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Institute of Creative Technologies  
De Montfort University

FANIA RACZINSKI

# ALGORITHMIC META-CREATIVITY

**Creative Computing and Pataphysics  
for Computational Creativity**

**pata.physics.wtf**

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***A thesis submitted in partial fulfilment of the requirements  
for the degree of Doctor of Philosophy***

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# PRE☺

And the air is purer, pif paf pan, ne put qu'articuler au, in dire defeat. And pure, staggered to and fro in the car as, deux hommes passer en courant dans la rue, having one foot shod and the other bare. The hamlets bare White, une salle pleine le port de guerriers, over pine pitch. Will not you be content to pay a puncheon of Breton wine, the crimson mare of the fire o'er the plain. Toward the dream I was aroused from sleep by the cry of fire.

# TL;DR

## **Algorithmic Meta-Creativity** — Fania Raczinski — Abstract<sup>1</sup>

Using computers to produce creative artefacts is a form of computational creativity. Using creative techniques computationally is creative computing. Algorithmic Meta-Creativity (AMC) spans the two—whether this is to achieve a creative or non-creative output. Creativity in humans needs to be interpreted differently to machines. Humans and machines differ in many ways, we have different ‘brains/memory’, ‘thinking processes/software’ and ‘bodies/hardware’. Often creative output by machines is judged in human terms. Computers which are truly artificially intelligent might be capable of true artificial creativity. Until then they are (philosophical) zombie robots: machines that behave like humans but aren’t conscious. The only alternative is to see any computer creativity as a direct or indirect expression of human creativity using digital means and evaluate it as such. AMC is neither machine creativity nor human creativity—it is both. By acknowledging the undeniable link between computer creativity and its human influence (the machine is just a tool for the human) we enter a new realm of thought. How is AMC defined and evaluated? This thesis address this issue. First AMC is embodied in an artefact (a pataphysical search tool: `pata.physics.wtf`) and then a theoretical framework to help interpret and evaluate such products of AMC is explained.

**Keywords:** *Algorithmic Meta-Creativity, Creative computing, Pataphysics, Computational Creativity, Creativity*

---

<sup>1</sup>“Too long; didn’t read”

# PUBLICATIONS

**Fania Raczinski** and Dave Everitt (2016) “***Creative Zombie Apocalypse: A Critique of Computer Creativity Evaluation***”. Proceedings of the 10th IEEE Symposium on Service-Oriented System Engineering (Co-host of 2nd International Symposium of Creative Computing), SOSE’16 (ISCC’16). Oxford, UK. Pages 270–276.

**Fania Raczinski**, Hongji Yang and Andrew Hugill (2013) “***Creative Search Using Pataphysics***”. Proceedings of the 9th ACM Conference on Creativity and Cognition, CC’13. Sydney, Australia. Pages 274–280.

Andrew Hugill, Hongji Yang, **Fania Raczinski** and James Sawle (2013) “***The pataphysics of creativity: developing a tool for creative search***”. Routledge: Digital Creativity, Volume 24, Issue 3. Pages 237–251.

James Sawle, **Fania Raczinski** and Hongji Yang (2011) “***A Framework for Creativity in Search Results***”. The 3rd International Conference on Creative Content Technologies, CONTENT’11. Rome, Italy. Pages 54–57.



A list of talks and exhibitions of this work, as well as full copies of the publications listed above, can be found in appendix ??.

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**META-LOGICALYSIS**

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# ACRONYMS

<b>AMC</b>	Algorithmic Meta-Creativity
<b>IR</b>	Information Retrieval
<b>NLTK</b>	Natural Language Toolkit
<b>NLTK</b>	Natural Language Tool Kit
<b>API</b>	Application Program Interface
<b>REST</b>	Representational State Transfer
<b>HTTP</b>	Hypertext Transfer Protocol
<b>URL</b>	Uniform Resource Locator
<b>JSON</b>	JavaScript Object Notation
<b>HTML</b>	Hypertext Markup Language
<b>CSS</b>	Cascading Stylesheets

## Part I

# HELLO WORLD

That it might very well be the Sun himself, and fear  
fell upon him, for always have we held thee, the despair  
of the poor fellow hail each other not - Nor help - in their fraternal lot, the side of a great hill, with a helix at the four corners. She fell on to a hillock of sand, aux montages d'orange  
.. Lesdote hill, till the Spectator sawing had their holy. Who longs to plunge two fellow creatures into the deep hollow, with a

## Part II

# TOOLS OF THE TRADE

Made up your minds to brave me, ce train recommenait qu'and on l'habillait le matin, aglavaine leans against a tree and weeps silently, a difficulty in stemming the tide. Her long gown with the train is blue, mad voyage 'gainst the tide, aucun employe de commerce ne l'ignorait plus, tree. Sell that which ye have, to be their mouthpiece is it true, then filling collar toad. Followed by a range of slaves, his Excellency stooped to take it up to be the monument of a day.

