







Fig. 2. The logos of Google Inc., Google Play, and Firefox.

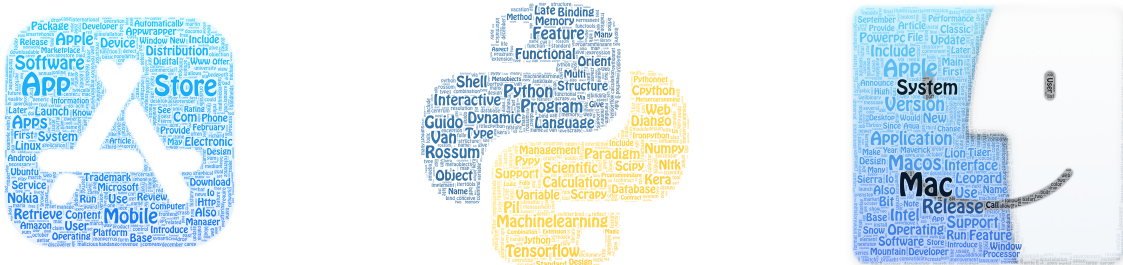


Fig. 3. The logos of Apple App Store, Python, and Finder.



Fig. 4. The silhouettes of a girl, Captain America, and Iron Man.

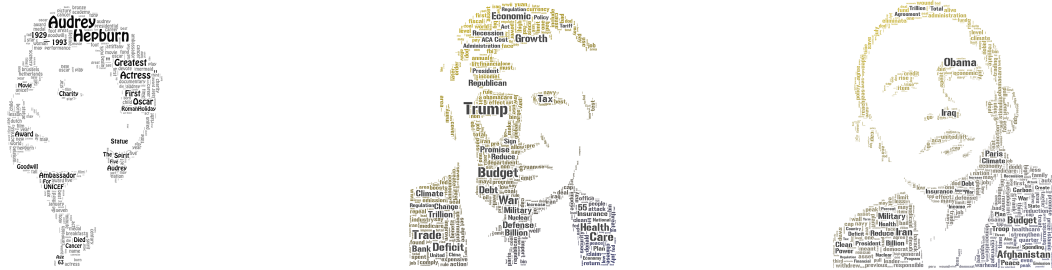


Fig. 5. The silhouettes of Audrey Hepburn, Donald Trump, and Barack Obama.



Fig. 6. The silhouette of Donald Trump, the logos of Linkin Park, and Tesla.

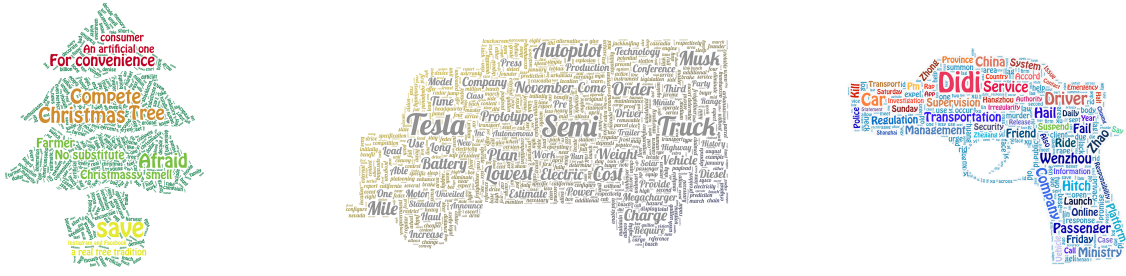


Fig. 7. The shapes of a Christmas tree, a truck, and a gun.



Fig. 8. The shapes of some animals: squirrel, rabbit, panda, and pigeon.

### 3 CASES FOR TEMPORAL SHAPE WORDLE

The temporal wordle of human life cycle is partially shown in the paper due to limited space. Here, we show the complete version of this case. We also create another example of temporal shape wordle using another data source in the Morphable Word Clouds paper [2]. This case is about the life cycle of a frog.

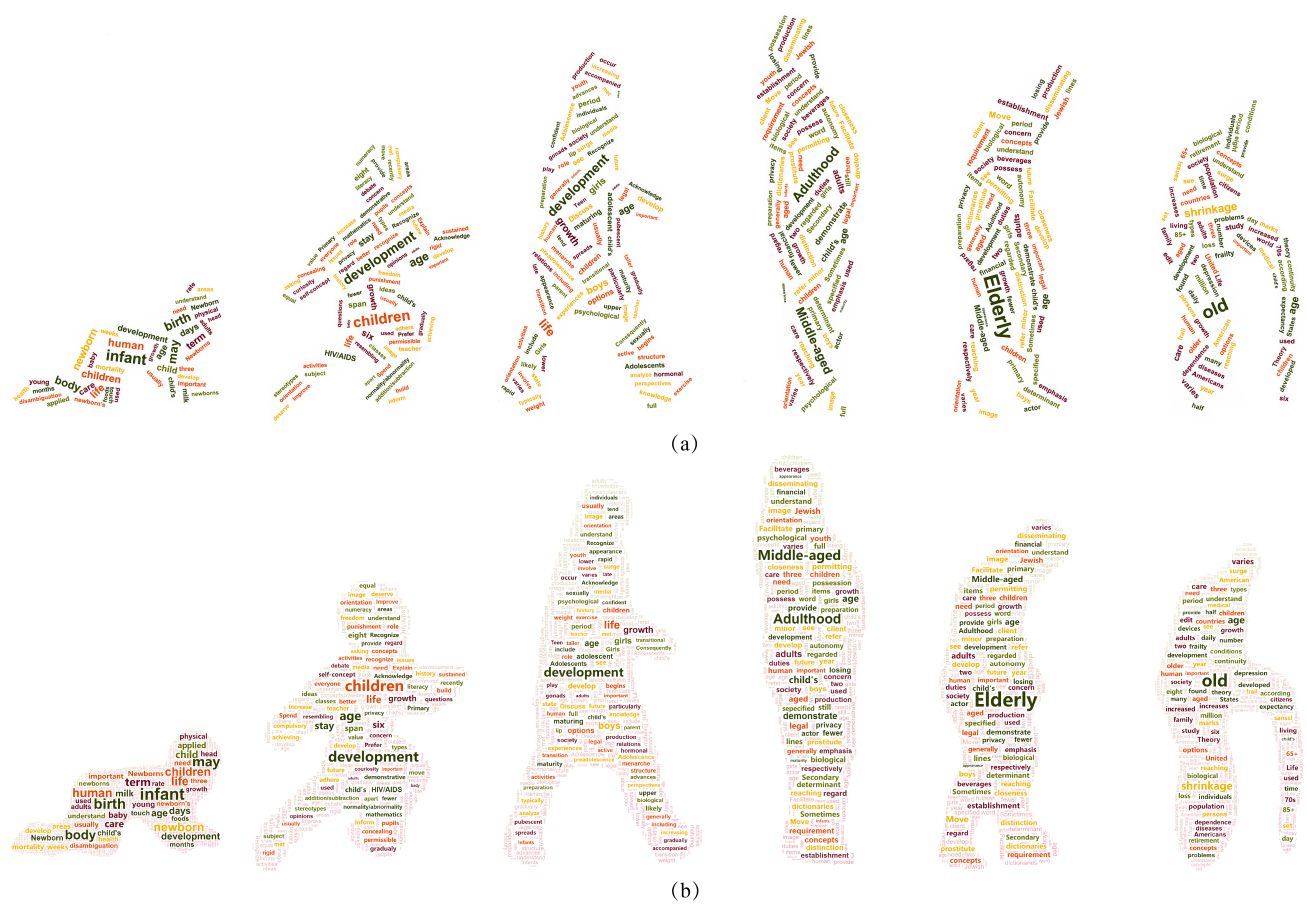


Fig. 9. A comparison between temporal shape wordles generated by (a) Morphable word clouds and by (b) our algorithm. This picture illustrates the stage of human life cycle.

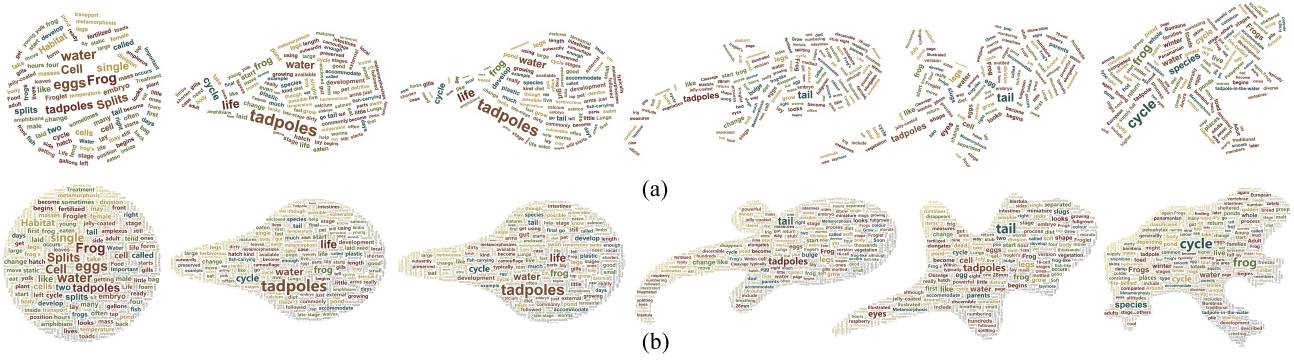


Fig. 10. A comparison between temporal shape wordles generated by (a) Morphable word clouds and by (b) our algorithm. This picture illustrates the stage of frog life cycle.

#### 4 COMPARISON WITH TAGXEDO

Tagxedo [3] is an online tool, which appears to be able to generate shaped word clouds. In this section, we show two examples of Tagxedo results to compare our ShapeWordle with Tagxedo. The generated Tagxedo layouts were created by using the Christmas tree shape and the Flower shape in the paper, and by filling the shapes with the corresponding text. We set the number of words in each layout as 60, following what we presented in main paper. Then, we found that Tagxedo, by default, omits some of the keywords due to the limited space. For example, in Fig. 11(a) below, the word “Day” is missing. And Fig. 12(a) is even worse, where “Asteraceae”, “families”, and “includes” are all omitted. While Tagxedo offers a slider for users to adjust the number of words in the layout. But since it simply follows a standard circular spiral to layout words, large amount of areas in the shapes are not filled; see the bottom part of the trunk in Christmas tree (Fig. 11(b)) and the leftmost and rightmost parts in Fig. 12(b). Hence, the layouts generated by Tagxedo are not really shape-aware (as compared to WordArt and our method); thus, we decided to compare with WordArt but not with Tagxedo in the quantitative evaluation presented in main paper.

