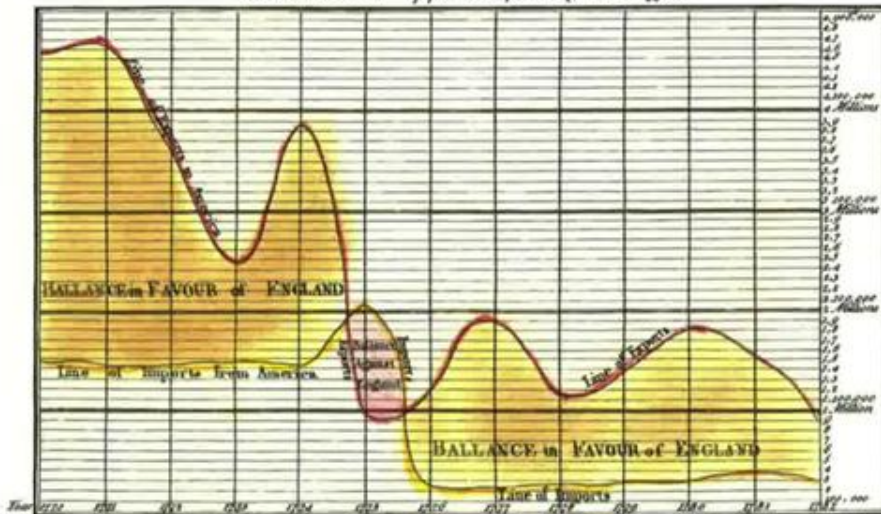
J. Smith Sculp.

Publ'd at the ... direct 10th Aug^o 1785.

SOURCE: WILLIAM PLAYFAIR, THE COMMERCIAL AND POLITICAL ATLAS, 1785,
VIA THE VISUAL DISPLAY OF QUANTITATIVE INFORMATION, E. TUFTS

1785

CHART of IMPORTS and EXPORTS of ENGLAND to and from all NORTHAMERICA From the Year 1770 to 1782 by W. Playfair

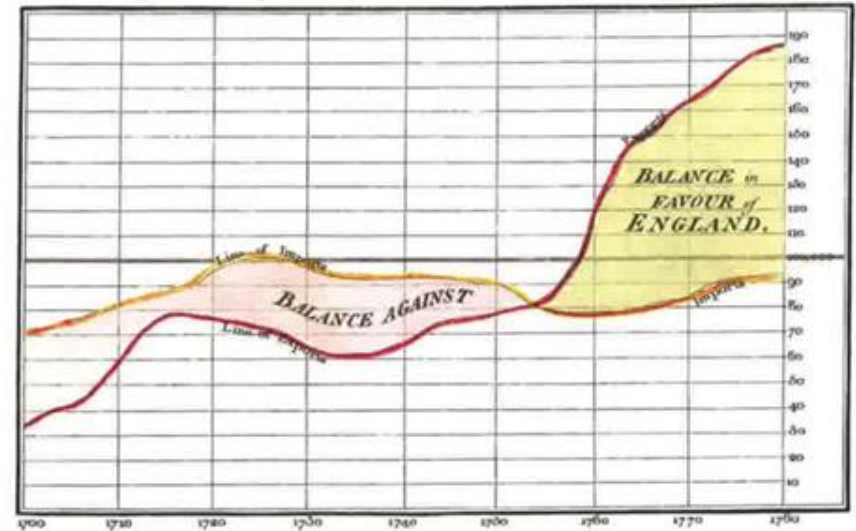


The Bottom Line is divided into Years the right-hand Line into HUNDRED THOUSAND POUNDS
J. Smith Sculp.
Published in the Art Journal 10th Augth 1785.

SOURCE: WILLIAM PLAYFAIR, THE COMMERCIAL AND POLITICAL ATLAS, 1785,
VIA THE VISUAL DISPLAY OF QUANTITATIVE INFORMATION, E. TUFT

1786

Exports and Imports to and from DENMARK & NORWAY from 1700 to 1780



The Bottom line is divided into Years, the Right hand line into £10000 each.
Published in the Art Journal, 10th Augth 1786, by W. Playfair.
Plate 104th 1786, London, Currier.

SOURCE: WILLIAM PLAYFAIR, 1786,
VIA THE VISUAL DISPLAY OF QUANTITATIVE INFORMATION, E. TUFT

Above all else, show the data

Data graphics should draw the viewer's attention to the sense and substance of the data, not to something else.

Data-ink ratio

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DATA-INK VS NON-DATA-INK

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DATA-INK VS NON-DATA-INK



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DATA-INK VS NON-DATA-INK



DATA-INK

Non-erasable core of the graphic.
Non-redundant ink.

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DATA-INK VS NON-DATA-INK



DATA-INK

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NON-DATA-INK

The rest of the ink in the graph.

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DATA-INK VS NON-DATA-INK

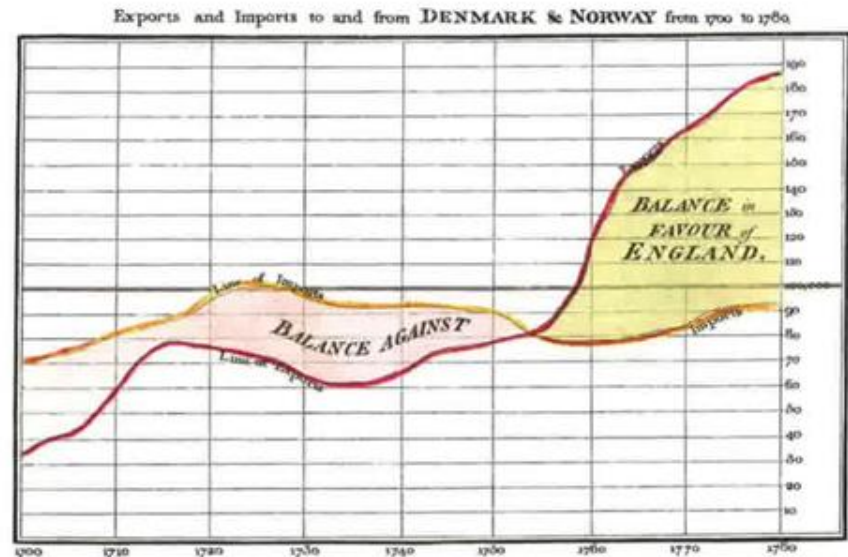


DATA-INK

Non-erasable core of the graphic.
Non-redundant ink.

NON-DATA-INK

The rest of the ink in the graph.



The Bottom line is divided into Years, the Right hand line into L10,000 each.
Published in the Age Journal 17th May 1781 by W. P. Popham. (Scale 1/100,000, London)

Data-ink ratio

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DATA-INK VS NON-DATA-INK



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Non-redundant ink.

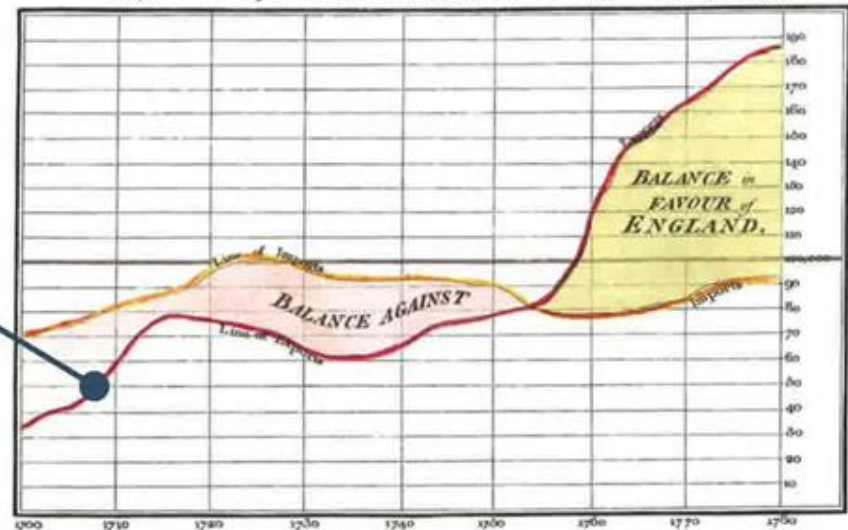
NON-DATA-INK

The rest of the ink in the graph.

DATA-INK



Exports and Imports to and from DENMARK & NORWAY from 1700 to 1780



The Bottom line is divided into Years, the Right hand line into LIQ.000 each.
Published in the Age of Reason 1789, by W.T. Figgis. Each page 100, London.

Data-ink ratio

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DATA-INK VS NON-DATA-INK

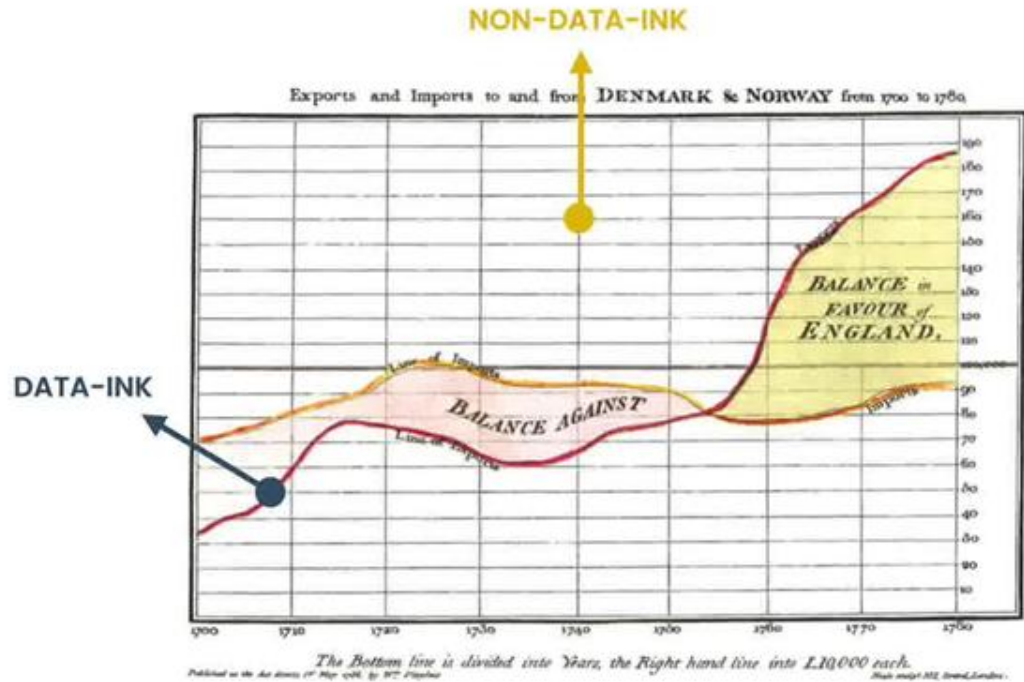


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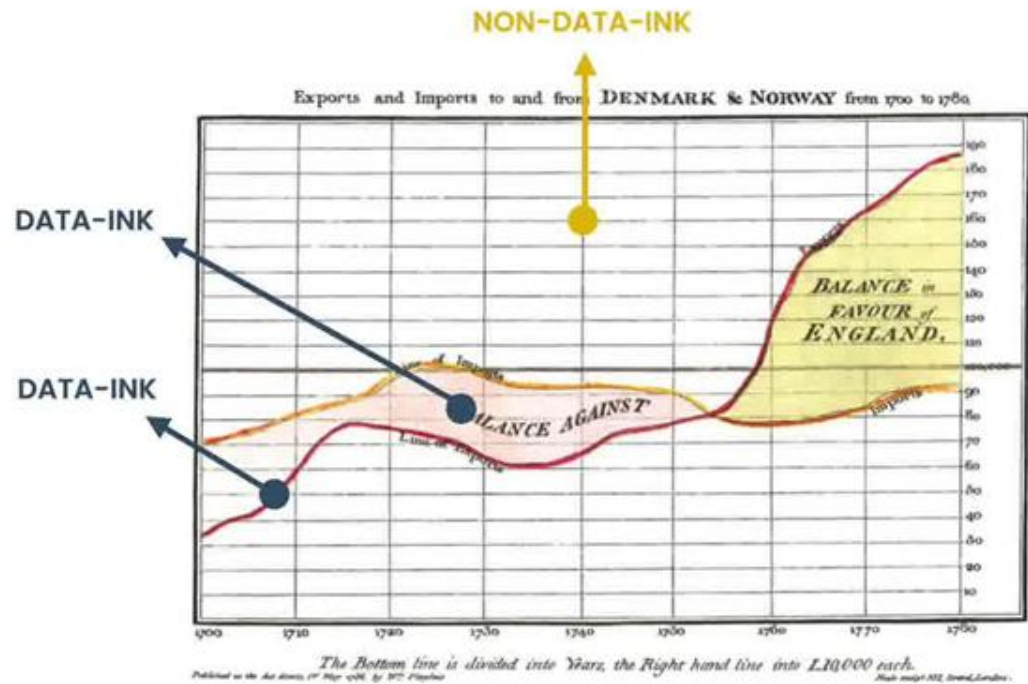