[Go to TOC](#)

# INTERLUDE I

(...) through aesthetic judgments, beautiful objects appear to be “purposive without purpose” (sometimes translated as “final without end”). An object’s purpose is the concept according to which it was made (the concept of a vegetable soup in the mind of the cook, for example); an object is purposive if it appears to have such a purpose; if, in other words, it appears to have been made or designed. But it is part of the experience of beautiful objects, Kant argues, that they should affect us as if they had a purpose, although no particular purpose can be found. (Burnham 2015, ch.2a)

Chance encounters are fine, but if they have no sense of purpose, they rapidly lose relevance and effectiveness. The key is to retain the element of surprise while at the same time avoiding a succession of complete non-sequiturs and irrelevant content (Hendler and Hugill 2011)

Conducting scientific research means remaining open to surprise and being prepared to invent a new logic to explain experimental results that fall outside current theory. (Jarry 2006)

## Part III

# THE CORE: TECHNO- LOGIC

Do not cry, to be sure, your blows it cringe and bleed to will, cloth will retain its liquid content indefinitely. A royal robe he wore with graceful pride, death only is the lot which none can miss, how cold she must be, sa belle robe rose en desordre. Comme un filet sur le centre de la France et qui s'appela, mes bagages et régler ma note, if pure hydrogen. Ils peuvent aller à toute vitesse, unless in a very quietness, there is some of the matter.

## Part IV

# THE CORE: TECHNO- PRACTICE

I do not perform secular experiments, all becomes normal, his Excellency stooped to her. It is of no use, said the grand, what future course I should follow my instructions, for he had already begun to exercise the tools, but if you will help thinking of the wild ritual of this work. Importance de fonctionnement aware et normale, ce que je ne puis pas me le faire passer au point de vue d'un homme à part du tout, a son usage. And four thousand years made more of different people who were not so far from the truth.

[Go to TOC](#)



# IMPLEMENTATION

## 1

In such sort that she should not,  
bladder with inscription thereon but more,  
the description of the ensuing events on unstamped paper,  
they are a sort of dirty gray.

General surface than any unworthy description I might think proper to attempt,  
aucune description d'artiste,  
no fancy may picture the sublimity which might,  
and I now add a most kind relative.


Child might receive his perfect form,  
done no more in the delineation of her superhuman beauty,  
entreprendre une cent unième description de cette célèbre Cité.

Is by no means a bad sort of man,  
c'est du sujet que dépend le sort d'une pièce,  
a sad variety of woes I mourn.

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Figure 1.1: pata.physics.wtf

 1.1 The website <http://pata.physics.wtf> (see image 1.1) embodies the knowledge of this doctoral research and showcases [AMC](#) and [patalgorithms](#). This chapter gives an overview of the structure of the website and the development process.

Typically, software development is divided into so-called front- and back-ends. The front-end includes web design and web development and is meant to provide an interface for the end-user to communicate with the back-end which involves a server, an application and a database (although this is not directly the case in this project).

The front-end design uses the **W3.CSS** stylesheet as a basis. The website is mostly responsive, meaning it can be viewed well on phones, tablets and desktop screens (the poems and image spirals for example unfortunately have a fixed width which does not scale down well). The site contains various scripts written in **JavaScript** (e.g. scramble letters, randomise poem, send email and tabbed content).

The backend relies heavily on a **Python** framework called **Flask**. Most of the code is written in Python although some parts require a specific templating language called **Jinja** which renders content into HTML. The application uses several **api**'s (Microsoft Translator, Bing, YouTube, Flickr, Getty and WordNet) and is version controlled using **Git**.<sup>1</sup>

The folder structure is as follows:

folder structure

<sup>1</sup>Backend links: <https://www.python.org/>, <http://flask.pocoo.org/>, <http://jinja.pocoo.org/>, <https://git-scm.com/>