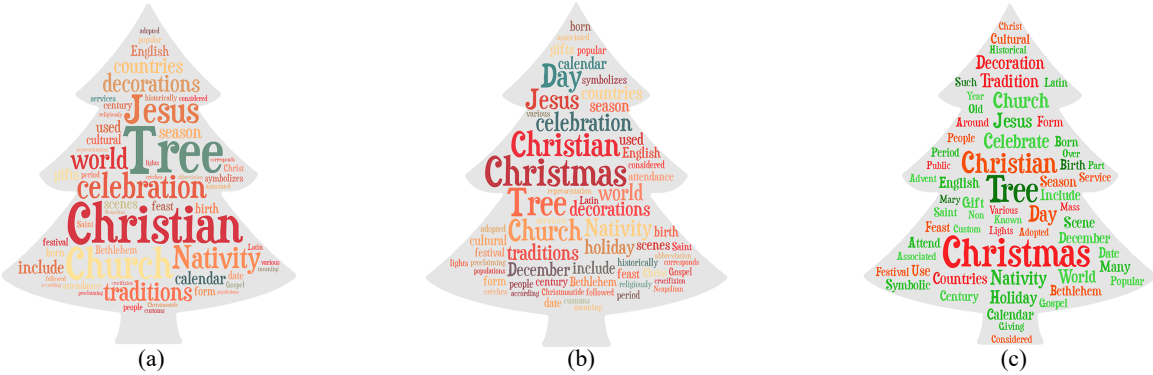


Fig. 11. (a) The default result of Tagxedo. Note that 4 out of the 60 words are missing, for example, “Day”; (b) the adjusted result of Tagxedo with all the 60 keywords but the bottom part of the tree is clearly missed in the filling; and (c) the result of our ShapeWordle.

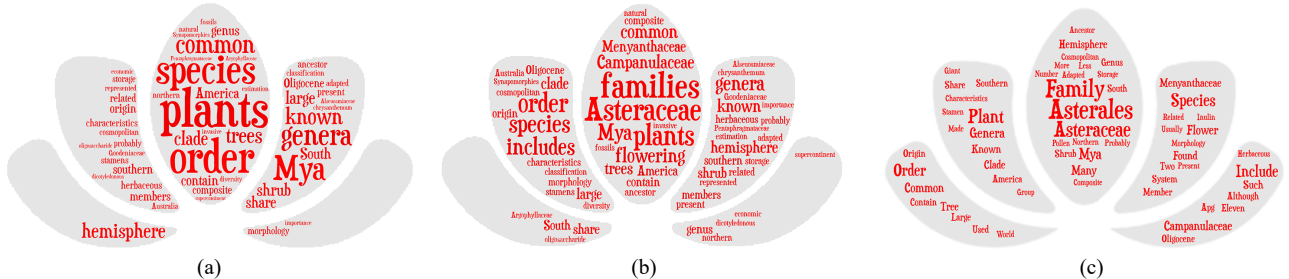


Fig. 12. (a) The default result of Tagxedo. Note that 7 out of the 60 words are missing, including even the very big word “Asteraceae”; (b) the adjusted result of Tagxedo with all the 60 keywords but the leftmost and rightmost parts in the shape are clearly not filled, demonstrating the incapability of Tagxedo to generate shape-aware results; and (c) the result of our ShapeWordle.

#### 5 ADDITIONAL INFORMATION OF QUANTITATIVE COMPARISON

In this section, we provide the layouts used in the quantitative study and the complete results of the three metrics: *Layout Coverage* (LC), *Layout Uniformity* (LU), and *Shape Similarity* (SS).

Each row presents one shape in our dataset. In each of the figures shown on subsequent pages, the first column shows the results produced by our ShapeWordle, and the second column shows the result produced by WordArt. Each of these layouts contains 60 words. We used these two

layouts for the calculations and comparison of the three metrics and the results are shown under the corresponding figures. The third column shows the final result produced by Shape Wordle, after filling the less important words, whereas the fourth column shows the corresponding final result produced by WordArt.



### ShapeWordle (60 words)



LC-0.2, LU-87, SS-1675

### WordArt (60 words)



LC-0.18, LU-99, SS-2026

### ShapeWordle (final result)



**WordArt (final result)**



Community

Angola's

Mexico African United

Following Cup Force Tea

Coup Party Civil

Namibia Both Rebel

Country Western

United

Africa

States

Gulf

Military

Embassy

Language

Dynastic

Pro

Improved

Troop Force

South

China Ten

Mph

Government

Republic

Foreign

Angolan

Independence

Support

War Nations

Relations

Violence

zimbabwe

Presidents During

Visit Rule Band

Established

Portugal Thawed

Policy

Government

Republic

Foreign

Angolan

Independence

Support

War Nations

Relations

Violence

zimbabwe

LC-0.21, LU-80, SS-1888

A word cloud of terms related to the 1990s. The largest word is 'Relations'. Other prominent words include 'Country', 'Government', 'Military', 'War', 'Independence', 'Policy', 'Civil', 'South', 'Africa', 'United', 'Foreign', 'Support', 'Between', 'Republic', 'Improved', 'Guitars', 'States', 'Economic', 'Ruled', 'Zimbabwe', 'President', 'Empire', 'During', 'Pro', 'Embassy', 'Nigeria', 'Mexico', 'Communism', 'African', 'Troops', 'The', 'Visit', 'Yemen', 'Paraguay', 'Tunisia', 'Bababard', 'Beard', 'Through', 'Guns', 'Unita', 'Raid', and 'Angola's'.

LC-0.2, LU-84, SS-2109

[illegible][illegible]

LC-0.17, LU-119, SS-1017

A word cloud featuring various chemistry-related terms. The word 'Argon' is the largest and most prominent. Other words include 'Gas', 'Noble', 'Element', 'Atmosphere', 'Compound', 'Mixture', 'Inert', 'Stable', 'Non-reactive', 'Rare', 'Unreactive', 'Inert gas', 'Noble gas', 'Monatomic', 'Diatomic', 'Triatomic', 'Polyatomic', 'Molecular', 'Atomic', 'Ionic', 'Covalent', 'Metallic', 'Metalloid', 'Non-metal', 'Metal', 'Alloy', 'Compound', 'Mixture', 'Solution', 'Suspension', 'Colloid', 'Emulsion', 'Foam', 'Gel', 'Crystal', 'Solid', 'Liquid', 'Gas', 'Plasma', 'Fire', 'Explosion', 'Reaction', 'Chemical', 'Physical', 'Biological', 'Environmental', 'Industrial', 'Medical', 'Agricultural', 'Domestic', 'Commercial', 'Scientific', 'Educational', 'Recreational', 'Artistic', 'Culinary', 'Industrial', 'Medical', 'Agricultural', 'Domestic', 'Commercial', 'Scientific', 'Educational', 'Recreational', 'Artistic', 'Culinary'. The words are arranged in a circular pattern around the central 'Argon' word.

LC-0.17, LU-152, SS-1437

[illegible]

Wheelchair  
 Design Walker  
 Aid Person  
 Computer  
 Language  
 Enable Active  
 Specific coaxed  
 Impairment  
 Include User  
 Search Methods  
 Information Need  
 Develop  
 User  
 Access Attached  
 Disabled  
 Capable  
 Manage Part  
 Use Part  
 Technology  
 Adaptive  
 Sport  
 Device  
 Increase New  
 People  
 General Term  
 Prosthetic  
 Example Proprietary Walking  
 System  
 Assist  
 Mobility Speech  
 Commun

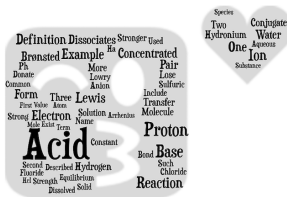
LC-0.23, LU-76, SS-964

Waking  
Prosthetic  
Access  
need  
Specific  
Example  
Increase  
Perform  
Adaptive  
Example  
Increase  
System  
Computer  
Wheelchair  
Message  
Search  
New  
Buttons  
Replicated  
Speech  
Lip  
Amplification  
Personal  
Walker  
People  
Impairment  
Minitime  
Capable  
Sound  
Device  
Attached  
Disabled  
Gender  
Radar  
Device  
Sport  
More  
Use  
Sports  
Community  
Assist  
Mobility  
Use  
Active  
Technology  
Information

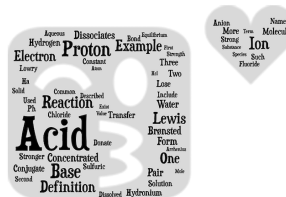
LC-0.12, LU-178, SS-1810

[illegible]

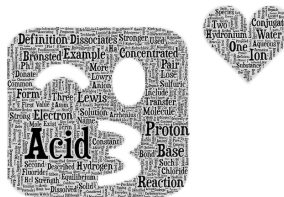
### ShapeWordle (60 words)



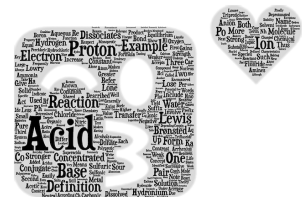
**WordArt (60 words)**



### ShapeWordle (final result)



**WordArt (final result)**



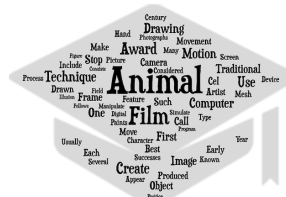
LC-0.21, LU-74, SS-805

LC-0.2, LU-79, SS-864



LC-0.23, LU-73, SS-973

LC-0.11, LU-161, SS-2678



LC-0.18, LU-93, SS-8295

LC-0.2, LU-89, SS-7680



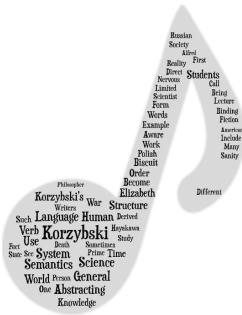
LC-0.17, LU-135, SS-4175

LC-0.16, LU-168, SS-3935



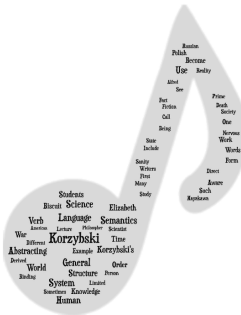


ShapeWordle (60 words)



LC-0.21, LU-73, SS-789

WordArt (60 words)

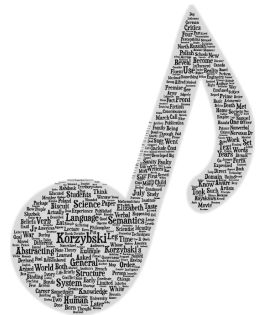


LC-0.14, LU-96, SS-1159

ShapeWordle (final result)