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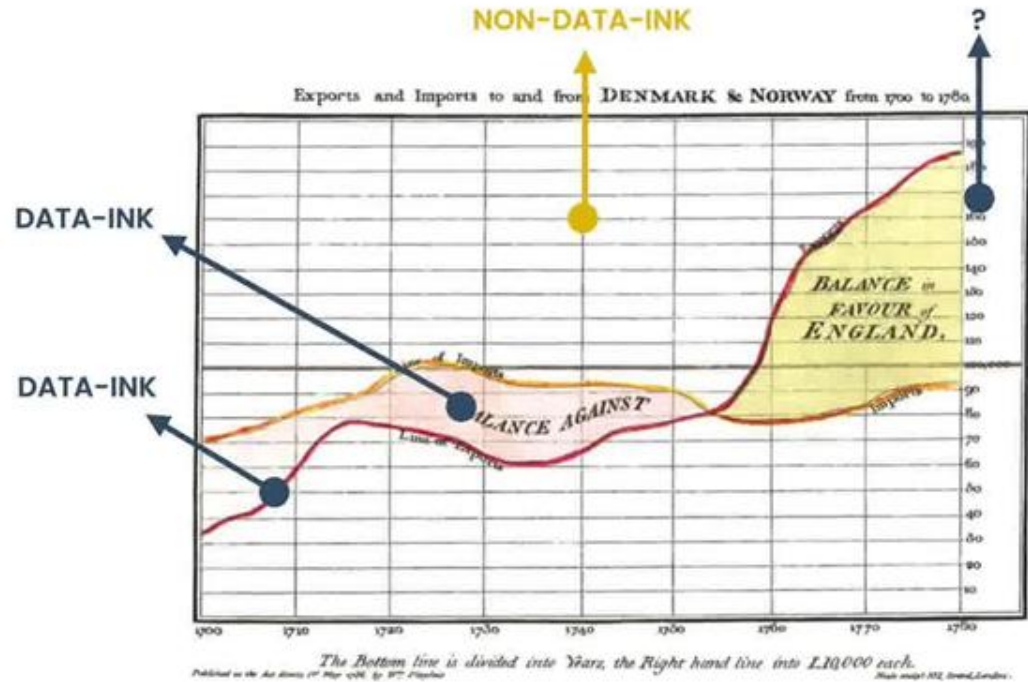


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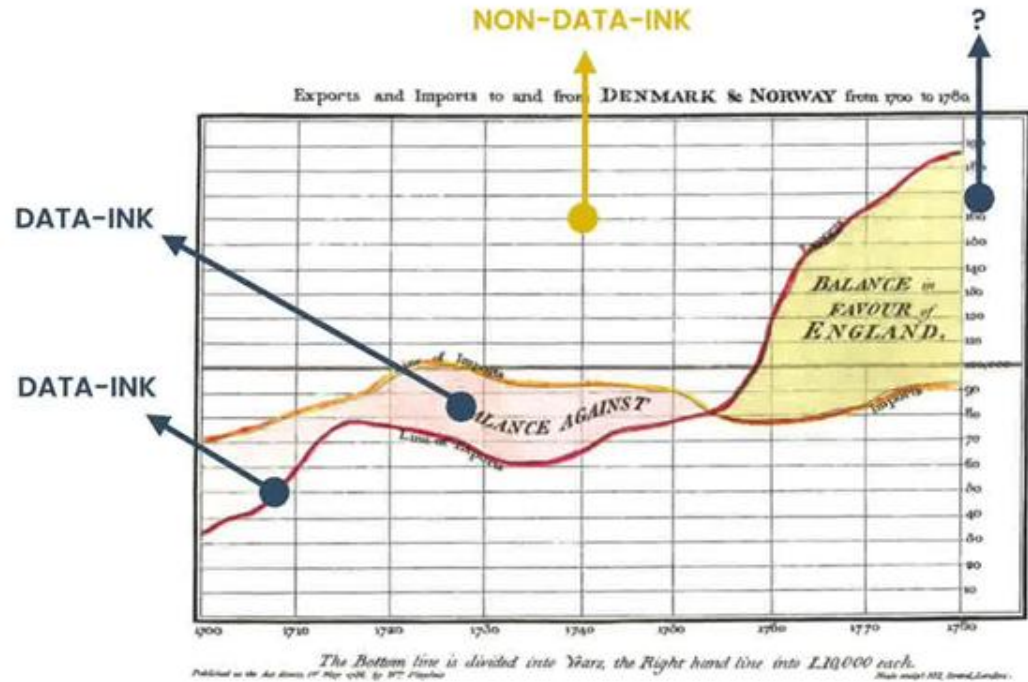


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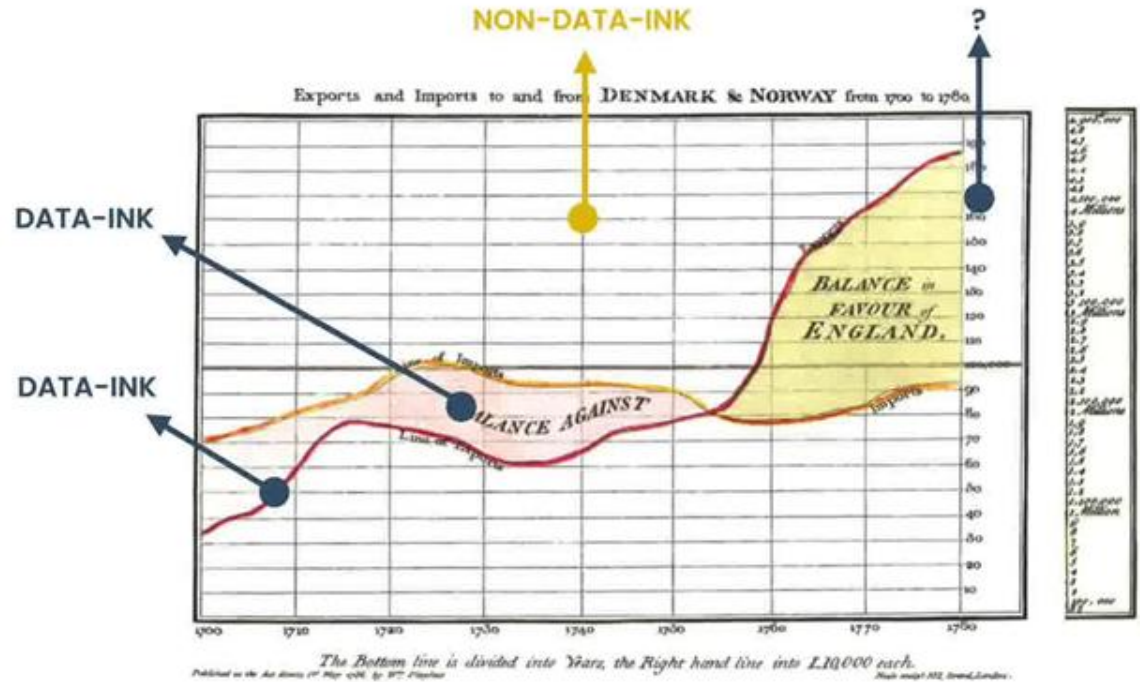


DATA-INK

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The rest of the ink in the graph.



Data-ink ratio

Data graphics should draw the viewer's attention to the sense and substance of the data, not to something else.

Maximize the data-ink ratio, where:

$$\text{DATA-INK RATIO} = \frac{\text{DATA-INK}}{\text{TOTAL INK USED IN THE GRAPHIC}}$$

Data-ink ratio

Data graphics should draw the viewer's attention to the sense and substance of the data, not to something else.

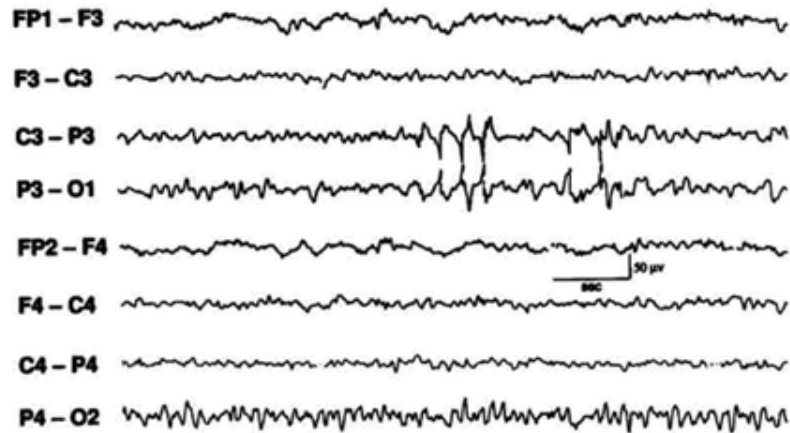
Maximize the data-ink ratio, where:

$$\text{DATA-INK RATIO} = \frac{\text{DATA-INK}}{\text{TOTAL INK USED IN THE GRAPHIC}}$$

This ratio will always be ≤ 1

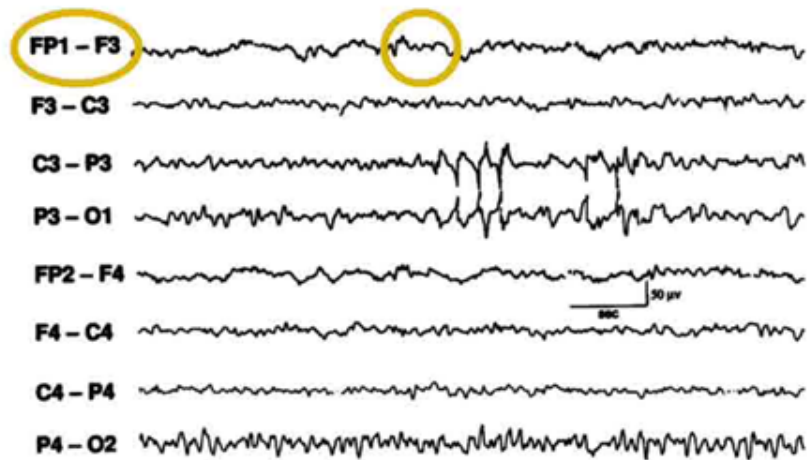
Our goal is to make the data-ink ratio as close as 1 as possible (within reason)