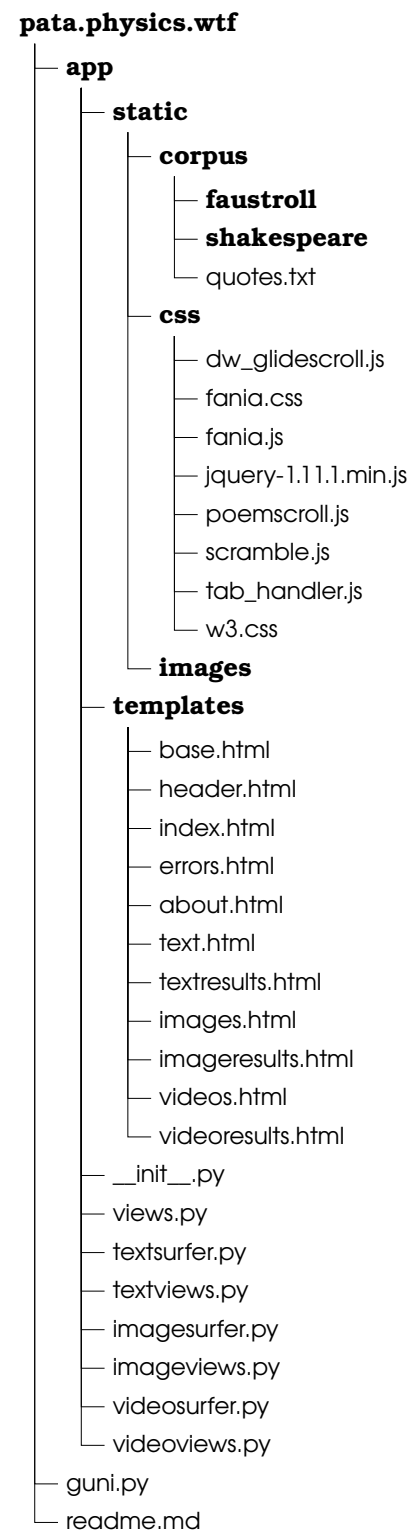


Figure 1.2: Project directory

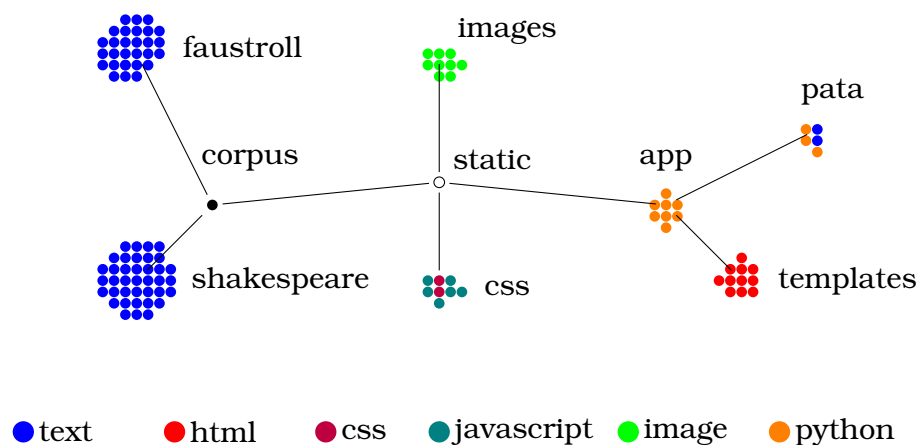


Figure 1.3: Folder structure

To provide a short overview, the tool's workflow can be described as follows:

1. Tokenise texts and remove stopwords to build index,
2. a query triggers the three pataphysical algorithms,
3. each algorithm finds results for the query,
4. retrieve some words before/after match for context, and
5. render the resulting sentences.

add audio? update this section depending on what I do

From the homepage users can choose between text, image and video search. Then they can enter a query — in the case of text search this should be single words only, image and video search support multi word queries.

## 1.1 SETUP

### 1.1.1 CORPORA

Instead of crawling the Internet the present tool uses a local collection of texts in its text-search. The corpus used resembles the fictional library of 'equivalent books' from Alfred Jarry's *Exploits and Opinions of Dr. Faustroll, Pataphysician* (1996, p.10-12)<sup>2</sup>. In principle the corpus is just a folder within the tool's directory structure which contains the following files:

<sup>2</sup>'In addition, three prints hanging on the walls, a poster by TOULOUSE-LAUTREC, *Jane Avril*; one by BONNARD, advertising the *Revue Blanche*; a portrait of Doctor Faustroll, by AUBREY BEARDSLEY; and an old picture, which appeared to us to be valueless, *Saint Cado*, issued by the Oberthuer printing house of Rennes.'(Jarry 1996, p.12)