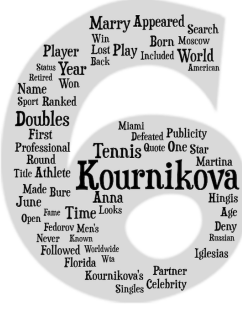
WordArt (final result)



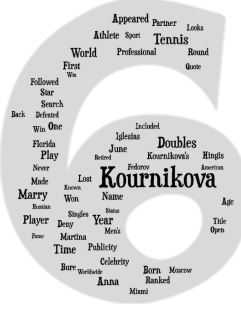
LC-0.21, LU-91, SS-1027



LC-0.2, LU-90, SS-1238



LC-0.21, LU-83, SS-1032



LC-0.12, LU-180, SS-2319



LC-0.18, LU-53, SS-3994



LC-0.2, LU-49, SS-3996

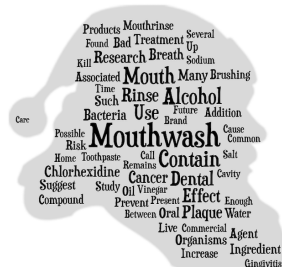


[illegible]

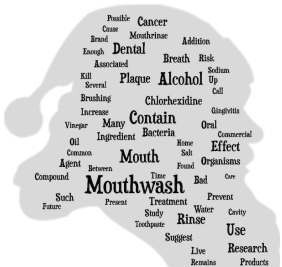
LC-0.19, LU-90, SS-1091

[illegible]

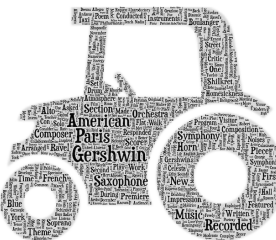
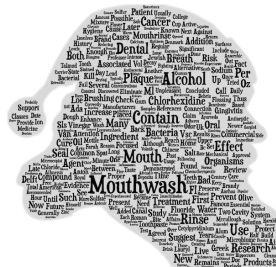
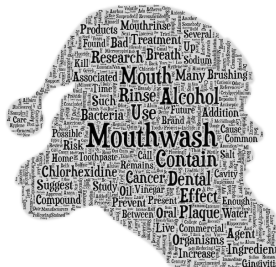
LC-0.18, LU-83, SS-1159

[illegible][illegible]

LC-0.16, LU-74, SS-1170



LC-0.16, LU-85, SS-1515



ShapeWordle (60 words)



WordArt (60 words)



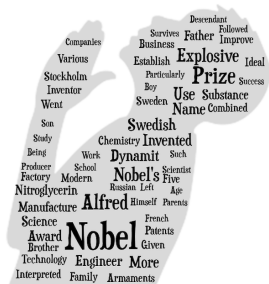
ShapeWordle (final result)



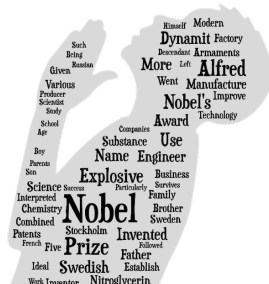
WordArt (final result)



LC-0.2, LU-54, SS-4118



LC-0.14, LU-78, SS-5835



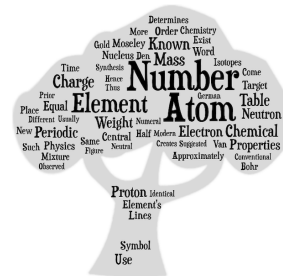
LC-0.22, LU-51, SS-947



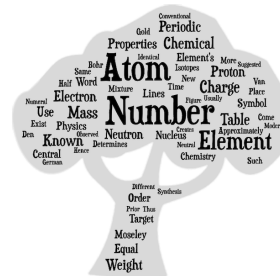
LC-0.22, LU-84, SS-1626



LC-0.21, LU-93, SS-728



LC-0.23, LU-80, SS-928



LC-0.24, LU-62, SS-1680



LC-0.23, LU-67, SS-1523



ShapeWordle (60 words)



LC-0.13, LU-110, SS-3304

WordArt (60 words)



LC-0.12, LU-134, SS-4776

ShapeWordle (final result)



WordArt (final result)



LC-0.25, LU-43, SS-817



LC-0.25, LU-49, SS-702



LC-0.23, LU-79, SS-1563



LC-0.23, LU-73, SS-1511



LC-0.22, LU-53, SS-721



LC-0.19, LU-78, SS-1015

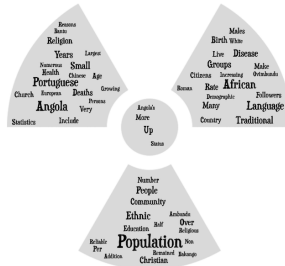


ShapeWordle (60 words)



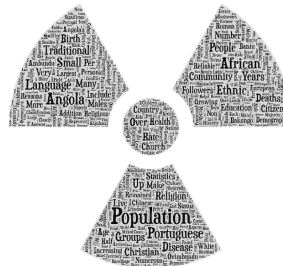
LC-0.2, LU-56, SS-811

WordArt (60 words)

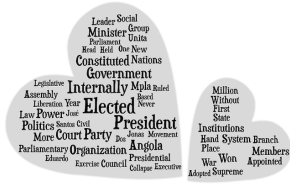
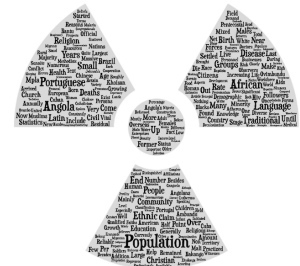


LC-0.15, LU-101, SS-1043

ShapeWordle (final result)



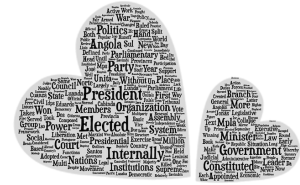
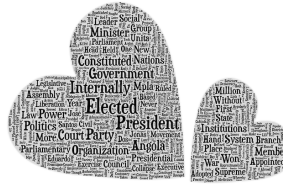
WordArt (final result)



LC-0.22, LU-75, SS-927



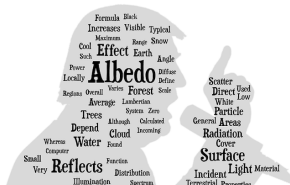
LC-0.21, LU-87, SS-1117



LC-0.16, LU-83, SS-1398



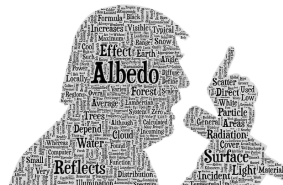
LC-0.15, LU-99, SS-1458



LC-0.19, LU-78, SS-1470



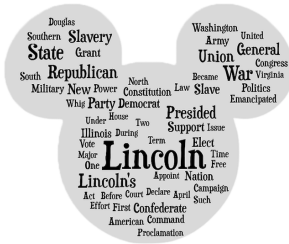
LC-0.24, LU-56, SS-1416





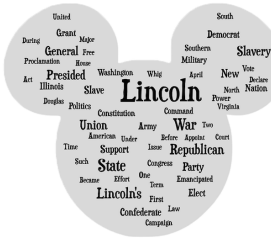


ShapeWordle (60 words)



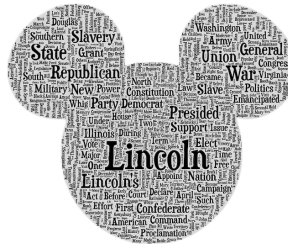
LC-0.19, LU-105, SS-1547

WordArt (60 words)

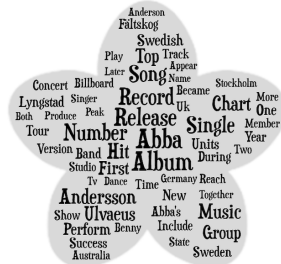
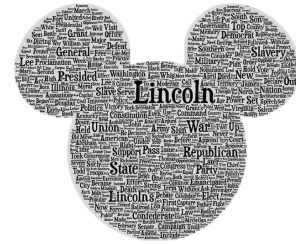


LC-0.14, LU-158, SS-1740

ShapeWordle (final result)



WordArt (final result)



LC-0.25, LU-56, SS-547



LC-0.23, LU-80, SS-994



LC-0.17, LU-87, SS-1465



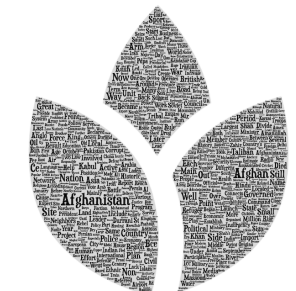
LC-0.1, LU-151, SS-1538



LC-0.16, LU-115, SS-1717



LC-0.08, LU-196, SS-2484

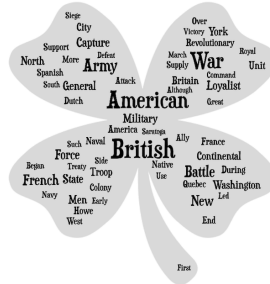


ShapeWordle (60 words)



LC-0.2, LU-81, SS-1657

WordArt (60 words)



LC-0.16, LU-112, SS-2128

ShapeWordle (final result)



WordArt (final result)



LC-0.19, LU-60, SS-1561



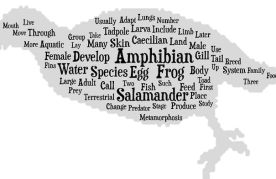
LC-0.15, LU-75, SS-2319



LC-0.23, LU-49, SS-1317



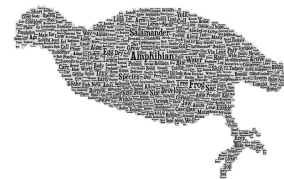
LC-0.11, LU-123, SS-2116



LC-0.23, LU-45, SS-9066



LC-0.09, LU-129, SS-10051





ShapeWordle (60 words)



LC-0.18, LU-152, SS-1448

WordArt (60 words)

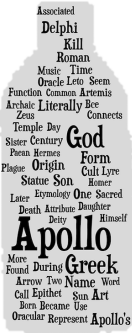


LC-0.11, LU-261, SS-2312

ShapeWordle (final result)



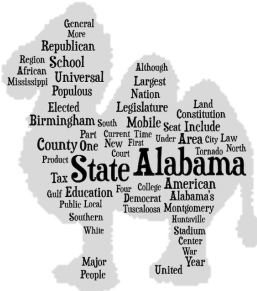
WordArt (final result)