Data-ink ratio



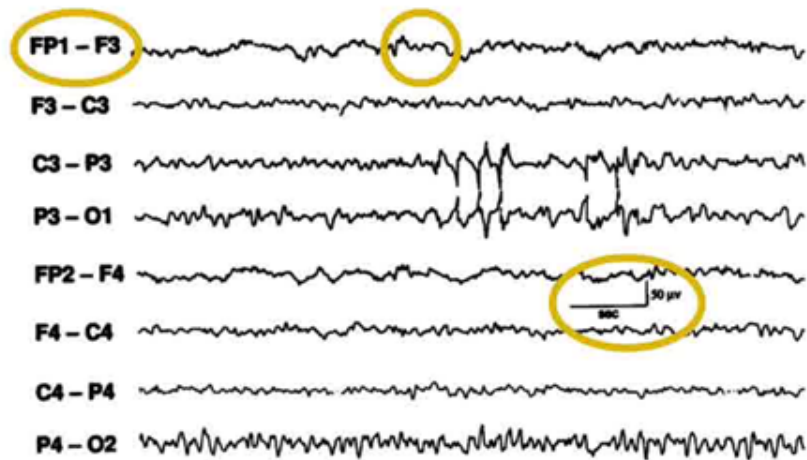
SOURCE: ELECTROENCEPHALOGRAPHY, ELECTROMYOGRAPHY AND
ELECTROOCULOGRAPHY: GENERAL PRINCIPLES AND BASIC TECHNOLOGY.
THADDEUS WALCZAK, SUDHANSU CHOKROVERTY, 1994

Data-ink ratio



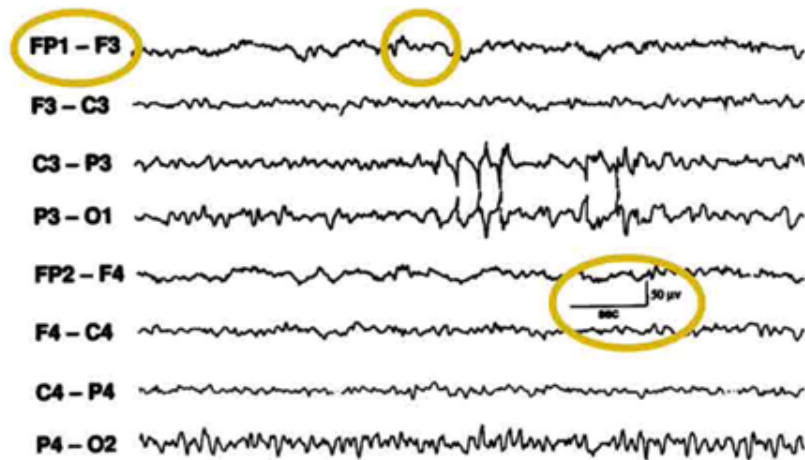
SOURCE: ELECTROENCEPHALOGRAPHY, ELECTROMYOGRAPHY AND
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Data-ink ratio



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THADDEUS WALCZAK, SUDHANSU CHOKROVERTY, 1994

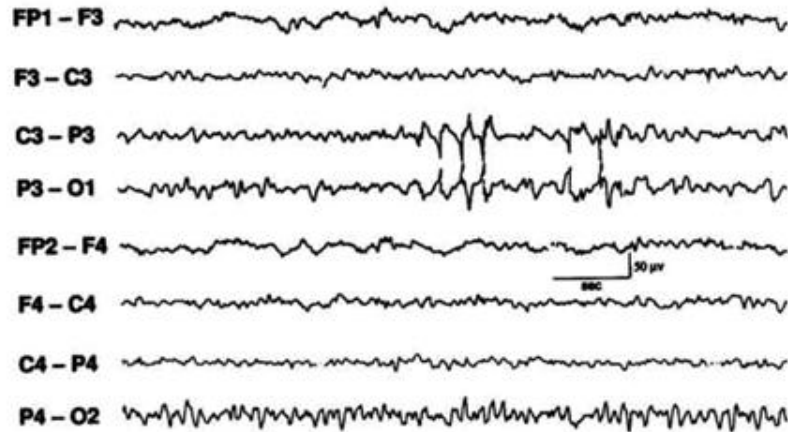
Data-ink ratio



DATA-INK RATIO = MAXIMUM

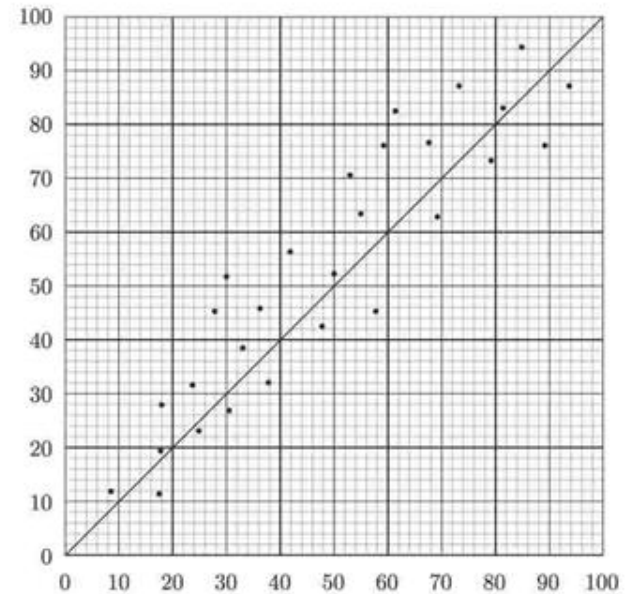
SOURCE: ELECTROENCEPHALOGRAPHY, ELECTROMYOGRAPHY AND
ELECTROOCULOGRAPHY: GENERAL PRINCIPLES AND BASIC TECHNOLOGY.
THADDEUS WALCZAK, SUDHANSU CHOKROVERTY, 1994

Data-ink ratio



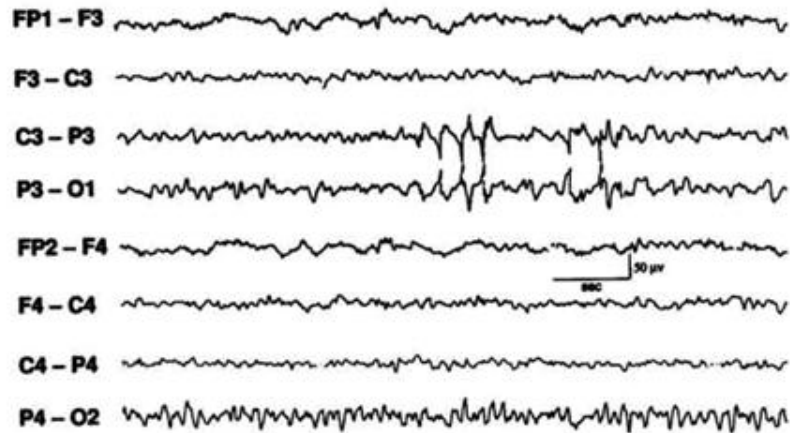
DATA-INK RATIO = MAXIMUM

SOURCE: ELECTROENCEPHALOGRAPHY, ELECTROMYOGRAPHY AND
ELECTROOCULOGRAPHY: GENERAL PRINCIPLES AND BASIC TECHNOLOGY.
THADDEUS WALCZAK, SUDHANSU CHOKROVERTY, 1994



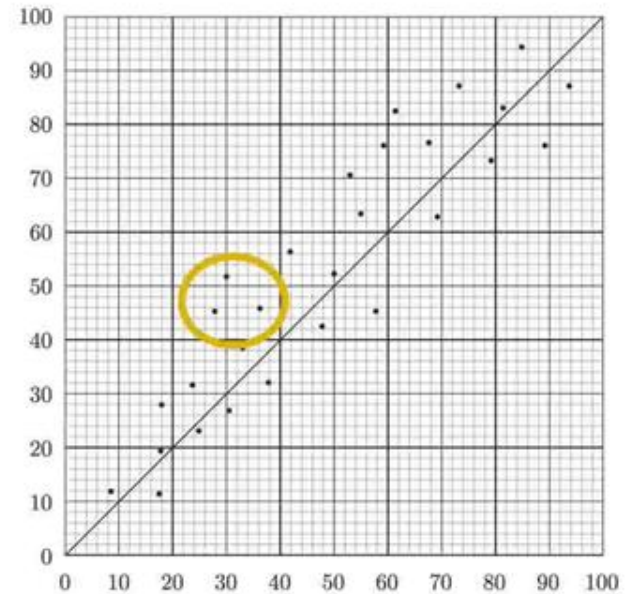
SOURCE: MADE-UP EXAMPLE

Data-ink ratio



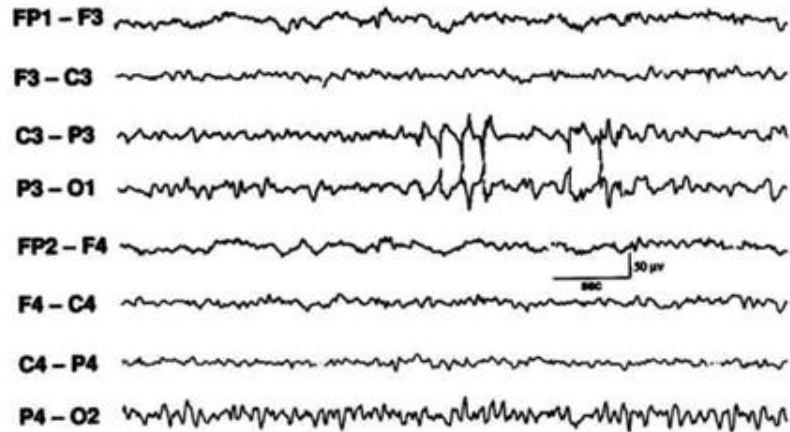
DATA-INK RATIO = MAXIMUM

SOURCE: ELECTROENCEPHALOGRAPHY, ELECTROMYOGRAPHY AND
ELECTROOCULOGRAPHY: GENERAL PRINCIPLES AND BASIC TECHNOLOGY.
THADDEUS WALCZAK, SUDHANSU CHOKROVERTY, 1994