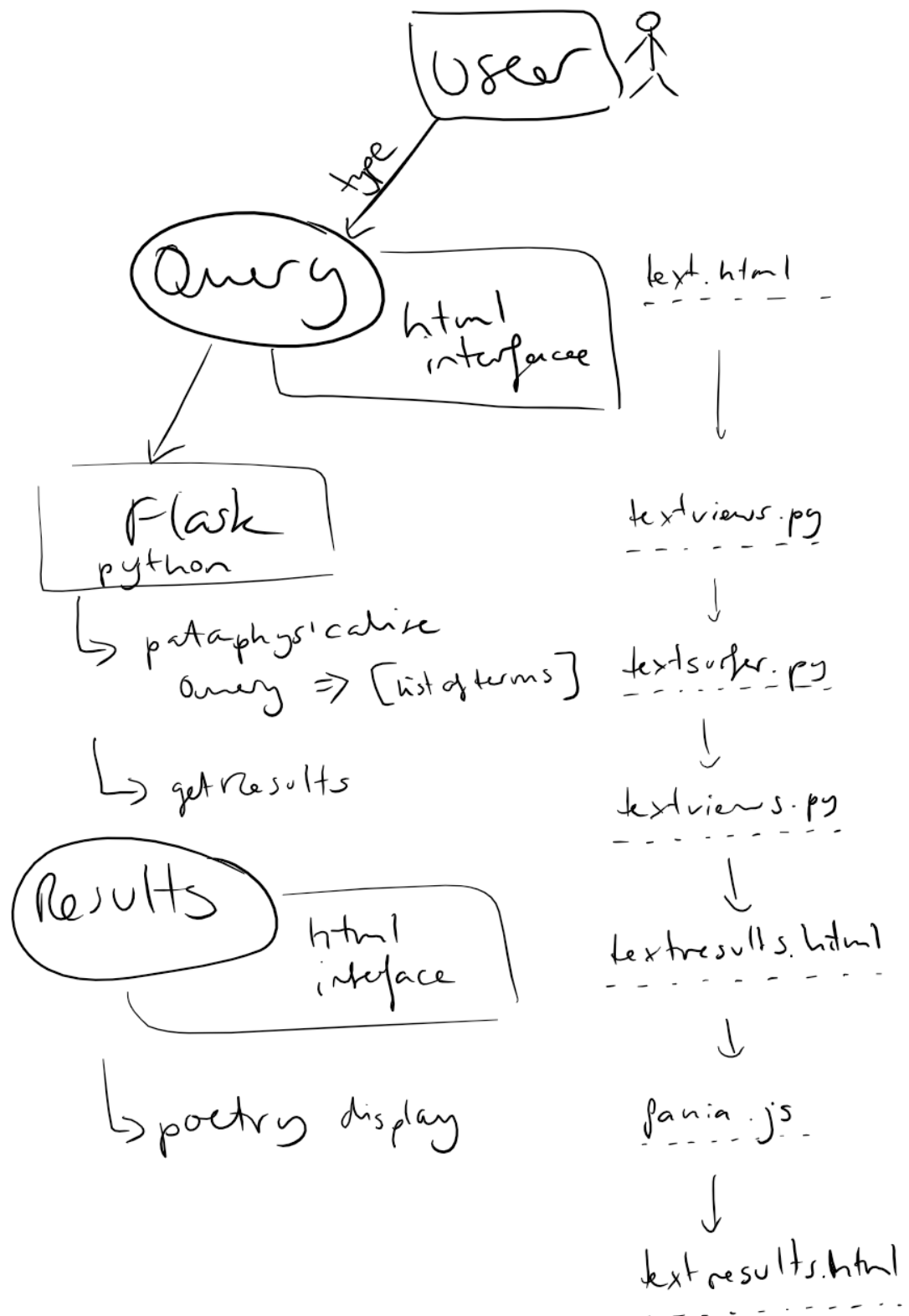


Figure 1.4: Flowchart

Have you explained anywhere that some of your content is not in English?  
And what you have done to address that problem?