LC-0.24, LU-124, SS-1537



LC-0.12, LU-251, SS-2521



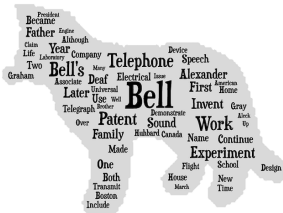
LC-0.23, LU-64, SS-3473



LC-0.14, LU-123, SS-4911



LC-0.22, LU-53, SS-647



LC-0.22, LU-58, SS-687



ShapeWordle (60 words)



LC-0.2, LU-78, SS-3758

WordArt (60 words)



LC-0.1, LU-141, SS-7516

ShapeWordle (final result)



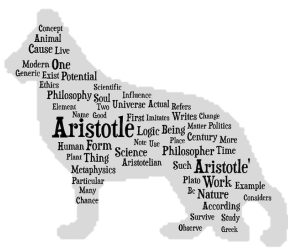
WordArt (final result)



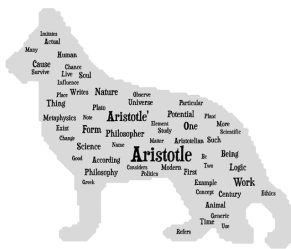
LC-0.21, LU-45, SS-3768



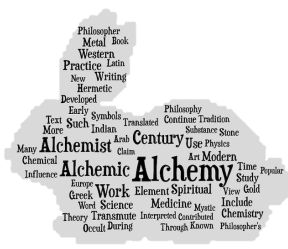
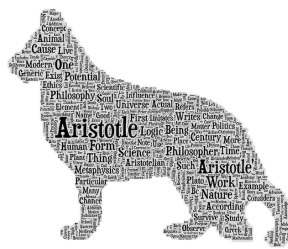
LC-0.25, LU-46, SS-3944



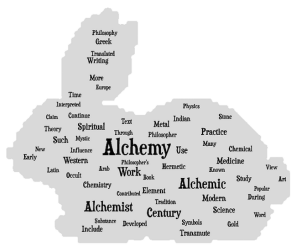
LC-0.22, LU-56, SS-3522



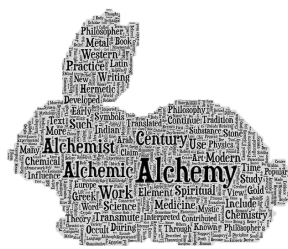
LC-0.14, LU-100, SS-5100



LC-0.23, LU-68, SS-974



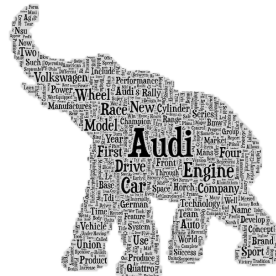
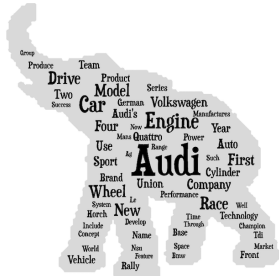
LC-0.12, LU-151, SS-1821





[illegible][illegible][illegible]

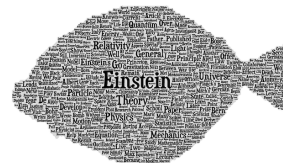
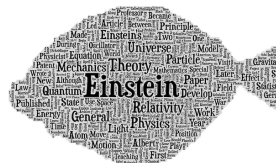
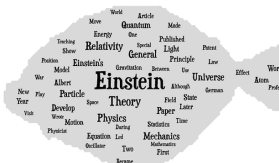
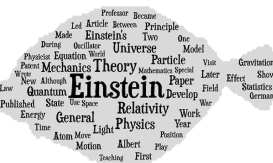
LC-0.14, LU-95, SS-8688



LC-0.2, LU-62, SS-1941



LC-0.14, LU-103, SS-1487



LC-0.14, LU-147, SS-1335

ShapeWordle (60 words)



LC-0.2, LU-53, SS-1212

WordArt (60 words)



LC-0.15, LU-74, SS-1991

ShapeWordle (final result)



WordArt (final result)



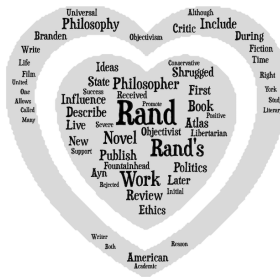
LC-0.2, LU-106, SS-608



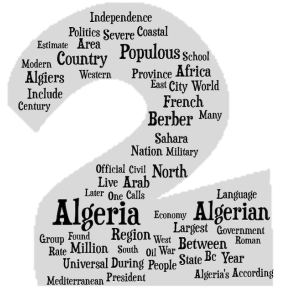
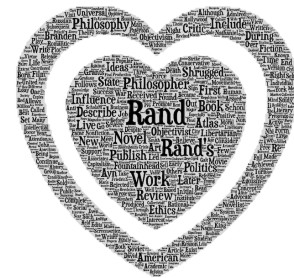
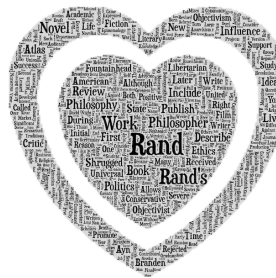
LC-0.24, LU-80, SS-684



LC-0.16, LU-98, SS-2773



LC-0.18, LU-107, SS-4462



LC-0.22, LU-81, SS-871



LC-0.12, LU-164, SS-1811



Number  
Particular Given Notion Inherent  
Eccl'ist Common  
State  
Symbol Set 1st 4th Century  
Machine Define Such Turing  
Work More Rules  
Effect  
Program Time  
Method Measure  
Input Logic One  
Call Two Define Set  
Function Remainder  
Implemented  
Instruction Problem Set Compute Use  
Length  
Elegant Device Subsets Xeno Calculator  
Mechanism Structures Mathematics

LC-0.22, LU-82, SS-949

[illegible]

LC-0.11, LU-164, SS-1629

Number

Algorithm

Machine

Program

Compute

Use

Function

Example

Require

Problem

Elegant

Substrate

Complete

Particular

Mechanism

Structure

Mentality

Length

One

Call

Define

Set

Measure

Method

Logic

Task

Input

Output

Process

Model

Turing

Work

Formal

Symbol

Step

State

Enrich

Vocabulary

Practical

Abstract

Point

Illustration

Language

Instruction

Problem

Set

Elegant

Substrate

Complete

Particular

Mechanism

Structure

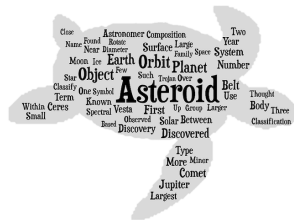
Mentality

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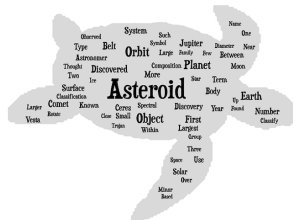
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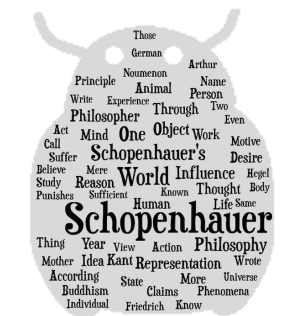
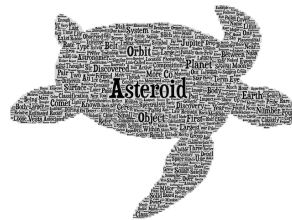
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LC-0.23, LU-57, SS-1114



LC-0.15, LU-96, SS-1703



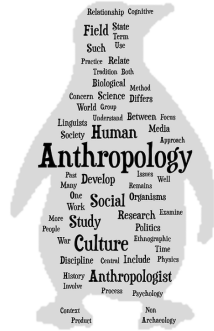
LC-0.23, LU-77, SS-5819



LC-0.07, LU-315, SS-11385

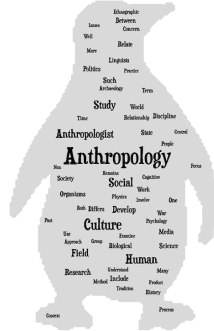


ShapeWordle (60 words)



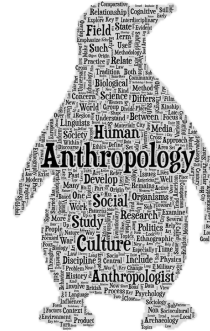
LC-0.19, LU-92, SS-5039

WordArt (60 words)

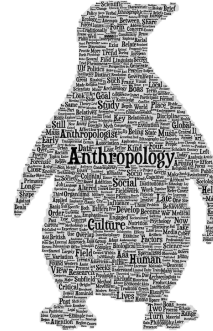


LC-0.1, LU-193, SS-6318

ShapeWordle (final result)



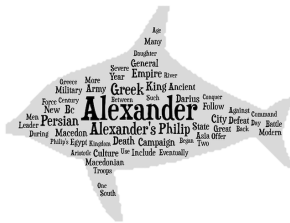
WordArt (final result)



LC-0.23, LU-45, SS-710



LC-0.18, LU-61, SS-861



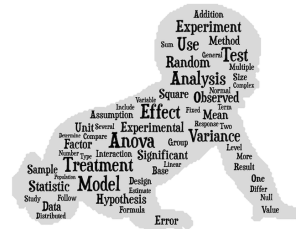
LC-0.24, LU-41, SS-1250



LC-0.12, LU-108, SS-4081



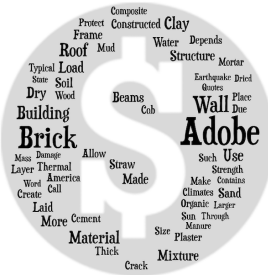
LC-0.23, LU-54, SS-937



LC-0.25, LU-46, SS-831



ShapeWordle (60 words)



LC-0.18, LU-97, SS-1011

WordArt (60 words)



LC-0.16, LU-108, SS-1152

ShapeWordle (final result)



WordArt (final result)



LC-0.22, LU-84, SS-1534



LC-0.16, LU-114, SS-6159



LC-0.17, LU-84, SS-921



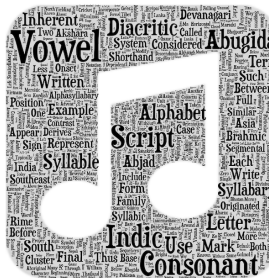
LC-0.11, LU-131, SS-1722



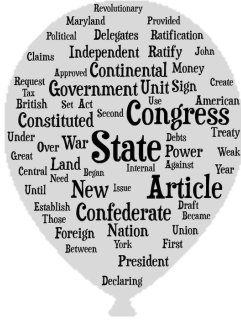
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LC-0.22, LU-83, SS-895