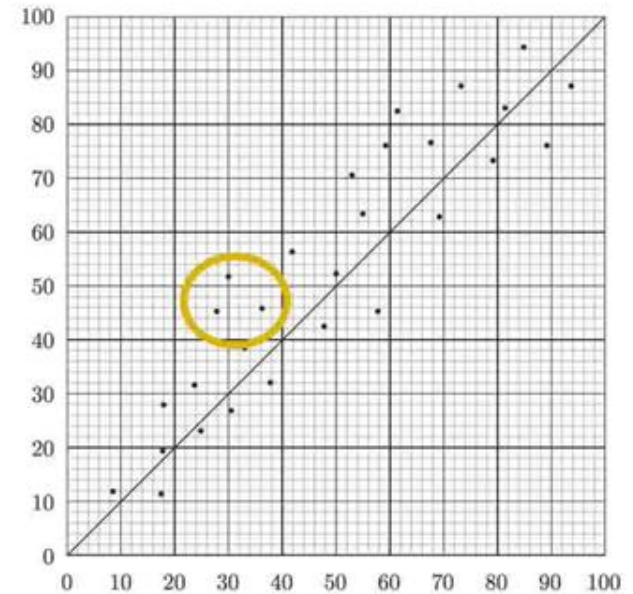
SOURCE: MADE-UP EXAMPLE

Data-ink ratio



DATA-INK RATIO = MAXIMUM

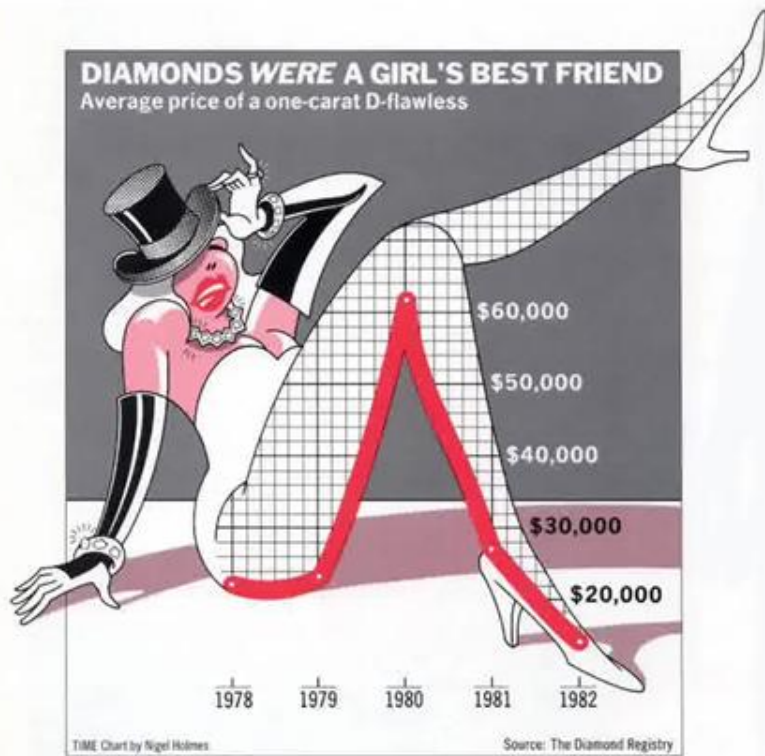
SOURCE: ELECTROENCEPHALOGRAPHY, ELECTROMYOGRAPHY AND
ELECTROOCULOGRAPHY: GENERAL PRINCIPLES AND BASIC TECHNOLOGY.
THADDEUS WALCZAK, SUDHANSU CHOKROVERTY, 1994



DATA-INK RATIO = VERY LOW

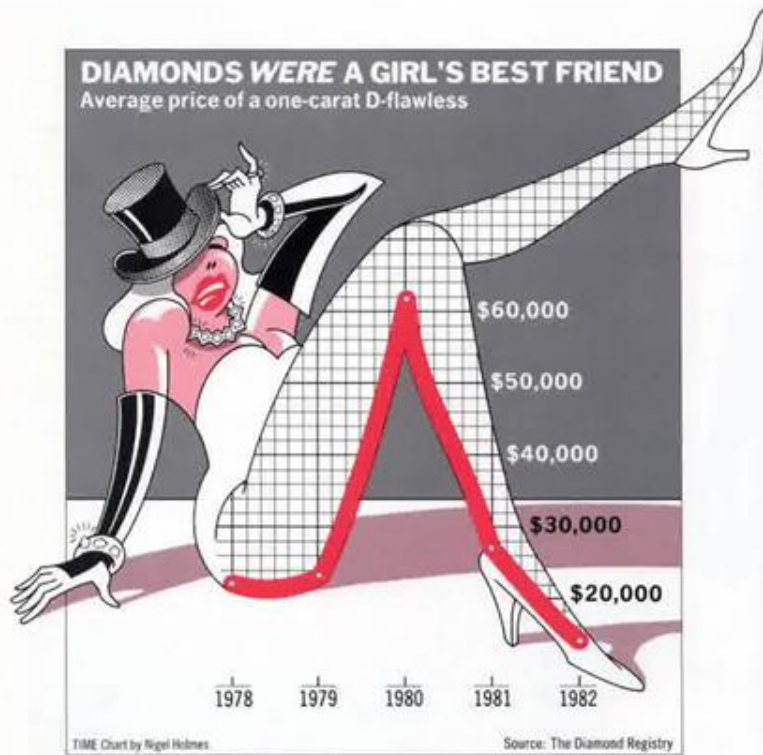
SOURCE: MADE-UP EXAMPLE

Data-ink ratio



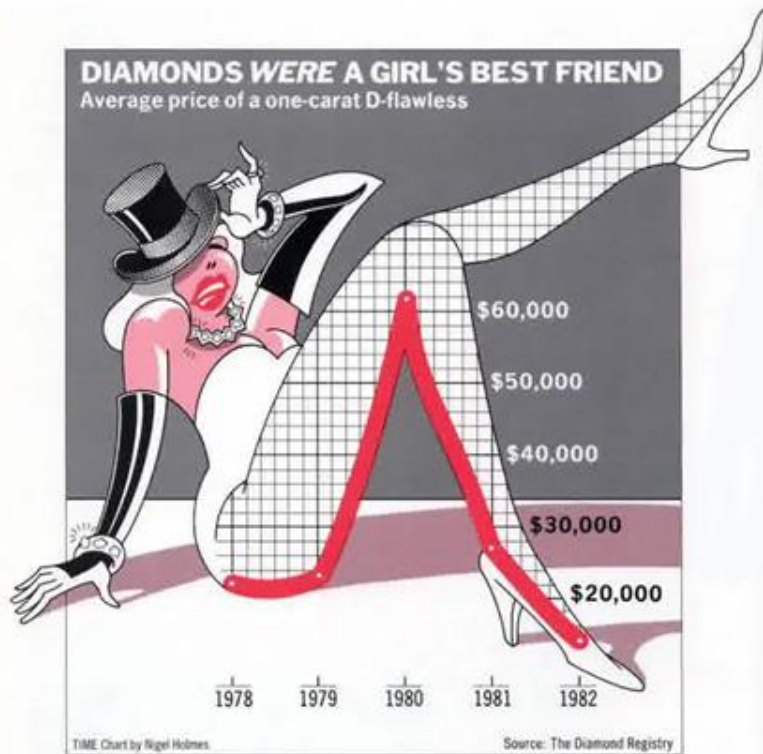
SOURCE: NIGEL HOLMES, TIMES MAGAZINE

Data-ink ratio

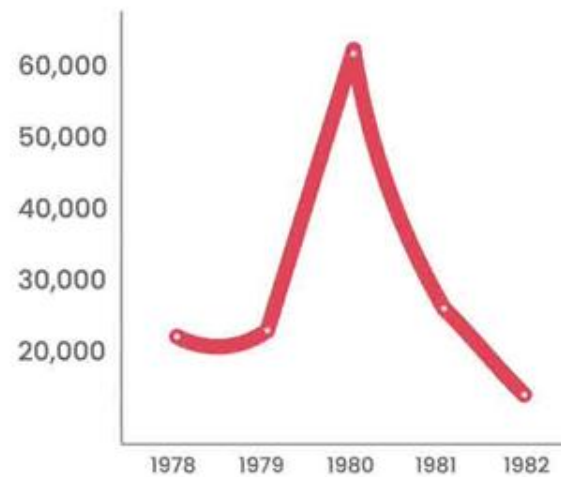


SOURCE: NIGEL HOLMES, TIMES MAGAZINE

Data-ink ratio



Average price of a one-carat
D-flawless (in USD)



SOURCE: NIGEL HOLMES, TIMES MAGAZINE

Data-ink ratio

GOAL

Maximize the data-ink ratio (within reason)

Data-ink ratio

GOAL

Maximize the data-ink ratio (within reason)

TWO ERASING PRINCIPLES

Erase non-data-ink, within reason

Erase redundant data-ink, within reason

Data-ink ratio

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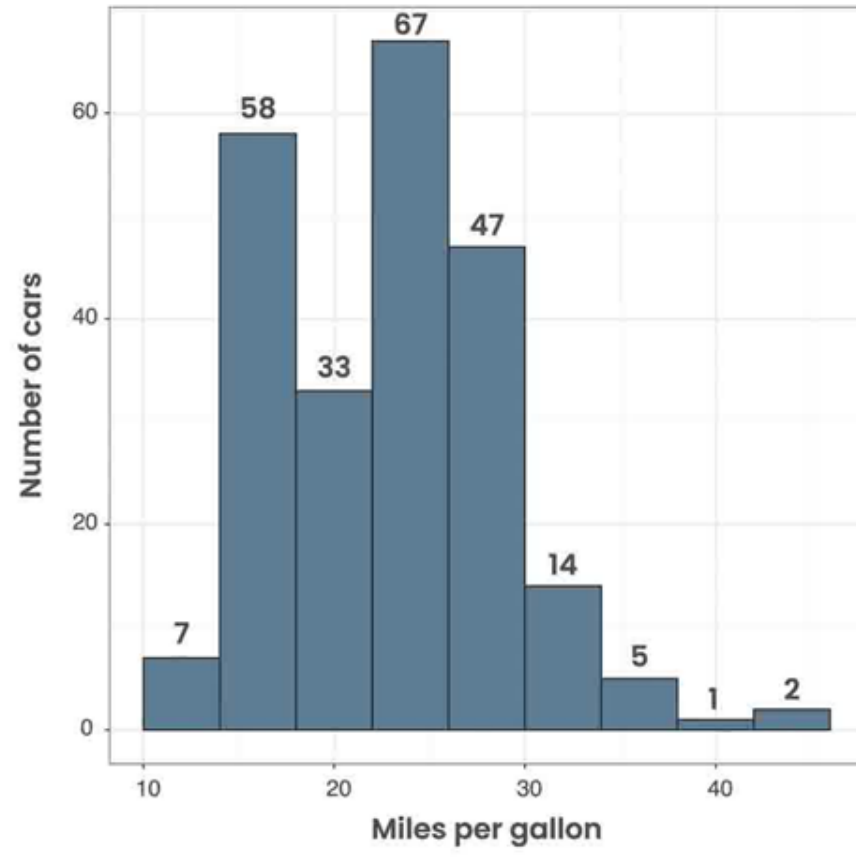
GOAL

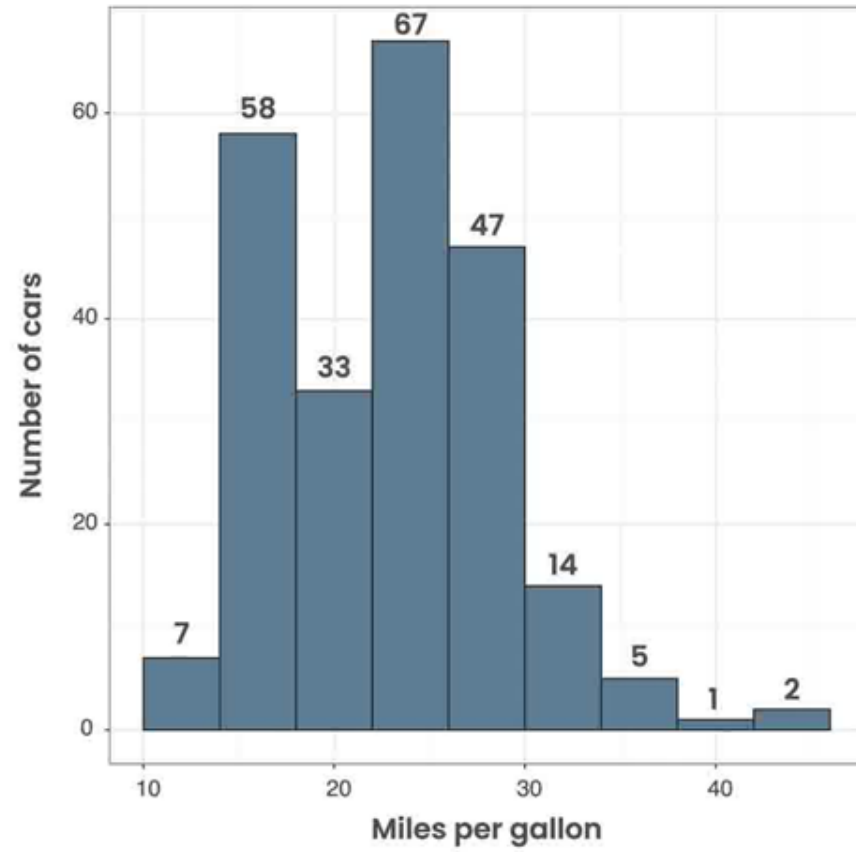
Maximize the data-ink ratio (within reason)