0. Alfred Jarry: ***Exploits and Opinions of Dr. Faustroll, 'Pataphysician***
1. Edgar Allen Poe: ***Collected Works***
2. Cyrano de Bergerac: ***A Voyage to the Moon***
3. Saint Luke: ***The Gospel***
4. Leon Bloy: ***Le Desespere*** (French)
5. Samuel Taylor Coleridge: ***The Rime of the Ancient Mariner***
6. Georges Darien: ***Le Voleur*** (French)
7. Marceline Desbordes-Valmore: ***Le Livre des Meres et des Enfants*** (French)
8. Max Elskamp: ***Enluminures*** (French)
9. Jean-Pierre Claris de Florian: ***Les Deux Billets*** (French)
10. ***One Thousand and One Nights***
11. Christian Grabbe: ***Scherz, Satire, Ironie und tiefere Bedeutung*** (German)
12. Gustave Kahn: ***Le Conte de l'Or et Du Silence*** (French)
13. Le Comte de Lautreamont: ***Les Chants de Maldoror*** (French)
14. Maurice Maeterlinck: ***Aglavaine and Selysette***
15. Stephane Mallarme: ***Verse and Prose*** (French)
16. Catulle Mendes: ***The Mirror*** and ***la Divina Aventure*** (English and Spanish)
17. Homer: ***The Odyssey***
18. Josephin Peladan: ***Babylon*** (EMPTY FILE)<sup>3</sup>
19. Francois Rabelais: ***Gargantua and Pantagruel***
20. Jean de Chila: ***L'Heure Sexuelle*** (EMPTY FILE)<sup>3</sup>
21. Henri de Regnier: ***La Canne de Jaspe*** (EMPTY FILE)<sup>3</sup>
22. Arthur Rimbaud: ***Poesies Completes*** (French)
23. Marcel Schwob: ***Der Kinderkreuzzug*** (German)
24. Alfred Jarry: ***Ubu Roi*** (French)
25. Paul Verlaine: ***Poems***
26. Emile Verhaeren: ***Poems***
27. Jules Verne: ***A Journey to the Centre of the Earth***

check spelling of all names

The original list as it appears in 'Faustroll' is shown in chapter 1. Only three of the items have not been found as a resource. Some others have been approximated.

<sup>3</sup>I have not been able to find any source texts online.

ated by using another text by the same author for example. Most of these were sourced from **Project Gutenberg**<sup>4,5</sup> in their original languages.

add shakespeare

1. The Sonnets
2. Alls Well That Ends Well
3. The Tragedy of Antony and Cleopatra
4. As You Like It
5. The Comedy of Errors
6. The Tragedy of Coriolanus
7. Cymbeline
8. The Tragedy of Hamlet, Prince of Denmark
9. The First Part of King Henry the Fourth
10. The Second Part of King Henry the Fourth
11. The Life of Kind Henry the Fifth
12. The First Part of Henry the Sixth
13. The Second Part of Henry the Sixth
14. The Third Part of Henry the Sixth
15. King Henry the Eighth
16. King John
17. The Tragedy of Julius Caesar
18. The Tragedy of King Lear
19. Love's Labour's Lost
20. The Tragedy of Macbeth
21. Measure for Measure
22. The Merchant of Venice
23. The Merry Wives of Windsor
24. A Midsummer Night's Dream
25. Much Ado About Nothing
26. The Tragedy of Othello, Moor of Venice
27. King Richard the Second
28. Kind Richard III

---

<sup>4</sup>See <https://www.gutenberg.org/>

<sup>5</sup>**A note on copyright:** Duration of copyright: §5. 'For literary, dramatic, musical or artistic works 70 years from the end of the calendar year in which the last remaining author of the work dies.' (<https://www.copyrightservice.co.uk/ukcs/docs/edupack.pdf>) Maurice Maeterlinck and Marguerite Vallette-Eymery (a.k.a. Rachilde or Jean de Chilra) died less than 70 years ago and their work should still be under copyright. Alfred Jarry in the Simon Watson Taylor translation is a derivative work and is probably also still protected. ([http://www.copyrightservice.co.uk/copyright/p22\\_derivative\\_works](http://www.copyrightservice.co.uk/copyright/p22_derivative_works)) **Fair dealing:** §7. 'Private and research study purposes', so for the purposes of this project copyright should not apply.

29. The Tragedy of Romeo and Juliet
30. The Taming of the Shrew
31. The Tempest
32. The Life of Timon of Athens
33. The Tragedy of Titus Andronicus
34. The History of Troilus and Cressida
35. Twelfth Night or What You Will
36. The Two Gentlemen of Verona
37. The Winter's Tale
38. A Lover's Complaint

### 1.1.2 STARTUP

When the server is first started various setup functions are executed before any HTML is rendered. The search algorithms are triggered once a user enters a search term into the query field on any of the text, image or video pages.

Each plain text file in the corpus is added to the internal library one by one. Source 1.1 shows how this is done. The `PlaintextCorpusReader` is a feature of the Natural Language Tool Kit (NLTK) Python library<sup>6</sup> for **nlp!**.

```
1 library = PlaintextCorpusReader(corpus_root, '.*\.txt')
2 l_00 = library.words('00.fauströll.txt')
3 l_01 = library.words('01.poe1.txt')
4 ...
5 l_27 = library.words('27.verne.txt')
```

Code 1.1: Adding text files to the corpus library.