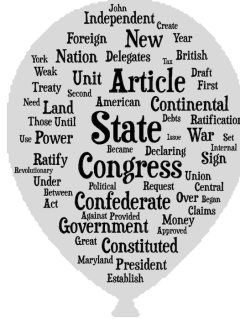


### ShapeWordle (60 words)



LC-0.24, LU-71, SS-1286

**WordArt (60 words)**



LC-0.24, LU-77, SS-2007

### ShapeWordle (final result)



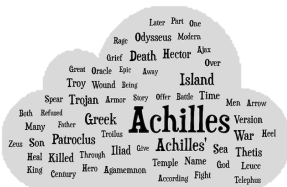
**WordArt (final result)**



LC-0.18, LU-98, SS-765



LC-0.19, LU-77, SS-862



LC-0.15, LU-139, SS-1875



LC-0.12, LU-190, SS-1988



LC-0.21, LU-71, SS-1373

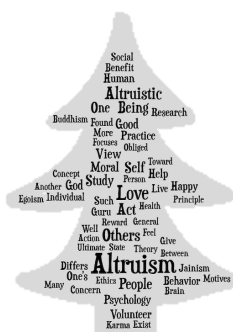


LC-0.15, LU-104, SS-1487



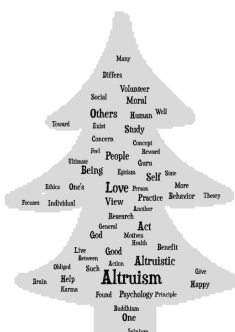


### ShapeWordle (60 words)



LC-0.22, LU-65, SS-1163

### WordArt (60 words)



LC-0.12, LU-121, SS-1539

### ShapeWordle (final result)



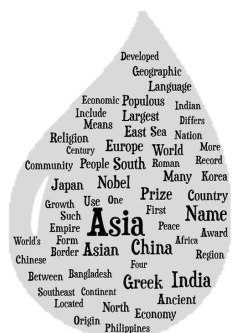
**WordArt (final result)**



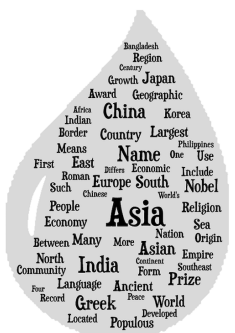
LC-0.22, LU-52, SS-1620



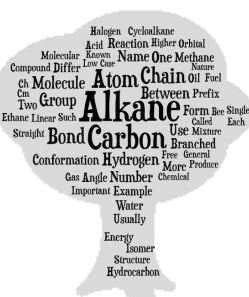
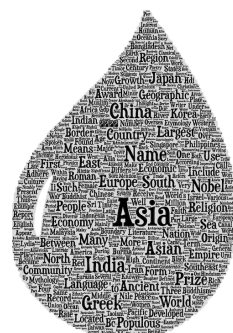
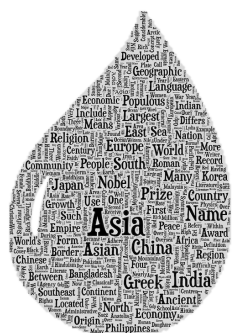
LC-0.15, LU-82, SS-1775



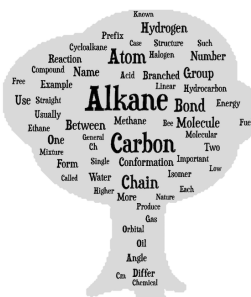
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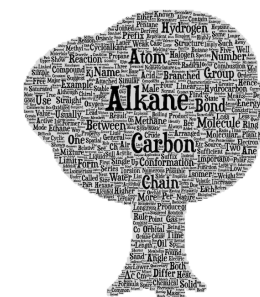
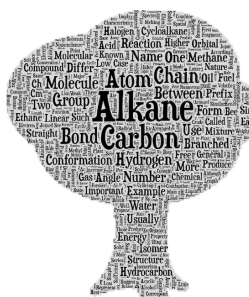
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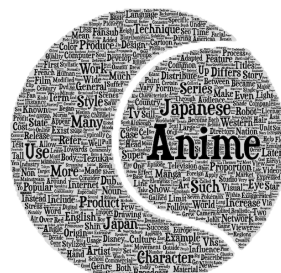
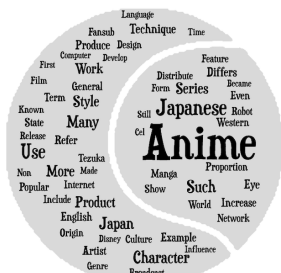
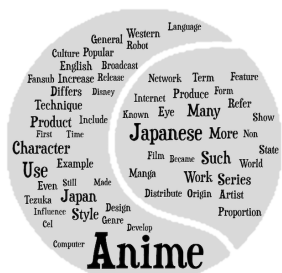
LC-0.18, LU-98, SS-1624



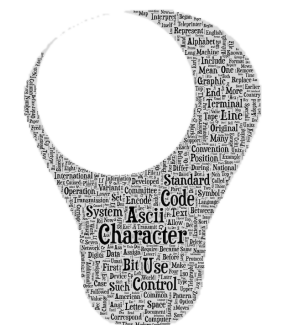
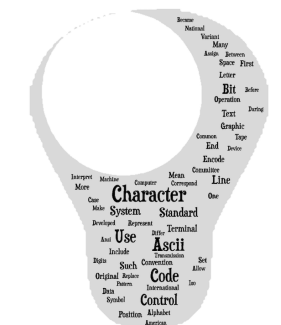
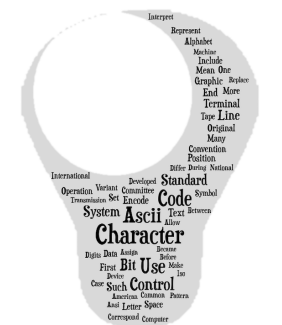
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A word cloud shaped like the constellation Aries. The words are arranged to follow the outline of the constellation's main stars and connecting lines. Prominent words include "Star", "Magnitude", "Galaxy", "Constellation", "Arietis", "Nictaeus", "Primary", "Secondary", "Tertiary", "Quaternary", "Polaris", "Betelgeuse", "Rigel", "Antares", "Deneb", "Altair", "Proxima Centauri", "Alpha Centauri", "Beta Centauri", "Gamma Centauri", "Delta Centauri", "Epsilon Centauri", "Zeta Centauri", "Eta Centauri", "Theta Centauri", "Iota Centauri", "Kappa Centauri", "Lambda Centauri", "Mu Centauri", "Nu Centauri", "Xi Centauri", "Omicron Centauri", "Pi Centauri", "Rho Centauri", "Sigma Centauri", "Tau Centauri", "Upsilon Centauri", "Phi Centauri", "Chi Centauri", "Psi Centauri", "Omega Centauri". Other words include "Ari", "Year", "Spectral", "Distance", "Age", "Size", "Temperature", "Color", "Brightness", "Parallax", "Radial Velocity", "Transit", "Variability", "Morphology", "Composition", "Evolution", "Formation", "Interaction", "Environment", "Observation", "Discovery", "History", "Culture", "Mythology", "Literature", "Art", "Science", "Technology", "Education", "Research", "Teaching", "Learning", "Communication", "Collaboration", "Innovation", "Progress", "Knowledge", "Understanding", "Appreciation", "Respect", "Curiosity", "Wonder", "Inspiration", "Motivation", "Passion", "Dedication", "Commitment", "Perseverance", "Courage", "Bravery", "Strength", "Endurance", "Patience", "Humility", "Gratitude", "Kindness", "Compassion", "Empathy", "Sympathy", "Love", "Peace", "Harmony", "Unity", "Cooperation", "Teamwork", "Partnership", "Friendship", "Relationship", "Community", "Society", "Civilization", "Humanity", "Planet Earth", "Solar System", "Milky Way", "Local Group", "Virgo Supercluster", "Observable Universe", "Cosmos", "Universe", "Multiverse", "Everything", "Nothing", "Somewhere", "Anywhere", "Everywhere", "Nowhere", "When", "Where", "How", "Why", "What", "Who", "Which", "Whether", "If", "Then", "Else", "Or", "And", "But", "For", "Of", "On", "At", "By", "With", "Without", "From", "To", "Through", "Across", "Along", "Between", "Amongst", "Inside", "Outside", "Above", "Below", "Nearby", "Faraway", "Closeby", "Distant", "Adjacent", "Opposite", "Relative", "Absolute", "Subjective", "Objective", "Qualitative", "Quantitative", "Descriptive", "Prescriptive", "Normative", "Value-laden", "Fact-based", "Opinion-based", "Evidence-based", "Theory-based", "Practice-based", "Experience-based", "Intuition-based", "Emotion-based", "Reason-based", "Logic-based", "Science-based", "Philosophy-based", "Religion-based", "Culture-based", "Tradition-based", "Custom-based", "Law-based", "Ethics-based", "Morality-based", "Justice-based", "Fairness-based", "Equality-based", 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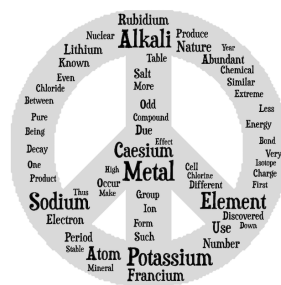
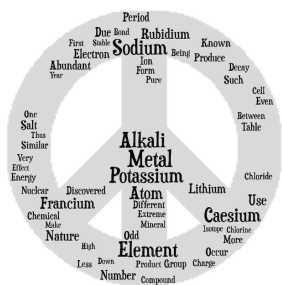
LC-0.2, LU-68, SS-3514



LC-0.16, LU-137, SS-1521



LC-0.15, LU-96, SS-9122



LC-0.19, LU-73, SS-725



[illegible][illegible]

A word cloud in the shape of a circular arrow, pointing clockwise. The words are of various sizes and orientations, creating a sense of motion. Key words include "Mission", "Crew", "Apollo", "Orbit", "Earth", "Spacecraft", "Flight", "First", "Columbia", "Moon", "Orion", "Crew", "Mission", "Earth", "Orbit", "Apollo", "Crew", "Mission", "Earth", "Orbit", "Apollo", "Crew", "Mission". Other visible words include "Spacecraft", "Flight", "First", "Columbia", "Moon", "Orion", "Crew", "Mission", "Earth", "Orbit", "Apollo", "Crew", "Mission", "Earth", "Orbit", "Apollo", "Crew", "Mission".



Figure 1. The relationship between Earth and Apollo.

