

WRITING THE ARTICLE

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Research Article – Basic Format

- Abstract: mini version of article
- Introduction
 - Background Information
 - Problem statement or hypothesis
 - Significance
- Materials and Methods
 - How was the research carried out?
 - Sufficient detail is provided so study can be repeated
 - All experiments and observational studies are explained
 - Statistical, mathematical or computational methods are explained and referenced if appropriate
 - Code and/or data are made available (e.g., on Github)
 - Description of *new* methods do not go here (these are Results)

Research Article – Basic Format

- Results

- An unbiased presentation of the results obtained from carrying out the methods
- Graphs and tables should be used to present results
- If the paper describes a new method, tool, or program, that would be described here

- Discussion

- Results are put into the context of the discipline (with respect to other published research)
 - Compare and contrast your results to other research
- The significance of the results are discussed (with respect to published research)
- Limitations of the study are discussed (with respect to published research)
- Possible extensions and future work are discussed (with respect to published research)

Outline of Hypothetical Example – GD sort vs. quick sort

- Introduction

- Background Information

- Sorting elements alphabetically or by value is a common problem in computer science
 - Common sorting algorithms include....

- Problem statement, objective, or hypothesis

- Slow sorting algorithms can slow down programs and limit analyses that depend on sorting, particularly for large datasets
 - Objective: develop a new, more efficient sorting method

- Significance

- The development of a faster sorting algorithm would allow for more rapid sorting of large datasets that currently cannot be sorted in a reasonable time

Outline of Hypothetical Example – GD sort vs. quick sort

- **Materials and Methods**

- All sorting algorithms are implemented in C++, compiled using Microsoft Visual Studio 2022, and tested on machines running Windows 11 with a 8th Generation Intel® Core™ i3-8145U Processor.
- For quicksort, implementation from the C Standard Implementation Library (cstdlib) was used
- Sorting performed on
 - 1 billion random integers between +/- 1 billion, and repeated 1000 times.
 - 1 billion random character strings between 2 – 20 characters
- Running times are compared using the two-sample t-test.

Outline of Hypothetical Example – GD sort vs. quick sort

- Results

- Description of GD-sort, with Figure showing pseudocode
- Theoretical running time of GD-sort is derived
- Bar graphs comparing GD-sort with quicksort, where height of bar is average running time (in ms), with standard deviation:
 - On 1 billion randomly generated numbers between -1 million and + 1 million
 - On 1 billion randomly generated character strings of sizes 2-20.
- In both cases, GD-sort is significantly faster than quicksort (expected)

Outline of Hypothetical Example – GD sort vs. quick sort

- Discussion

- Summary:

- Theoretical running time shows GD-sort has faster average running time than quicksort
 - Experimental results confirm these findings in the datasets we looked at

- Related work

- Multiple references indicating quicksort is 'best' or most popular
 - Quicksort has previously been improved with multiple pivots

- Limitations / future work – It remains to be seen how

- GD-sort performs on nearly sorted datasets (reference showing that performance of sorting methods depend on how sorted the data is to begin with)
 - Changing the selection of the pivot used in GD-sort might effect the running time, as was done for quicksort (reference)

The FB study

- Introduction
 - Background Information
 - No evidence of social contagion without direct interactions
 - Even then, studies are observational, not experimental
 - Research suggests that exposure to happiness can be depressing
 - FB must decide what content to show or omit from a person's newsfeed
 - Problem statement, objective, or hypothesis
 - Does exposure to positive/negative posts change the emotional content of a user's posts?
 - Significance
 - Would be first to show that emotional states can be transferred to others in the absence of direct interaction

The FB study

- **Materials and Methods**

- Posts are deemed positive or negative based on Linguistic Inquiry and Word Count software
- Experiment:
 - Control – a proportion of posts eliminated at random
 - Treatment – a proportion of positive or negative posts were eliminated at random

- **Results**

- Figure with y-axis for the % of positive words, and x-axis the treatment (or control), which shows that
 - When positive posts are reduced, individuals post fewer positive words
 - When negative posts are reduced, Individuals post more negative words
- Withdrawal effect – users viewing fewer emotional posts were less expressive

The FB study

- Discussion

- Results contrast with other studies suggesting that viewing positive posts has an adverse effect (references for these studies)
- First experimental evidence of emotional contagion
- Related work
 - Description of linguistic inquiry and word count tool and studies supporting its accuracy
 - Additional FB studies -- reference to article showing FB content effects voter turnout
- Limitations
 - Emotional content of FB posts do not necessarily reflect emotional status of the poster
 - Effect sizes (changes) are small, but
 - *many* variables effect a person's mood (include reference)
 - small effect sizes are not negligible when social networks are so large (reference to related work)