Choosing a Term Paper Topic

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Choose a focus for your term paper and list at least two references that you may consult as you write your term paper. Describe what information you plan to use from each reference, and what perspective you plan to provide yourself. The rest of this document explains how to go about choosing a good topic. It concludes with a list of many suggested topics.

1   Focus of the paper

The purpose of the term paper assignment is for you to learn and synthesize a topic of your choosing and present it in a way that is accessible to your classmates. Your paper should have value for your readers beyond the value they would gain by simply reading your sources. In other words, you should not simply parrot your sources; rather you should use them to develop and present your own perspective.

Example 1.1. *You might choose as your focus a theorem that you want to understand. You could gain an understanding of the theorem by reading two or more sources that present different proofs of the theorem as well as different examples/applications. Then, from among those sources, choose the proofs and examples that you think are clearest and most helpful. In your own words, explain those proofs and examples to your audience (your classmates) so that they too can understand the theorem. (Be sure to cite the source of each proof and example you present, even though you use your own words.)*

Example 1.2. *If your topic is networks, you might have one theoretical source about networks in general, and another source about the internet. In your paper, you could assess the internet by using the tools provided in your theoretical source.*

Counterexample 1.3. *If your topic is networks, you may be tempted to write a paper that presents everything you know about networks: a few different theorems that are unrelated to each other, several different applications that are unrelated to each other, etc.*

The problem with this paper: Such a paper is very difficult to write well because the different pieces of the paper are disconnected so there's no logical structure. This paper would also be difficult for readers to read because readers would get lost in the different topics: the paper couldn't go anywhere. It's better to choose a specific focus for the paper.

Counterexample 1.4. *If you decide to focus the paper on a particular theorem, you may be tempted to read about the theorem in one book and then summarize in your paper the presentation that appears in that book.*

The problem with this paper: This paper is a poor choice because there's no reason for readers to read your paper: they could simply read your source instead. If you simply summarize the book, you have not added your own perspective. Furthermore, even if you acknowledge the source and use your own words, copying the structure and approach of the source is plagiarism (unless you explicitly acknowledge that you are following the source closely).

To summarize, choose a topic that interests you and use two or more main sources to develop your own perspective on the topic. Use your perspective to focus the paper, and present the content in a way that will be accessible to your classmates.

2 Possible Topics

Here is a list of possible topics, many of which have been used successfully in the past. This is, of course, non exhaustive; you are welcome to choose a topic on this list.

An introduction to the discrete cosine transform and its applications
Applications of discrete mathematics in game theory
A survey of Ramsey theory
Bayesian networks
Beating the house at blackjack
Big integer math
The Boolean Satisfiability Problem
Boosting
Breaking the Enigma
The Burrows-Wheeler transform and data compression
Card shuffling, magic tricks, and randomness
Catalan numbers: an introduction
Combinatorial game theory
Domino tilings of the Aztec diamond
Economic game theory and auctions
Electrical networks and random spanning trees
Electronic voting
Elliptic curves and cryptography
Evolution of the four color theorem
Fractal image compression using IFS fractals
Fractional graph coloring
Game theory and the U.S. Federal Government
Graph theory and some of its applications
Introduction to game theory and various applications
Introduction to graphical models
Jpeg compression
Kirchhoff's matrix tree theorem

Lossless data compression
The stable marriage problem
Matching theory
Mathematics and algorithms in Sudoku puzzles
Mathematics of solving a Rubik's cube blindfolded
Modern cryptography
Morse code vs Huffman coding
Nearest Neighbor Random Walks on Z and Z^2
Neural networks as digital systems
Penrose tiles and colorability
Probabilistic strategies for playing blackjack
Probability and its importance in gambling
Properties of Latin squares
Quadratic sieve factoring algorithm
Rank aggregation
Shortest path problem
Solving a Rubik's cube
Support vector machines
Survey of graphs and coloring
Survey of the Jacobsthal numbers
The directed, undirected, and mixed Chinese postman problem
The game of Nim and some variations
The mathematics of Set
The mathematics of Sudoku
Variations in the gamblers ruin problem
Variations of the birthday problem and applications to cryptography