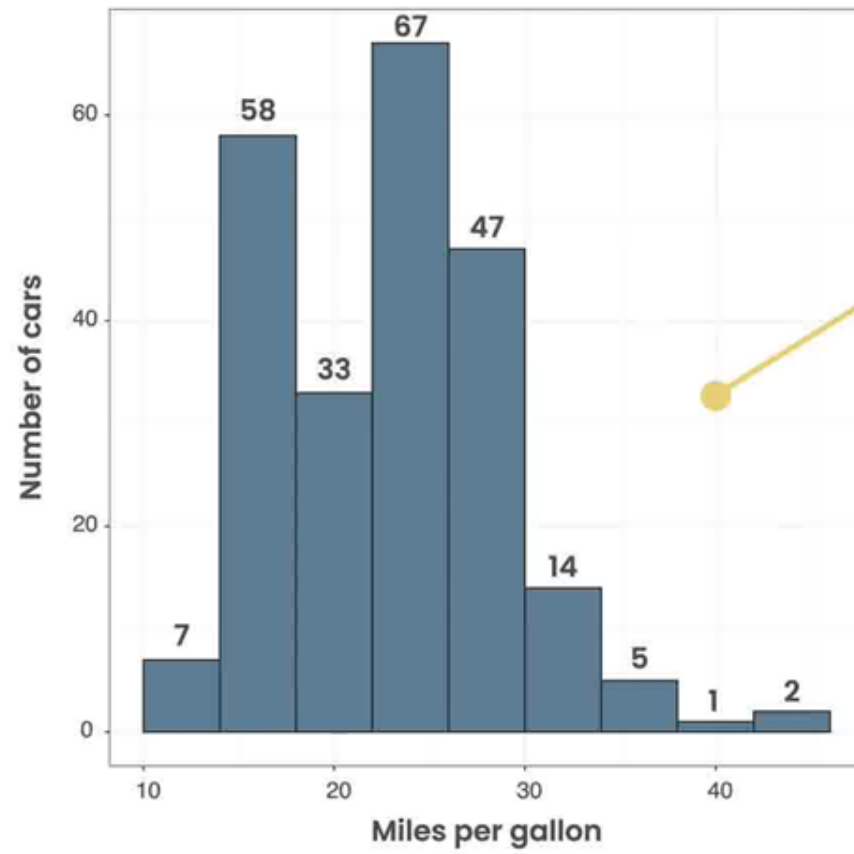
TWO ERASING PRINCIPLES

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Erase redundant data-ink, within reason

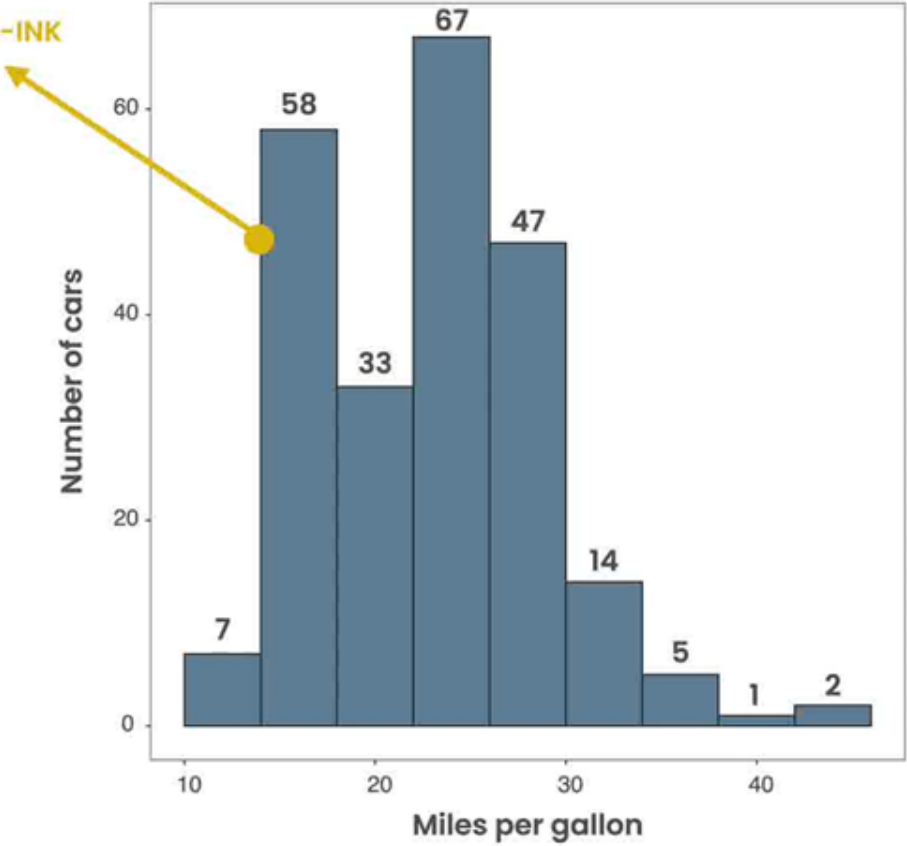




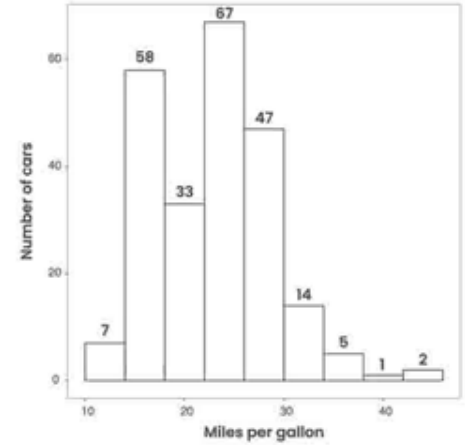
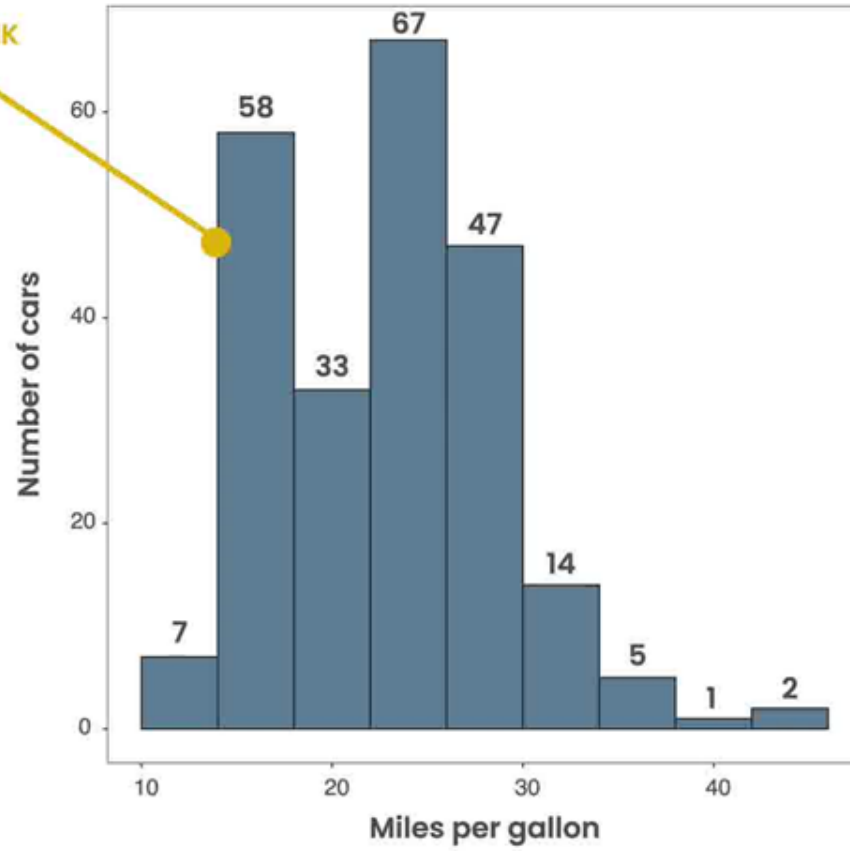