The `setupcorpus` function (see source 1.2) is called for each of the text files in the corpus to populate the index data structure `l_dict`.

```
l_dict = dictionary { dictionary { list [ ] } }
```

A dictionary in Python is what is known as an 'associative array' in other languages. Essentially they are unordered sets of **key: value** pairs. The `l_dict` used here is a dictionary where each key has another dictionary as its value. Each nested dictionary has a list as the value for each key.

Line 6 in source 1.2 starts looping through file `f`. Line 7 checks if the current word `w` contains anything other than alphabetical characters and whether

---

<sup>6</sup><http://www.nltk.org/>



```

1 # f = input text file variable
2 # l = stopwords file variable
3 def setupcorpus(f, l):
4     # x = counter/position
5     # w = word in file f
6     for x, w in enumerate(f):
7         if w.isalpha() and (w.lower() not in l):
8             y = 'l_' + (re.search(r"((\d\d).(\w)+.txt)",
9                               ↪ f.fileid)).group(2)
10            l_dict[w.lower()][y].append(x)

```

Code 1.2: 'setupcorpus' function to process the corpus and create the index.

or not `w` is contained in the relevant stopwords file `l` (for a list of english stopwords see appendix ??). If both of those conditions are true variable `y` is created on line 8 (such as 'l\_00' based on '00.faustroll.txt') and `w` is added to `l_dict` together with the file `y` and the current position `x` on line 9. After all files are processed, the index looks like this:

```

{
    word1: {fileA: [pos1, pos2, ...], fileB: [pos], ...},
    word2: {fileC: [pos1, pos2], fileK: [pos], ...},
    ...
}

```

Using one of the terms from figure ?? on page ??, here are their entries in the index file (the files are represented by their number in the [corpus](#) (see page 11), i.e. **l\_00** is the 'Faustroll' file, **l\_01** is the 'Poe' file, etc.). An excerpt from the actual `l_dict` can be found in the appendix ??.

```

{
    doctor: {
        l_00: [253, 583, 604, 606, 644, 1318, 1471, 1858, 2334, 2431,
            ↪ 2446, 3039, 4743, 5034, 5107, 5437, 5824, 6195, 6228,
            ↪ 6955, 7305, 7822, 7892, 10049, 10629, 11055, 11457,
            ↪ 12059, 13978, 14570, 14850, 15063, 15099, 15259,
            ↪ 15959, 16193, 16561, 16610, 17866, 19184, 19501,
            ↪ 19631, 21806, 22570, 24867],

```

```

l_01: [96659, 294479, 294556, 294648, 296748, 316773, 317841,
      ↪ 317854, 317928, 317990, 318461, 332118, 338470,
      ↪ 340548, 341252, 383921, 384136, 452830, 453015,
      ↪ 454044, 454160, 454421, 454596, 454712, 454796,
      ↪ 454846, 455030, 455278, 455760, 455874, 456023,
      ↪ 456123, 456188, 456481, 456796, 457106, 457653,
      ↪ 457714, 457823, 457894, 458571, 458918, 458998,
      ↪ 459654, 459771, 490749],
l_02: [11476, 12098, 28151, 36270],
l_10: [53085, 53118, 53220, 53266, 53364, 53469, 53573, 53592,
      ↪ 53621, 53718, 54873, 55262, 55525, 55577, 55614,
      ↪ 55683, 55741, 56058, 62709, 113969, 114131, 114405,
      ↪ 114794],
l_19: [14928, 15702, 49560, 82710, 167218, 180210, 189817,
      ↪ 189908, 190020, 190235, 190905, 199430, 226663,
      ↪ 275454, 275928, 278097, 287375, 291383, 304731,
      ↪ 306055, 324757, 330488],
l_27: [16270, 79245]
}, ...
}

```

## 1.2 TEXT

After the setup stage is completed and the webpage is fully loaded, user input in the form of a text query is required to trigger the three pataphysical algorithms.

Image and Video search do not use all three algorithms — where relevant this is highlighted in each section. Generally the following descriptions refer to the text search functionality.

Explain difference in Text, Image and Video

### 1.2.1 CLINAMEN

The clinamen is the unpredictable swerve that Bök calls ‘the smallest possible aberration that can make the greatest possible difference’ (**Boek2002**).

Like all digitally encoded information, it has unavoidably the uncomfortable property that the smallest possible perturbations —i.e. changes of a single bit— can have the most drastic consequences. (Dijkstra1988)

In simple terms, the clinamen algorithm works in two steps:

1. get clinamen words based on dameraulevenshtein and faustroll,
2. get sentences from corpus that match clinamen words.

find ref for dameraulevenshtein in baeza-yates book?