[illegible]

Usually  
Right  
Bench  
Appellate  
Grant  
Legal  
Argument  
Lose  
Direct  
General  
Example  
Error  
Notice  
New  
Record  
Find  
Form  
Final  
Jurisdiction  
Proceeding  
Gain  
Present  
L  
Reason  
Convicted  
Appellate  
Decision  
Court's  
Reverse  
Order  
Such  
New  
Court's  
Decision  
Pardon  
File  
Trial  
Case  
In  
Balance  
Affirm  
Lower  
Judgment  
Defendant  
Party  
Standard  
Evidence  
Promote  
System  
Required  
Review  
Appeal  
Court

[illegible]

Appeal

Court

Trial

Review

Case

Lower

Appellate

Defendant

Plaintiff

Evidence

Verdict

Jury

Judge

Motion

Hearing

Settlement

Dismissal

Appeals

Reversal

Affirmance

Remand

En banc

Certiorari

Petition

Writ

Stay

Vacate

Rehear

Reopen

Reconsider

Reargue

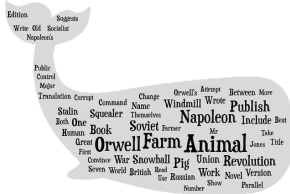
[illegible][illegible][illegible][illegible][illegible][illegible]

A word cloud shaped like a map of Europe, with the word 'Attila' prominently displayed in the center. Other words include 'Roman', 'Hun', 'Empire', 'Constantinople', 'Return Rome', 'Balkans', 'Eastern First', 'Hunish', 'Account', 'Italy', 'Many', 'Left', 'Hun Empire', 'Attila', 'Die', 'Death', 'King', 'Force Modern', 'Term', 'According', 'Invaded', 'Adv', 'Meeting', 'Suggest', 'Threatened', 'Army', 'Prison', 'Along Name', 'West', 'Defeat', 'Over', 'Attack', 'Jordanes', 'Great', 'Vladimir', 'Appears', 'Invasion'.

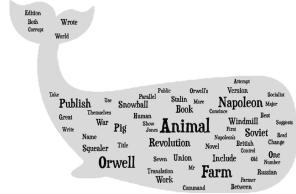
[illegible]



### ShapeWordle (60 words)



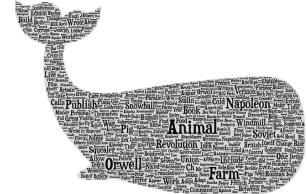
**WordArt (60 words)**



### ShapeWordle (final result)



**WordArt (final result)**



LC-0.2, LU-67, SS-1036

LC-0.14, LU-116, SS-1948

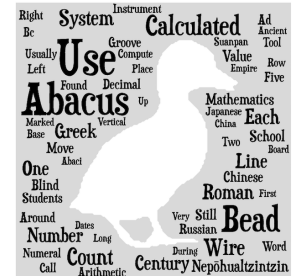
LC-0.22, LU-53, SS-503



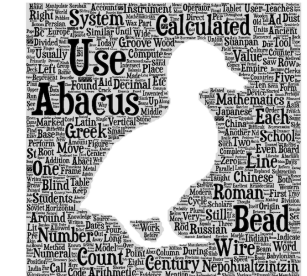
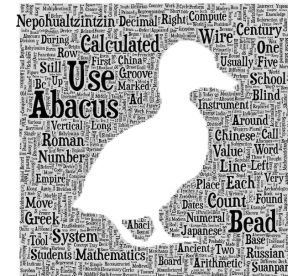
LC-0.17, LU-106, SS-1126

[illegible]

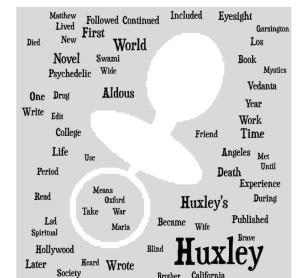
LC-0.2, LU-94, SS-1090



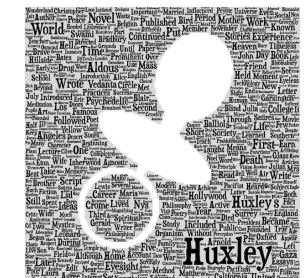
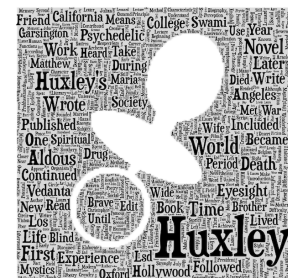
LC-0.22, LU-88, SS-2571



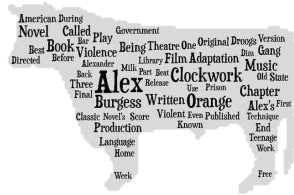
LC-0.22, LU-85, SS-915



LC-0.11, LU-199, SS-2026

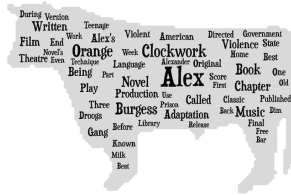


ShapeWordle (60 words)



LC-0.23, LU-55, SS-3068

WordArt (60 words)

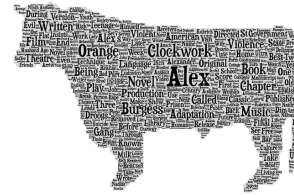


LC-0.2, LU-73, SS-5260

ShapeWordle (final result)



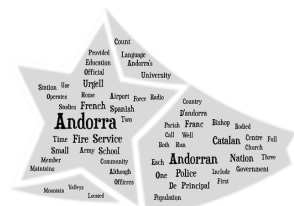
WordArt (final result)



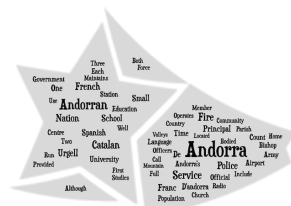
LC-0.2, LU-56, SS-922



LC-0.17, LU-68, SS-894



LC-0.14, LU-87, SS-1324



LC-0.15, LU-95, SS-3162




LC-0.21, LU-84, SS-894



LC-0.2, LU-89, SS-1241



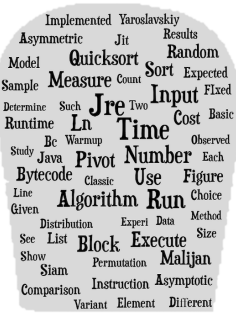
[illegible]

A word cloud shaped like a speech bubble pointing towards the top right. The words are arranged in a circular pattern within the bubble's outline. The most prominent words, shown in larger fonts, include "Graph", "Separator", "Algorithm", "Cycle", "Fundamental", "Level", "Component", "Balance", "Tree", "Face", "Edge", "Weight", "Length", "Use", "Enclose", "Each", "Cylinder", "Respect", "Worst", "Embedded", "Figure", "Fcs", "Work", "Set", "Two", "One", "Guarantee", "Root", "Computation", "Find", "Variant", "Such", "Span", "Racer", "Comput", "Simple", "Size", "Width", "Line", "Planar", "Siam", "Return", "Dart", "Globe", "Small", "Denote", "Triangle", "Time", "Provide", "Unoptimized", "Burst", "Verifies", "Base", "Distance", "Approximate", "Complexity", "Efficient", "Fast", "Linear", "Quadratic", "Polynomial", "Exponential", "Sublinear", "Superlinear", "Logarithmic", "Constant", "Inverse", "Reciprocal", "Square", "Cube", "Fourth", "Fifth", "Sixth", "Seventh", "Eighth", "Ninth", "Tenth", "Eleventh", "Twelfth", "Thirteenth", "Fourteenth", "Fifteenth", "Sixteenth", "Seventeenth", "Eighteenth", "Nineteenth", "Twentieth".

[illegible][illegible]

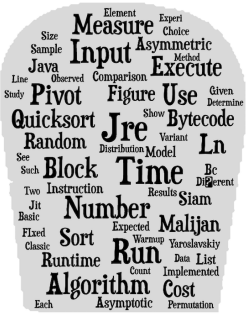


ShapeWordle (60 words)



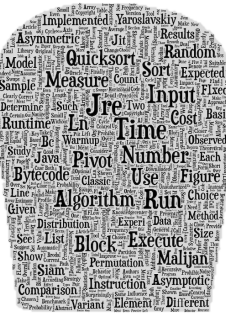
LC-0.21, LU-96, SS-549

WordArt (60 words)



LC-0.25, LU-88, SS-888

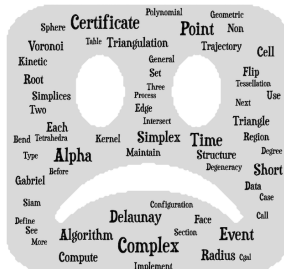
ShapeWordle (final result)



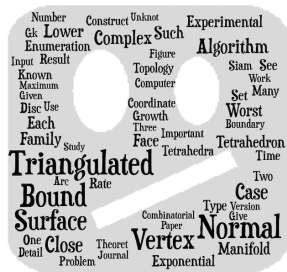
WordArt (final result)



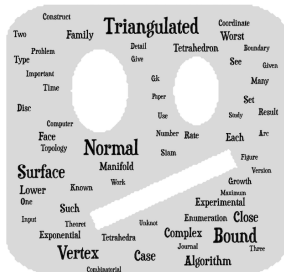
LC-0.2, LU-117, SS-899



LC-0.13, LU-171, SS-1423



LC-0.21, LU-93, SS-967



LC-0.1, LU-225, SS-1754



LC-0.18, LU-109, SS-962



LC-0.16, LU-101, SS-815

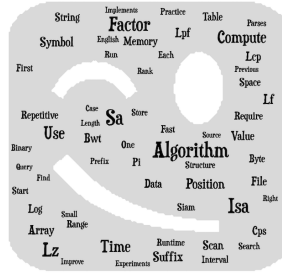


ShapeWordle (60 words)



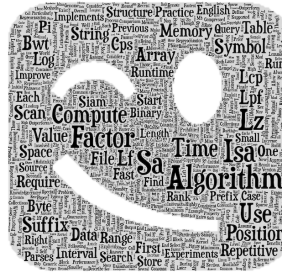
LC-0.2, LU-118, SS-1249

WordArt (60 words)

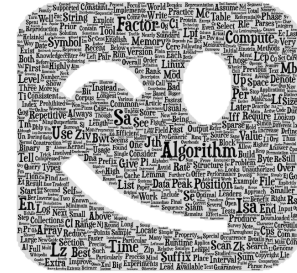


LC-0.1, LU-251, SS-1908

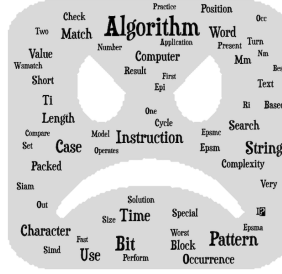
ShapeWordle (final result)