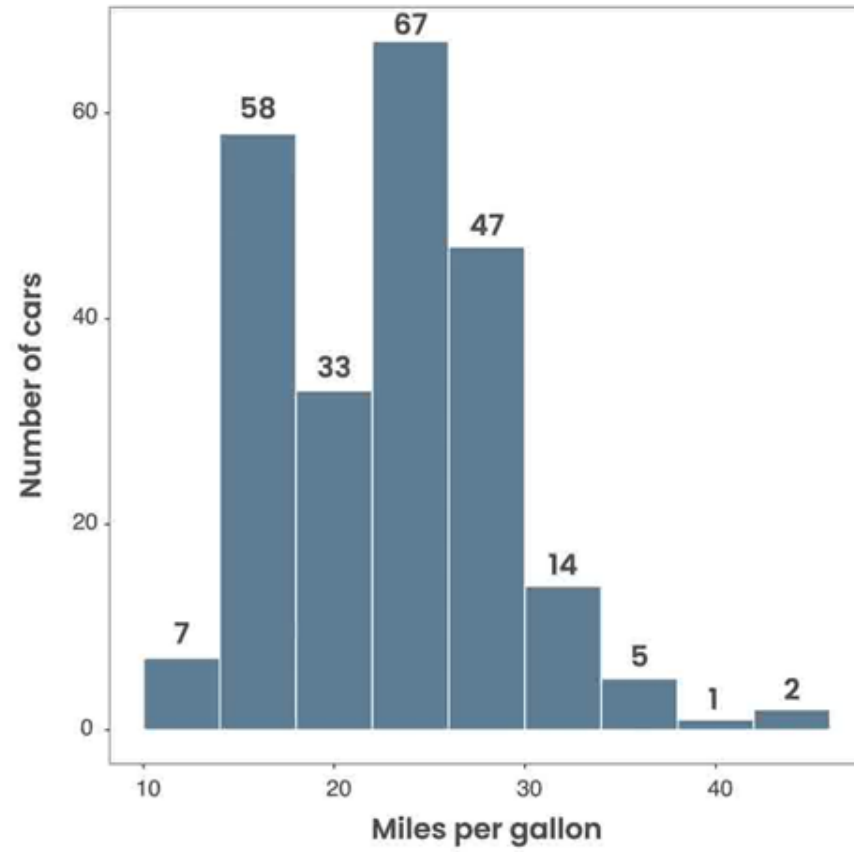
NON-DATA-INK

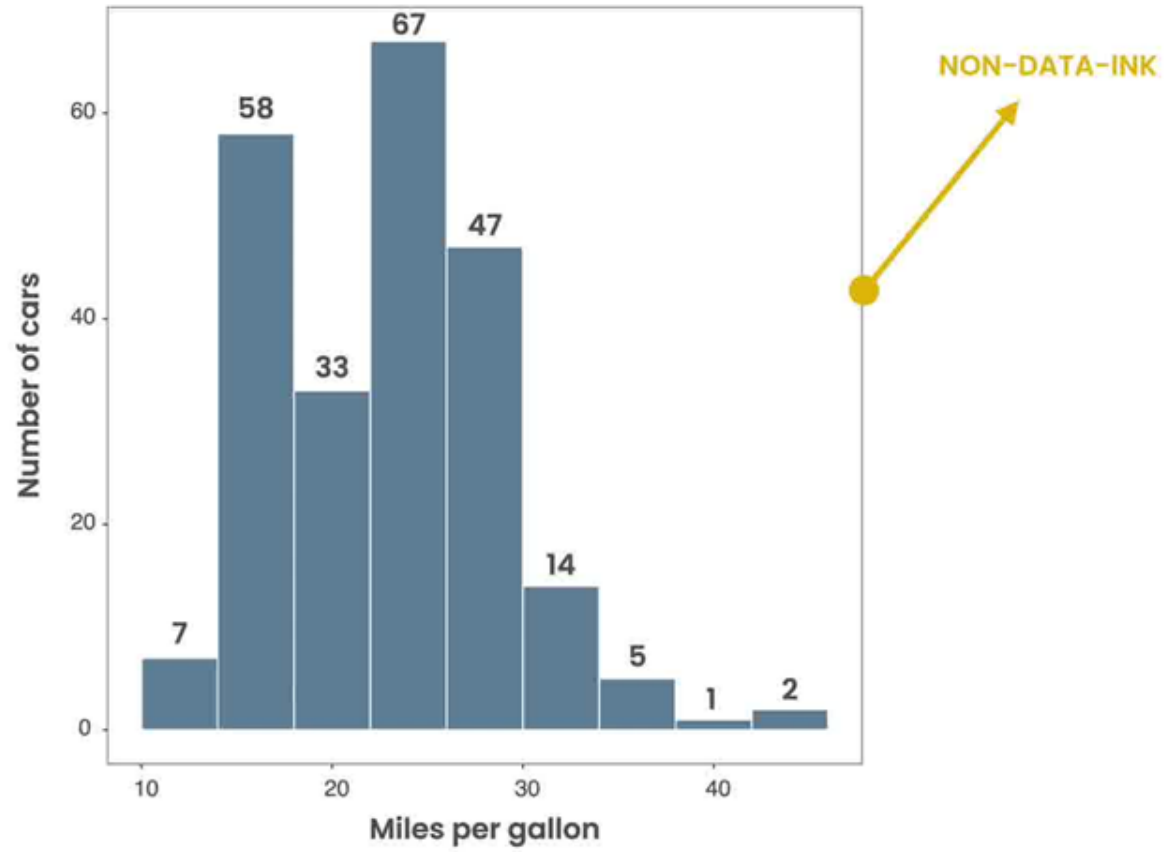
REDUNDANT DATA-INK

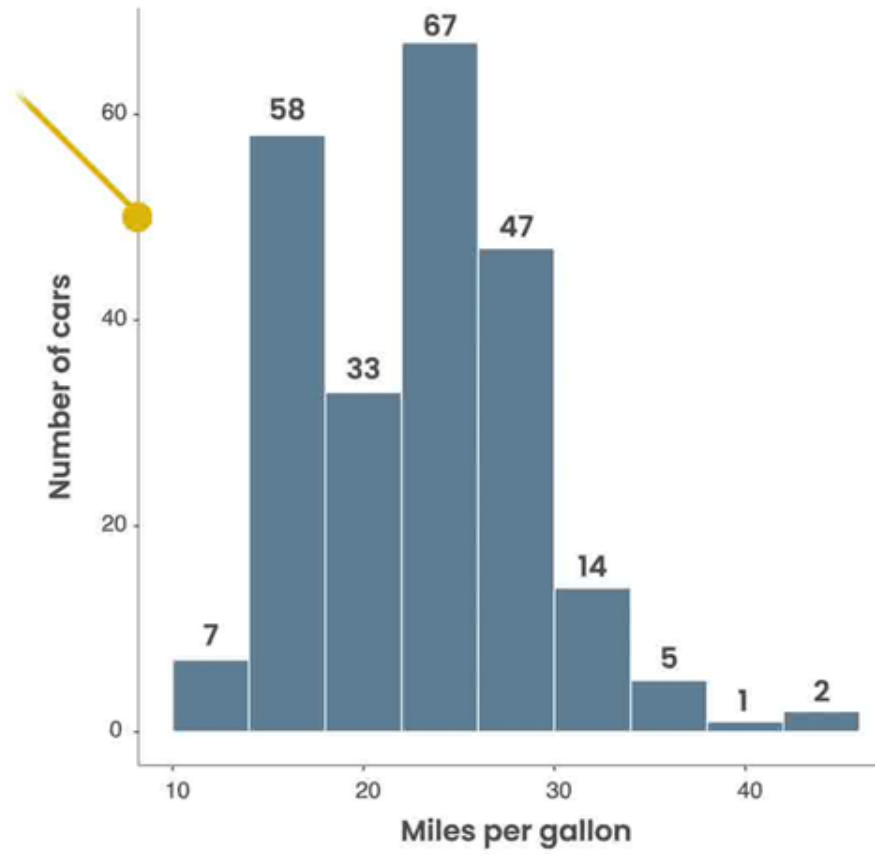


REDUNDANT DATA-INK

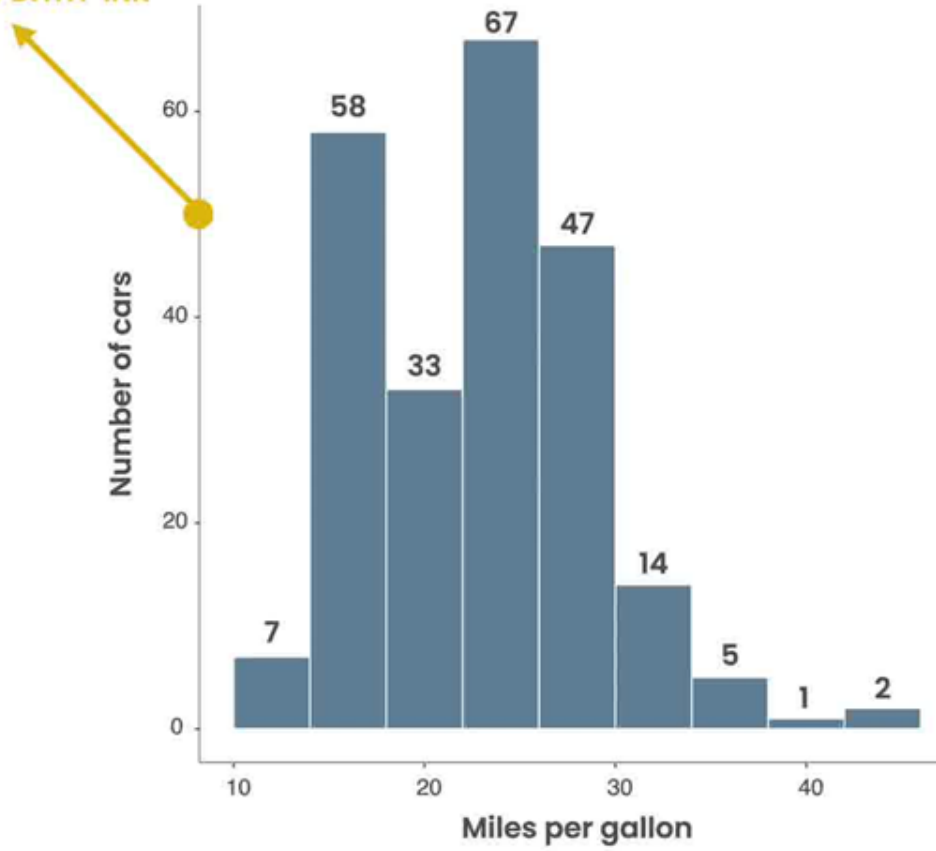




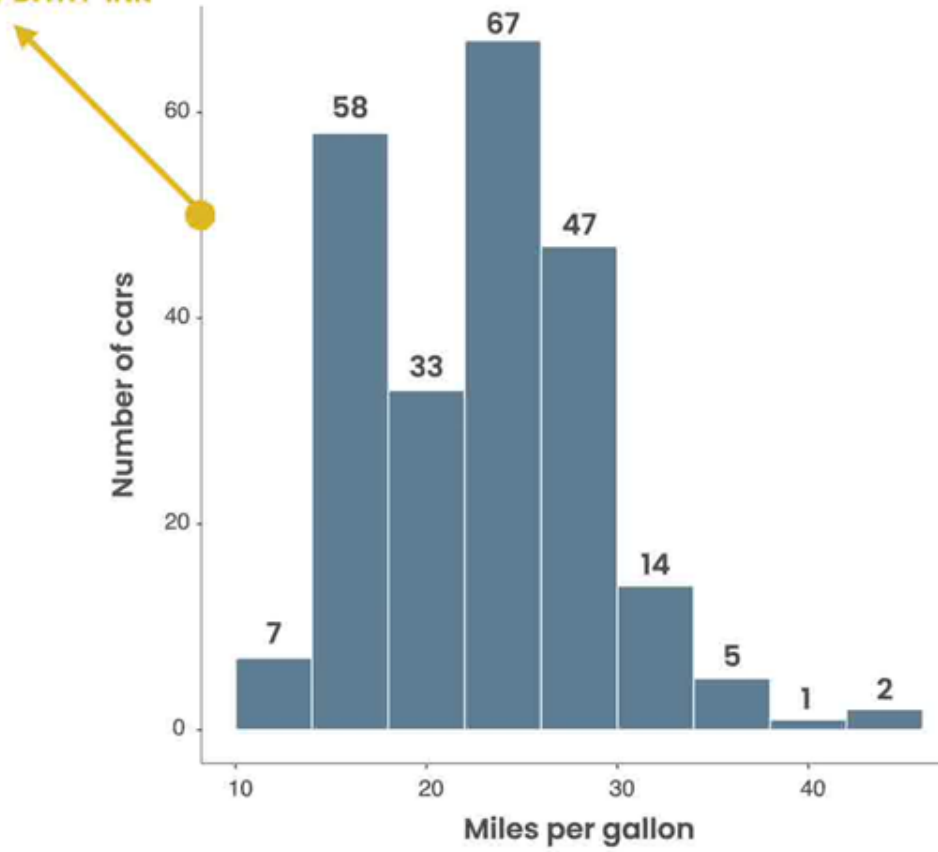


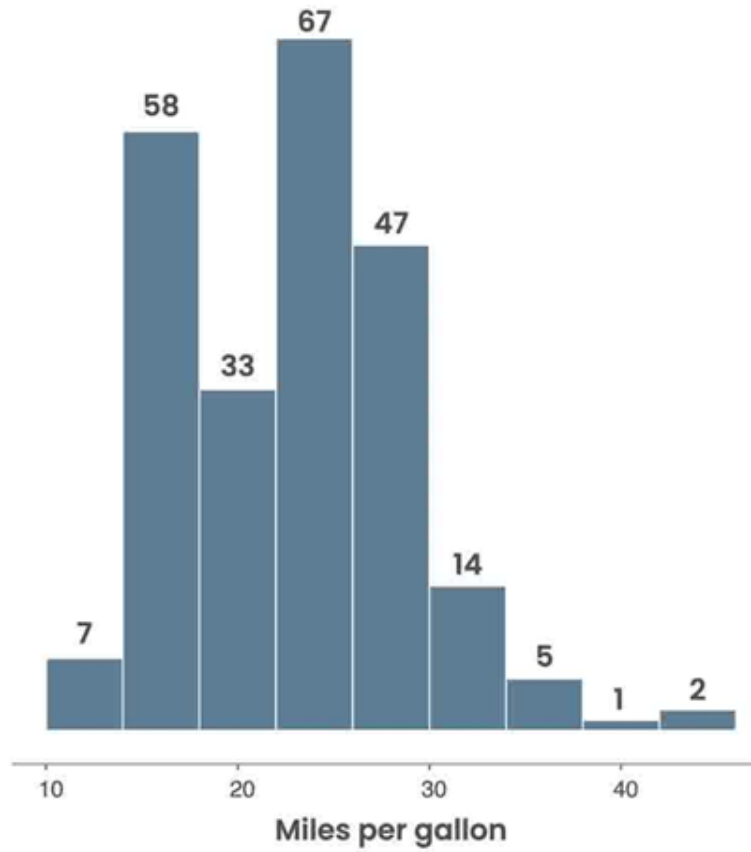


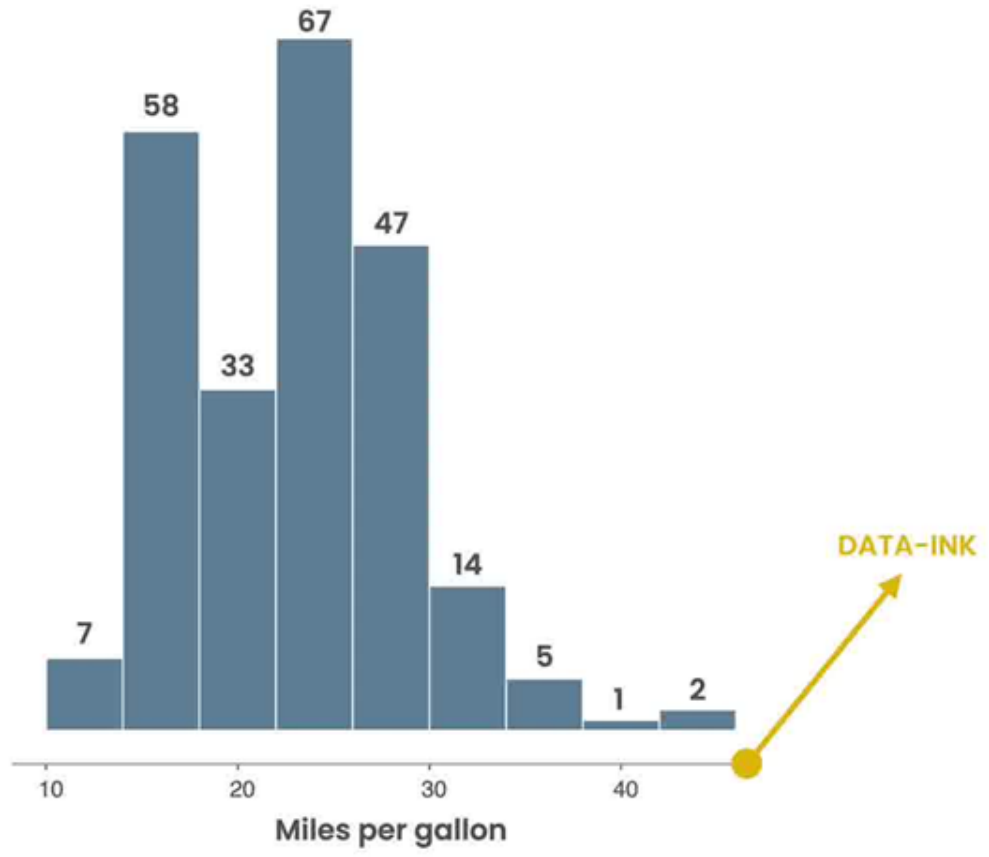
REDUNDANT DATA-INK

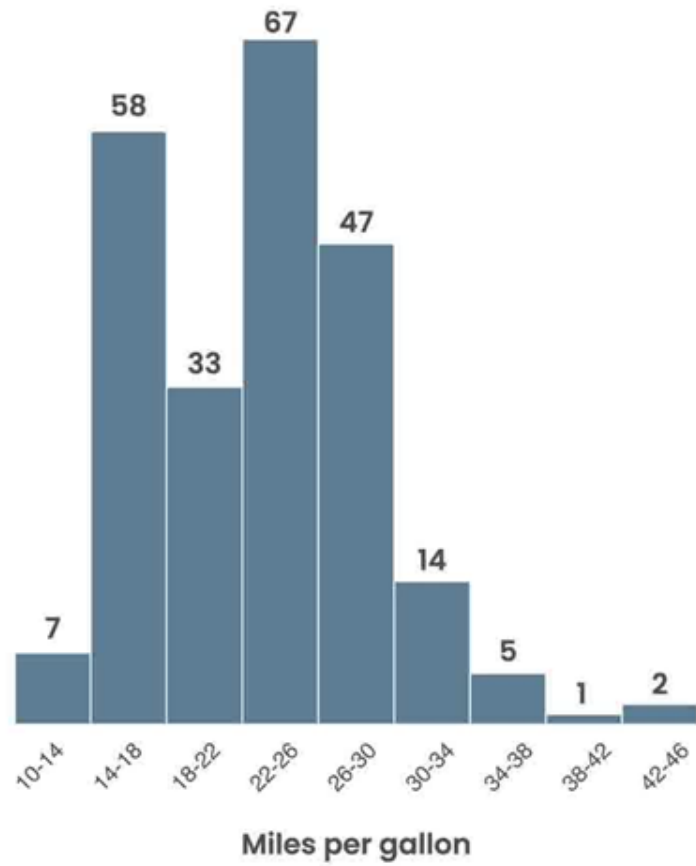


REDUNDANT DATA-INK



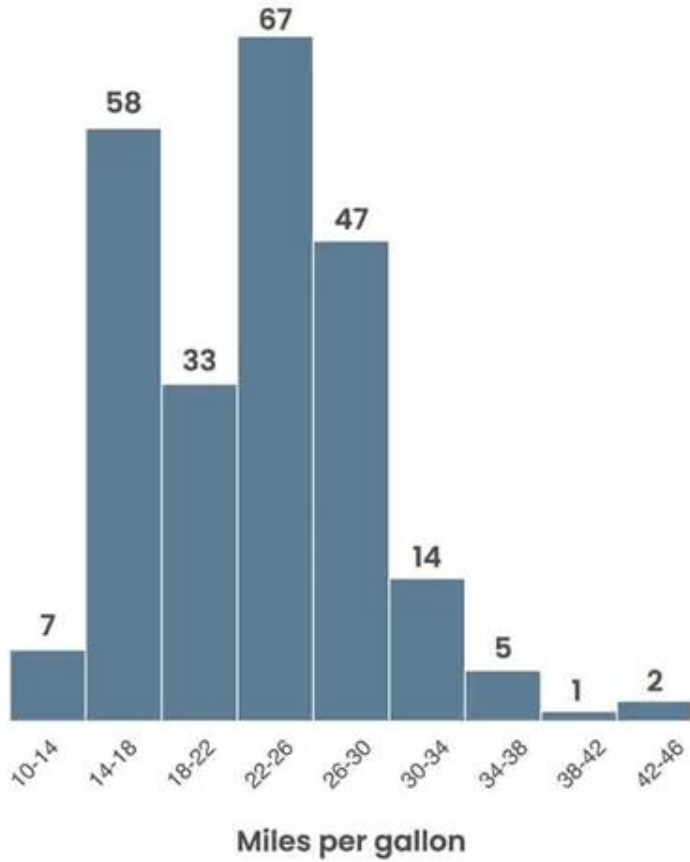




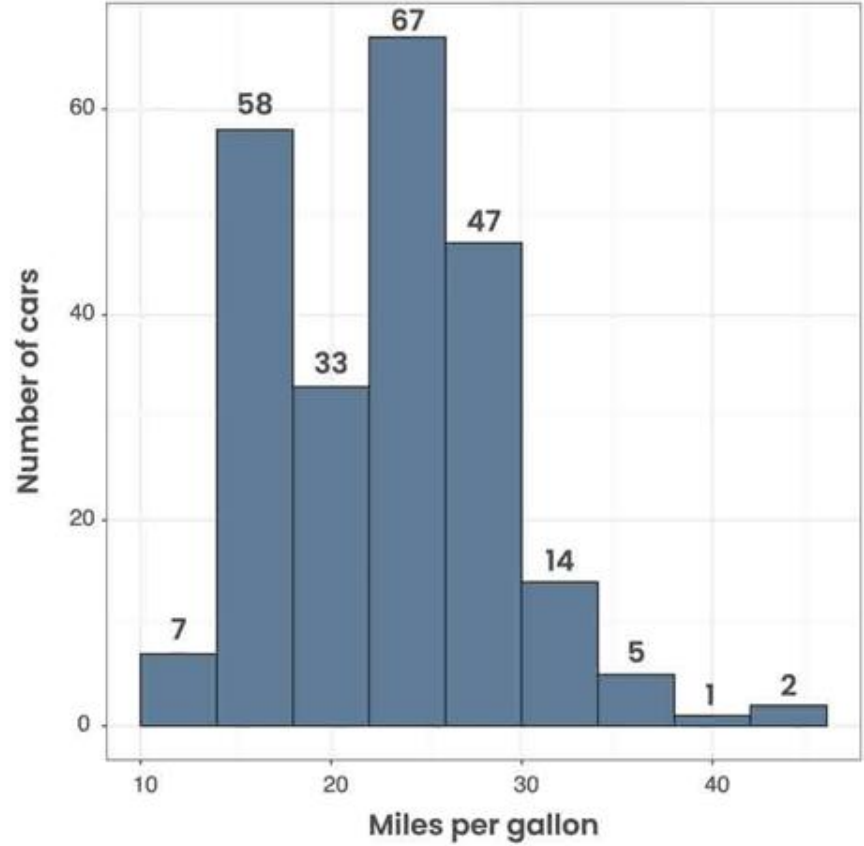


HIGHER DATA-INK RATIO

Number of cars by fuel consumption

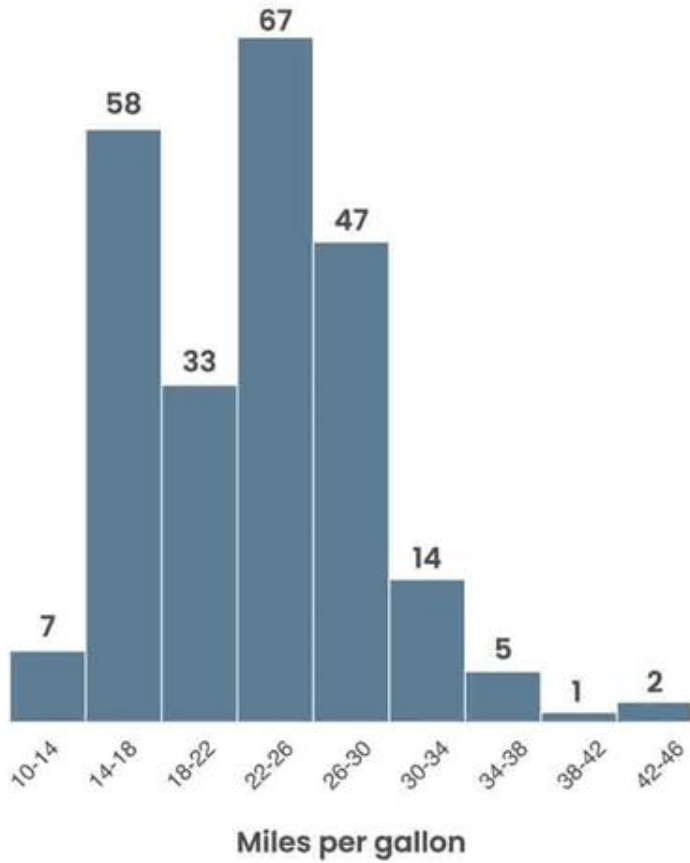