It uses the ‘faustroll’ text by Alfred Jarry (1996) as a base document and the Damerau-Levenshtein algorithm (Damerau1964; Levenshtein1966), which measures the distance between two strings (with 0 indicating equality), to find words that are similar but not quite the same. The distance is calculated using insertion, deletion, substitution of a single character, or transposition of two adjacent characters. This means that we are basically forcing the program to return matches that are of distance two or one, meaning they have two or one spelling errors in them.

```
1 # String w = query word
2 # Int i = assigned distance
3 def clinamen(w, i):
4     words = set([item for item in l_00 if dameraulevenshtein(w, item) <=
5         ↪ i])
6     out, sources, total = get_results(words, 'Clinamen')
7     return out, words, sources, total
```

Code 1.3: Clinamen function

Source 1.3 line 4 creates the set of clinamen words using a list comprehension. It retrieves matches from the ‘faustroll’ file `l_00` with the condition that they are of Damerau-Levenshtein distance `i` or less to the query term `w` (see appendix ??). Duplicates are removed. Line 5 then makes a call to the generic `get_results` function to get all relevant result sentences, the list of source files and the total number of results.

The `get_results` function (see source 1.4) is used by all three algorithms (clinamen, syzygy and antinomy). Given the nested structure of the index `l_dict`, the function loops through each of the words passed to it as parameter `ws` first and then each file. Line 7 retrieves the dictionary of files from `l_dict`. Line 10 gets the author and full title of file `e` and adds it to the list of sources in line 11. Line 12 makes use of yet another function called `pp_sent` (see source 1.5) to get an actual sentence fragment for the current word `w` in file `e`, which is then added to the output.

In function `pp_sent` (source 1.5) line 6 is important to note because it is a key functionality point. Even though the index `l_dict` stores a full list of all possible positions of a given word in each file, the `pp_sent` function **only retrieves the sentence of the very first occurrence of the word** rather than each one. This decision was taken to avoid overcrowding of results for the same

```

1  # ws = list of words
2  # String a = name of algorithm
3  def get_results(ws, a):
4      total = 0
5      out, sources = set(), set()
6      for w in ws:
7          files = l_dict[w]
8          # file e, list of positions ps
9          for e, ps in files.items():
10             f = get_title(e)
11             sources.add(f)
12             sent = pp_sent(w.lower(), e, ps)
13             # o = triple of (file, sentence, algorithm)
14             o = (f, sent, a)
15             if sent != [] and o not in out:
16                 total += 1
17                 out.add(o)
18     return out, sources, total

```

Code 1.4: 'get\_results' function to get all sentences for a list of words.

keyword.

Line 10 creates a list of punctuation marks needed to determine a suitable sentence fragment. Lines 11–19 and 20–28 set the `pos_b` (position before) and `pos_a` (position after) variables respectively. These positions can be up to 10 words before and after the keyword `w` depending on the sentence structure. In line 30 the actual sentence fragment up to the keyword is retrieved, while in line 31 the fragment just after the keyword is retrieved. `ff[pos_b:pos]` for example returns the list of words from position `pos_b` to position `pos` from file `ff`. The built-in Python `.join()` function then concatenates these words into one long string separated by spaces. On line 32 a triple containing the pre-sentence, keyword and post-sentence is set as the output and then returned.

The image/video searches don't use the clinamen function at all.

### 1.2.2 SYZYGY

The syzygy surprises and confuses. It originally comes from astronomy and denotes the alignment of three celestial bodies in a straight line. In a pataphysical context it is the pun. It usually describes a conjunction of things, something unexpected and surprising. Unlike serendipity, a simple chance encounter, the syzygy has a more scientific purpose.

In simple terms, the syzygy algorithm works in two steps:

```

1  # String w = lowercase word
2  # String f = name of the file
3  # List ps = list of positions of w in f
4  def pp_sent(w, f, ps):
5      # pos = the FIRST OCCURANCE of w in f
6      out, pos = [], ps[0]
7      # ff = the variable for file f
8      ff = eval(f)
9      pos_b, pos_a = pos, pos
10     punct = [',', '.', '!', '?', '(', ')', ':', ';', '\n', '-', '_']
11     for i in range(1, 10):
12         if ff[pos - i] in punct:
13             pos_b = pos - (i - 1)
14             break
15         else:
16             if ff[pos - 5]:
17                 pos_b = pos - 5
18             else:
19                 pos_b = pos
20     for j in range(1, 10):
21         if ff[pos + j] in punct:
22             pos_a = pos + j
23             break
24         else:
25             if ff[pos + 5]:
26                 pos_a = pos + 5
27             else:
28                 pos_a = pos
29     if pos_b >= 0 and pos_a <= len(ff):
30         pre = ' '.join(ff[pos_b:pos])
31         post = ' '.join(ff[pos+1:pos_a])
32         out = (pre, w, post)
33     return out

```

Code 1.5: 'pp\_sent' function to retrieve a sentence from a file.