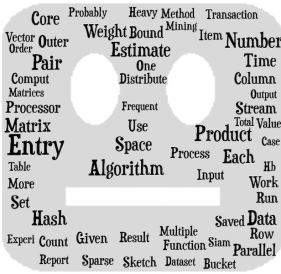
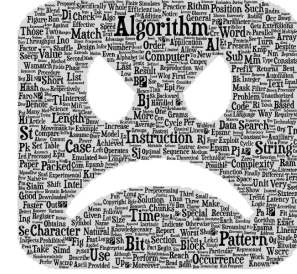
WordArt (final result)



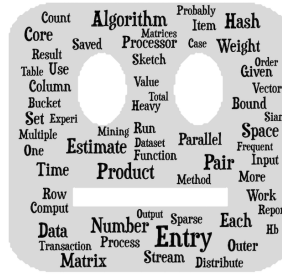
LC-0.2, LU-122, SS-1065



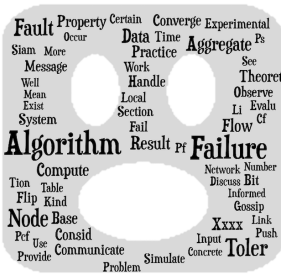
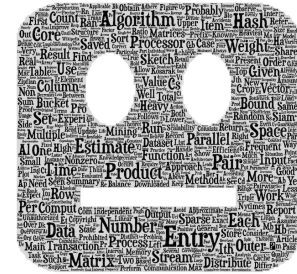
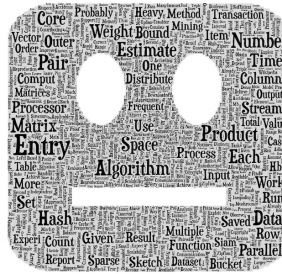
LC-0.11, LU-206, SS-1705



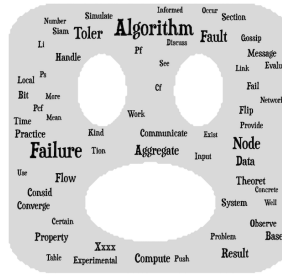
LC-0.18, LU-161, SS-938



LC-0.18, LU-127, SS-1078



LC-0.19, LU-103, SS-1013



LC-0.1, LU-221, SS-1543



A word cloud visualization showing various terms related to cluster analysis. The most prominent words are "Cluster" and "Algorithm". Other significant words include "Intercluster", "Graph", "Modularity", "Diversity", "Density", "Measure", "Comparison", "Conduct", "Greedy", "Move", "Max Time", "Vertex", "Yield", "Aid", "Intracluster", "Valve", "Set", "Constraint", "Function", "Edge", "Basis", "Evolve", "Result", "General", "Learn", "Merge", "Cut", "Constraint", "Budget", "Sparsity", "Obtained", "Optimal", "Difference", "Expert", "Average", "Mean".

Algorithm

Random

Brund

Move

Lemma

Show

Intro

First

Ram

One

Cache

Access

Search

Can

Special

Path

Log

Each

Size

Evict

Bin

Army

Prio

Lost

Machine

Miss

Stan

Time

Lamin

Perform

Next

Lru

Two Level

Translate

Insert

Node

Min

Address

Replace

Prox

T Strategy

Memory

Virtual

Segment

Tree

Number

Current

Optimal

Require

Rence

[illegible]

A word cloud shaped like a silhouette of a person's head, facing right. The words are arranged to fit the shape, with larger words being more prominent. The terms include:

- Idea
- Problem
- Log
- First
- Rank
- Lambda
- Size
- Lemma
- Tree
- Address
- Search
- Model
- Evict
- Use
- Cache
- Store
- Level
- Cost
- Miss
- Random
- Insert
- Spatial
- Access
- Time
- Node
- Segment
- Each
- Number
- Record
- Tier
- Scan
- Strategy
- One
- Pap
- To
- Memory
- Path
- Optional
- Replicate
- Algorithm
- Replace
- Min
- Current
- Show
- Dequantant
- Cache
- Errone
- Array

[illegible]

A word cloud shaped like a map of the United States, containing various computer science and programming terms. The words are arranged to fit the geographical shape of the country, with some terms appearing larger than others. The words include:

- Perfrom
- Compute
- Cut
- Case
- Contract
- Individual
- Disack
- Local
- Obtain
- Time
- Random
- Node
- graph
- Combine
- Use
- Two
- Kaffpa
- Partition
- Each
- Paritionner
- Black
- Maildner
- Very

Failure  
Distributed  
Number  
Space  
Level  
Process  
Probability  
Required  
Random  
Item  
Sampler  
Set  
Non  
Sample  
AI  
Data  
Function  
Over  
Zero  
Recovery  
Vector  
Sparse  
Supp  
Stetch  
Errors  
Weights  
Repetition  
Figure  
Accuracy  
Increase  
Independent  
Analysis  
Fit  
Simul  
Draw  
Show  
Small  
Test  
Output  
Bias  
Section  
Time  
Nj  
Experiment  
Selected  
Est

A word cloud shaped like a tree, representing the structure of a machine learning course. The root is "Machine Learning". Major branches include "Supervised Learning" (with sub-branches like "Classification" and "Regression"), "Unsupervised Learning" (with sub-branches like "Clustering" and "Dimensionality Reduction"), "Model Evaluation", "Deep Learning", "Reinforcement Learning", and "Applications". The words are sized and colored to represent their frequency or importance in the course.

ShapeWordle (60 words)



WordArt (60 words)



ShapeWordle (final result)

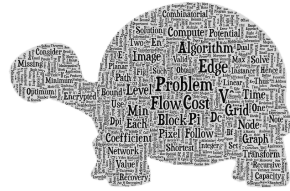
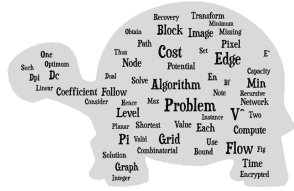
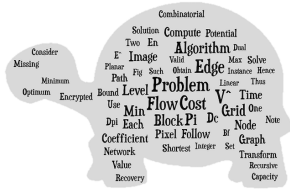


WordArt (final result)



LC-0.19, LU-51, SS-7019

LC-0.2, LU-58, SS-7031



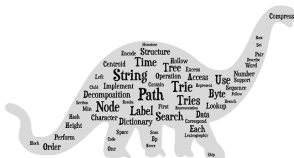
LC-0.17, LU-109, SS-1335

LC-0.15, LU-137, SS-1481



LC-0.2, LU-73, SS-2721

LC-0.16, LU-83, SS-3018

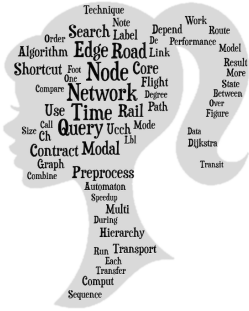


LC-0.18, LU-57, SS-2039

LC-0.2, LU-52, SS-2038

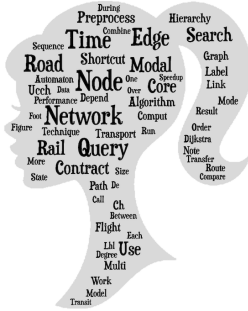


ShapeWordle (60 words)



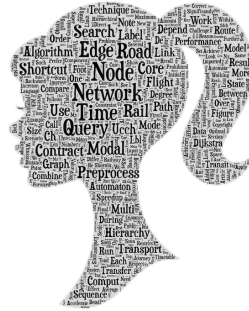
LC-0.21, LU-76, SS-1505

WordArt (60 words)

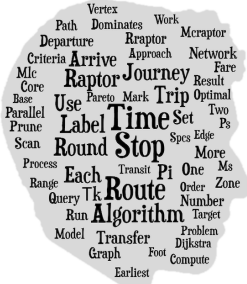


LC-0.22, LU-69, SS-1281

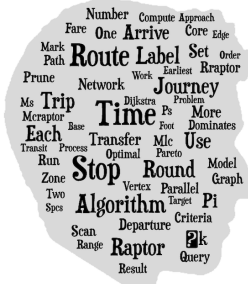
ShapeWordle (final result)



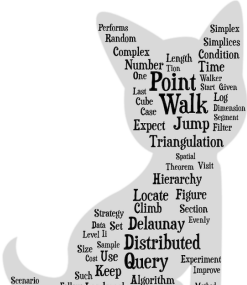
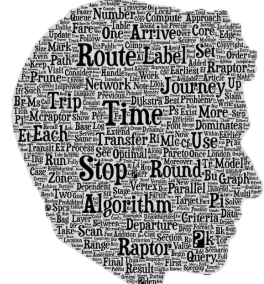
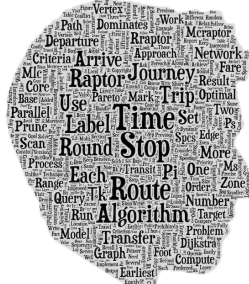
WordArt (final result)



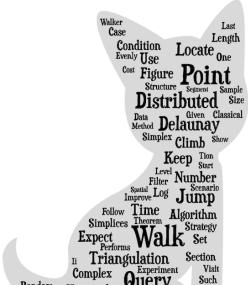
LC-0.24, LU-71, SS-613



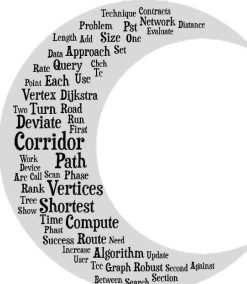
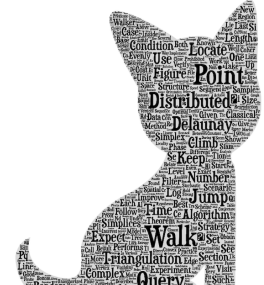
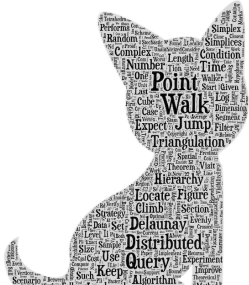
LC-0.22, LU-85, SS-1055



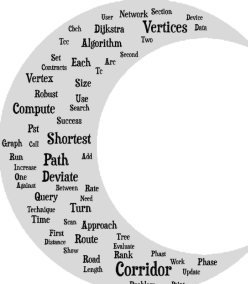
LC-0.22, LU-61, SS-928



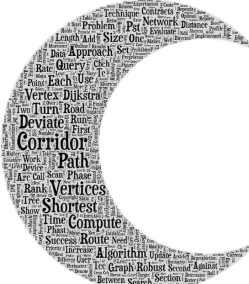
LC-0.25, LU-47, SS-1164



LC-0.22, LU-60, SS-2177



LC-0.15, LU-89, SS-2358



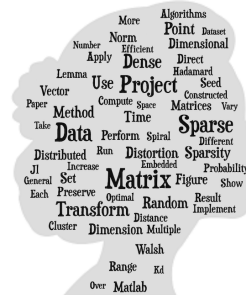
**WordArt (final result)**



LC-0.13, LU-149, SS-3815



LC-0.23, LU-53, SS-2255



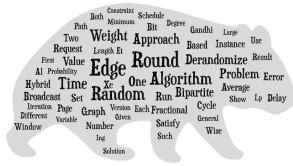
LC-0.2, LU-97, SS-1494



LC-0.12, LU-130, SS-1550



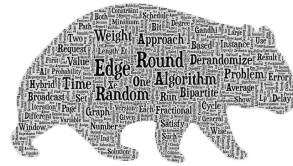
ShapeWordle (60 words)