LOWER DATA-INK RATIO

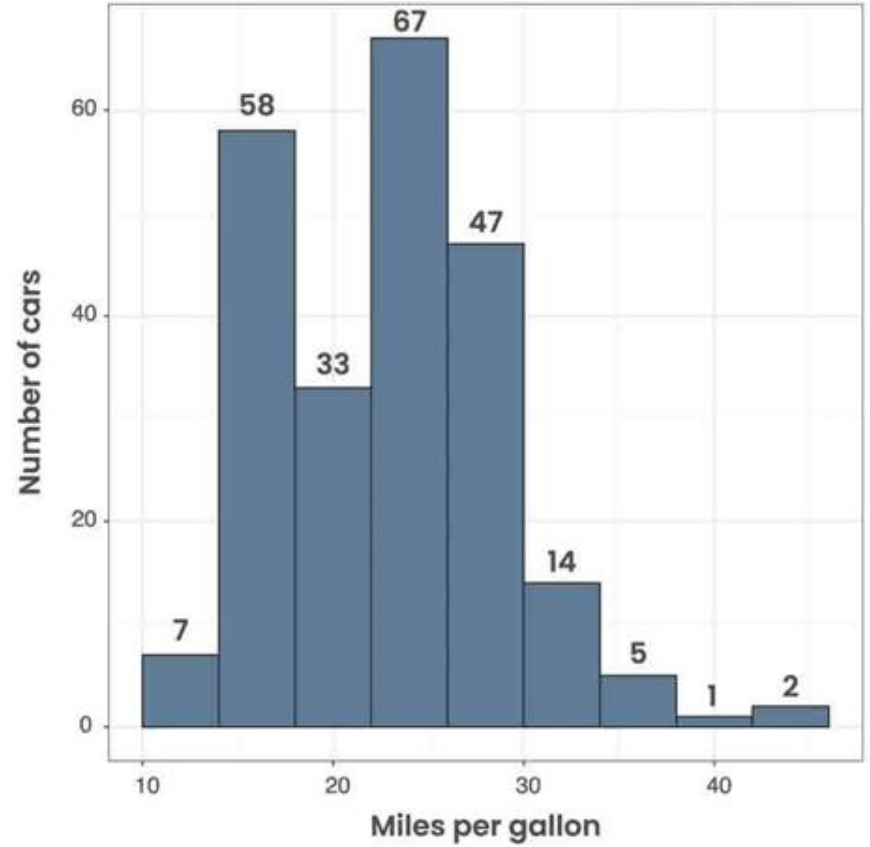


HIGHER DATA-INK RATIO

Number of cars by fuel consumption



LOWER DATA-INK RATIO



Data-ink ratio > **Redesign of plots**

GOAL

Maximize the data-ink ratio (within reason)

TWO ERASING PRINCIPLES

Erase non-data-ink, within reason

Erase redundant data-ink, within reason

Data-ink ratio > Redesign of plots

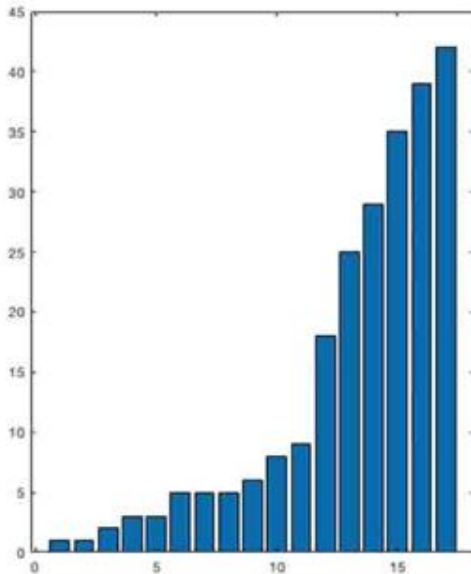
GOAL

Maximize the data-ink ratio (within reason)

TWO ERASING PRINCIPLES

Erase non-data-ink, within reason

Erase redundant data-ink, within reason



SOURCE: LEONARD P. AYRES (1919)
 VIA THE VISUAL DISPLAY OF QUANTITATIVE INFORMATION.
 E. TUFTS

Data-ink ratio > Redesign of plots

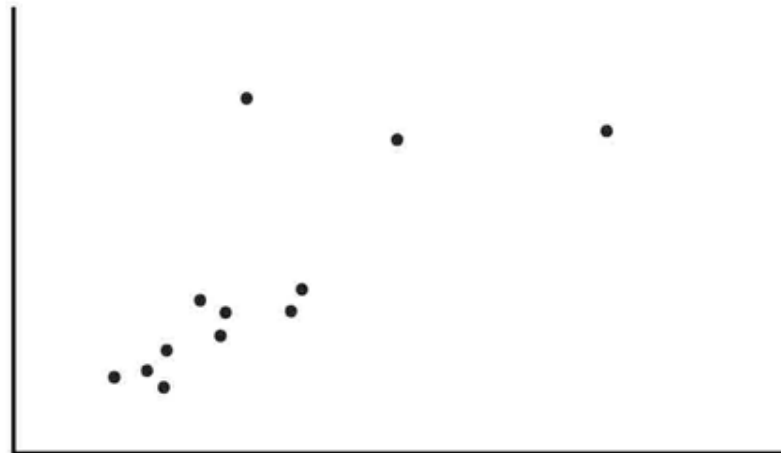
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Data-ink ratio > Redesign of plots

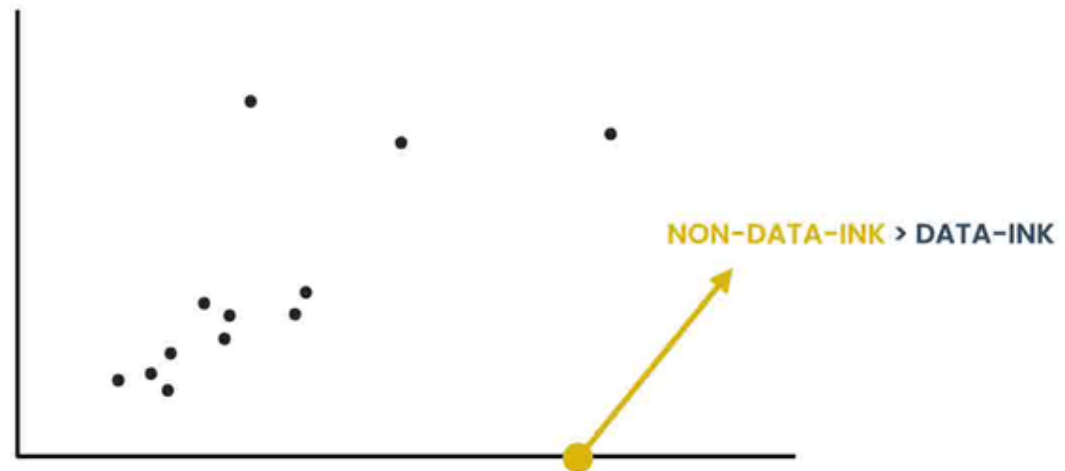
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Data-ink ratio > Redesign of plots

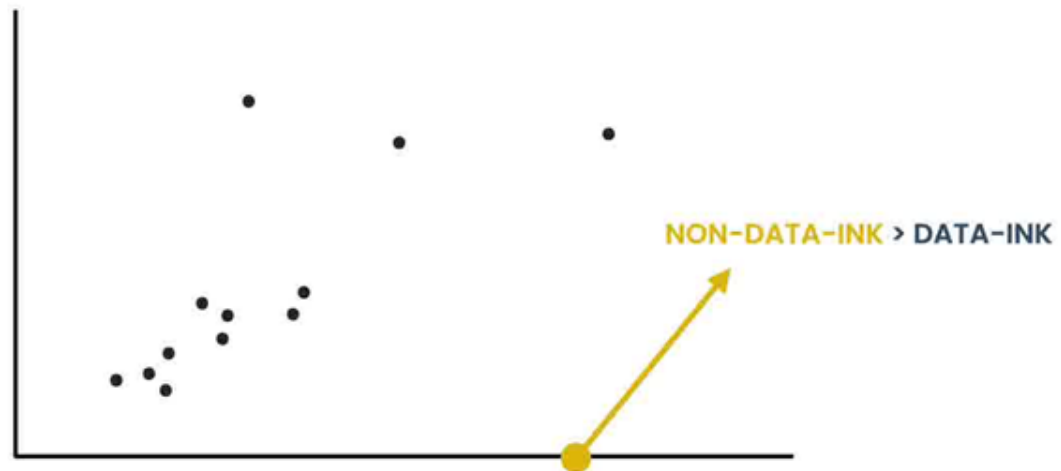
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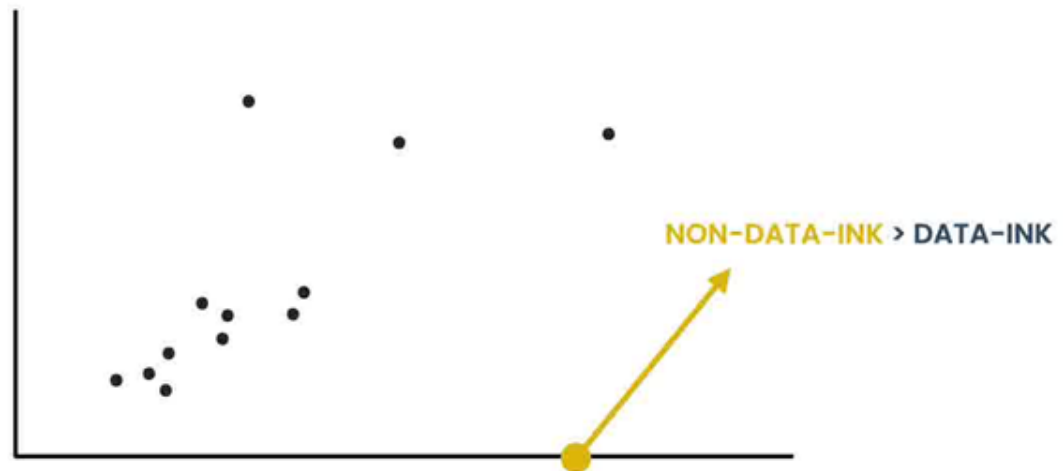
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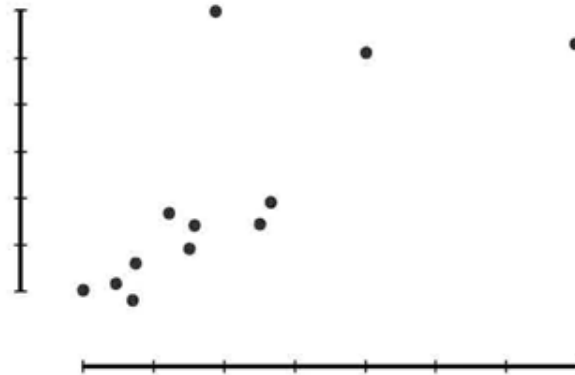
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