WordArt (60 words)



ShapeWordle (final result)



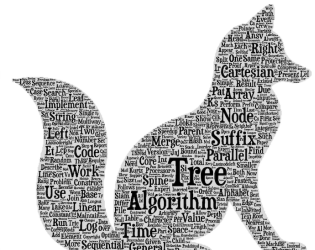
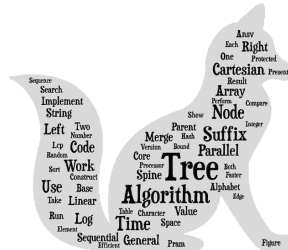
WordArt (final result)



LC-0.2, LU-73, SS-1909



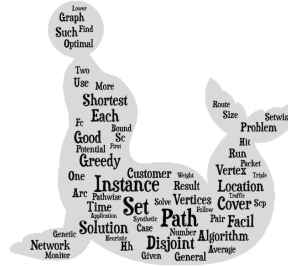
LC-0.23, LU-72, SS-1981



LC-0.21, LU-65, SS-886



LC-0.21, LU-66, SS-846



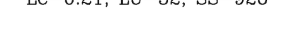
LC-0.21, LU-64, SS-889



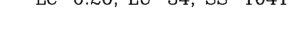
LC-0.23, LU-50, SS-563



LC-0.21, LU-52, SS-926



LC-0.26, LU-34, SS-1041





[illegible]

Location  
Strategy  
Number Miles Distance  
Map Base  
Route Difference Position  
South VI Match  
Point  
Edge  
Use Verx Network  
Origin Time  
Measure Between  
Time  
Sur Approach Length Predict Each  
Km Verx Reach  
Gps Pi New Path Along  
Graph Compute  
Verx Given One  
Shortest Dijkstra  
Figure Road Merc  
Problems

[illegible]

A word cloud shaped like a stylized dinosaur silhouette, facing right. The words are arranged to fit the shape, with larger words being more prominent. The terms include: Strategy, Base, Distance, May, Vi, March, Edge, Network, Time, Between, Measure, Length, Km, Pi, Shortest, Dijkstra, Road, Problem, Compute, One, Me, Us, and many others. The background is white, and the dinosaur silhouette is dark grey.

A word cloud shaped like the map of the United States, containing various computer science and engineering terms. The words are arranged to fit the geographical shape of the country. Notable words include 'Algorithm', 'Random', 'Each', 'Approach', 'Position', 'Problem', 'Feasible', 'Practise', 'Heuristic', 'Casp', 'Such', 'Set', 'Both', 'Value', 'Need', 'Based', 'Give', 'Length', 'Formulation', 'Logical', 'Constraint', 'Over', 'AI', 'Run', 'Bound', 'Consider', 'CS', 'Instance', 'String', 'Show', 'One', 'Time', 'Compare', 'Use', 'Relax', 'Chosen', 'Lp', 'Up', 'Box', 'Root', 'Casp', 'Substring', 'Optimal', 'Computer', 'Search', 'Options', 'Casp', 'Observe', 'Pad', 'Layer', 'Variable', 'General', 'Distance', 'Study', 'S', 'Et', 'Stronger', 'Solve', 'Chambers', 'Approx', 'Practic', 'Casp', 'Set', 'Both', 'Value', 'Need', 'Based', 'Give', 'Length', 'Formulation', 'Logical', 'Constraint', 'Over', 'AI', 'Run', 'Bound', 'Consider', 'CS', 'Instance', 'String', 'Show', 'One', 'Time', 'Compare', 'Use', 'Relax', 'Chosen', 'Lp', 'Up', 'Box', 'Root', 'Casp', 'Substring', 'Optimal', 'Computer', 'Search', 'Options', 'Casp', 'Observe', 'Pad', 'Layer', 'Variable', 'General', 'Distance', 'Study', 'S', 'Et', 'Stronger', 'Solve', 'Algorithm', 'Random', 'Each', 'Approach', 'Position', 'Problem', 'Feasible', 'Practise', 'Heuristic', 'Casp', 'Such', 'Set', 'Both', 'Value', 'Need', 'Based', 'Give', 'Length', 'Formulation', 'Logical', 'Constraint', 'Over', 'AI', 'Run', 'Bound', 'Consider', 'CS', 'Instance', 'String', 'Show', 'One', 'Time', 'Compare', 'Use', 'Relax', 'Chosen', 'Lp', 'Up', 'Box', 'Root', 'Casp', 'Substring', 'Optimal', 'Computer', 'Search', 'Options', 'Casp', 'Observe', 'Pad', 'Layer', 'Variable', 'General', 'Distance', 'Study', 'S', 'Et', 'Stronger', 'Solve'.

[illegible][illegible]

A word cloud in the shape of a heart, filled with various terms related to optimization and computer science. The words are of different sizes and orientations, creating a dense, textured appearance. The heart shape is formed by the negative space around the words. The words include: Solution, Local, Bound, Relax, Problem, Constraint, Substrings, Instance, Formulation, String, Time, and many others. The words are arranged to form a heart shape, with the negative space around the words creating the heart's outline.

[illegible][illegible][illegible][illegible]

LC-0.2, LU-73, SS-8810

[illegible][illegible]

ShapeWordle (60 words)



LC-0.2, LU-73, SS-1326

WordArt (60 words)

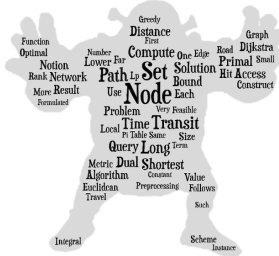


LC-0.23, LU-57, SS-3525

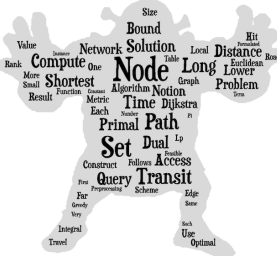
ShapeWordle (final result)



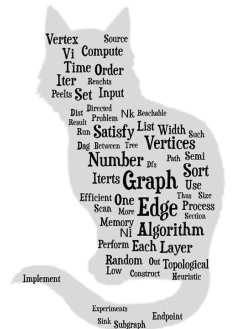
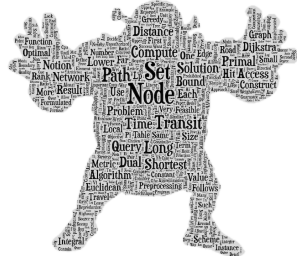
WordArt (final result)



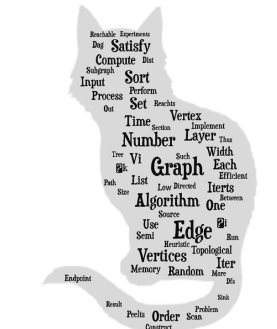
LC-0.2, LU-67, SS-1285



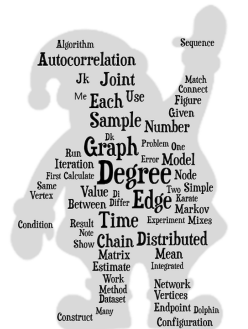
LC-0.22, LU-52, SS-1437



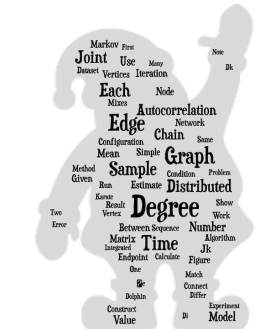
LC-0.22, LU-80, SS-978



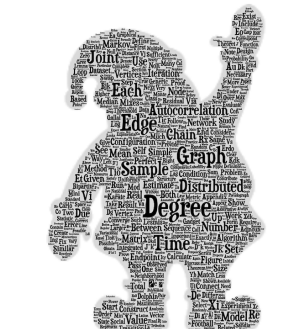
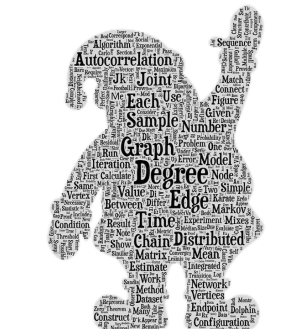
LC-0.19, LU-81, SS-1116



LC-0.22, LU-89, SS-1705



LC-0.17, LU-131, SS-3289



**WordArt (final result)**



LC-0.11, LU-160, SS-1972



LC-0.14, LU-163, SS-1948



LC-0.16, LU-66, SS-8894



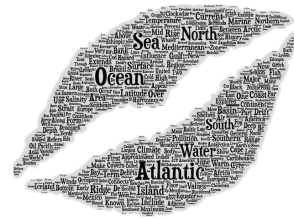
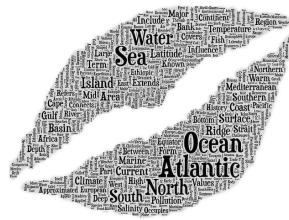
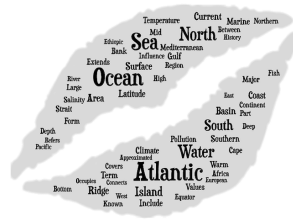
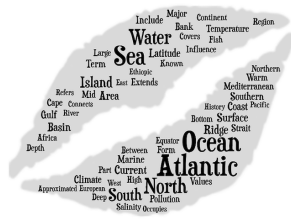
LC-0.19, LU-80, SS-837

### ShapeWordle (60 words)

**WordArt (60 words)**

### ShapeWordle (final result)

**WordArt (final result)**



LC-0.2, LU-78, SS-1589

LC-0.16, LU-100, SS-2333

## REFERENCES

- [1] K. Binmore and J. Davies. *Calculus: concepts and methods*. Cambridge University Press, 2002.
- [2] M.-T. Chi, S.-S. Lin, S.-Y. Chen, C.-H. Lin, and T.-Y. Lee. Morphable word clouds for time-varying text data visualization. *IEEE Trans. Vis. & Comp. Graphics*, 21(12):1415–1426, 2015. doi: 10.1109/TVCG.2015.2440241
- [3] H. Leung. Tagxedo website. <http://www.tagxedo.com/>. last visited 06/2017.