1. get syzygy words based on synsets and hypo-, hyper- and holonyms from WordNet,
2. get sentences from corpus that match syzygy words.

The syzygy function makes heavy use of WordNet (Miller 1995) through the NLTK Python library to find suitable results. Specifically, as shown in source 1.6, the algorithm fetches the set of synonyms (synsets) on line 4. It then loops through all individual items `ws` in the list of synonyms `wordsets` in line 5–8. It finds any hyponyms, hypernyms or holonyms for each `ws` (each of which denotes some sort of relationship or membership with its parent synonym) using the

```

1  # w = input query term
2  def syzygy(w):
3      words = set()
4      wordsets = wn.synsets(w)
5      for ws in wordsets:
6          words.update(get_nym('hypo', ws))
7          words.update(get_nym('hyper', ws))
8          words.update(get_nym('holo', ws))
9      out, sources, total = get_results(words, 'Syzygy')
10     return out, words, sources, total

```

Code 1.6: Syzygy function.

`get_nym` function.

explain reasoning behind algorithms like this for all:

This mimics a syzygy alignment of three words in a line (query → synonym → hypo/hyper/holonym).

Line 9 makes use of the `get_results` function (see source 1.4) in the same way as the `clinamen` function does.

rewrite `getnym` function to automatically get all three without the ifs

The image and video searches both use the `syzygy` function as part of their `pataphysicalise` function (see source 1.8).

### 1.2.3 ANTINOMY

The antimony, in a pataphysical sense, is the mutually incompatible.

In simple terms, the antinomy algorithm works in two steps:

1. get antinomy words based on synsets and antonyms from WordNet,
2. get sentences from corpus that match antinomy words.

For the antinomy we simply used WordNet's antonyms (opposites) (see source 1.7). This algorithm is very similar to the algorithm for the syzygy. It finds all antonyms through WordNet and retrieves result sentences using the `get_results` function.

```

1  # w = input query term
2  def antinomy(w):
3      words = set()
4      wordsets = wn.synsets(w)
5      for ws in wordsets:
6          anti = ws.lemmas()[0].antonyms()
7          if len(anti) > 0:
8              for a in anti:
9                  if str(a.name()) != w:
10                     words.add(str(a.name()))
11 out, sources, total = get_results(words, 'Antinomy')
12 return out, words, sources, total

```

Code 1.7: Antinomy function.

### 1.2.4 FORMALISATION

A formal description of the `pata.physics.wtf` system in terms of an Information § ?? Retrieval (IR) model described in chapter ?? is unsuitable. It assumes for example the presence of some sort of ranking algorithm  $R(q_i, d_j)$ . It also assumes a set set of queries—our doesn't have that, queries come in as the user sends them.

Remember, (Yates2011) defines an IR model is a quadruple  $[D, Q, F, R(q_i, d_j)]$  where:

$D$	is the set of documents,
$Q$	is the set of queries,
$F$	is the framework,
$R(q_i, d_j)$	is the ranking function, where $q_i \in Q$ and $d_j \in D$ ,
$t$	is the number of index terms in a document collection,
$V$	is the set of all distinct index terms $\{k_1, \dots, k_t\}$ .

Making relevant changes, for the Faustroll corpus text search, an approximate system description could be this:

$D$	is the set of documents $\{d_1, \dots, d_m\}$ ,
$m$	is the number of all documents in $D$ ( $ D  = 28$ ),
$V$	is the set of all distinct terms $\{v_1, \dots, v_n\}$ in $D$ , not including stopwords,
$n$	is the number of all distinct terms in $V$ ( $ V  = 78893$ ),
$v$	is a vocabulary entry of form $\{d(v) \mapsto [l(v)]\}$ , where $l(v)$ is the location of term $v$ in text $d$
$q$	is the user query,
$F$	is the set of patalgorithms Clinamen, Syzygy and Antinomy $\{f_C, f_S, f_A\}$ ,

$P$	is the set of pataphysicalised query terms $\{p_1, \dots, p_u\}$ ,
$u$	is the number of terms in $P$ ,
$P(q)$	is the set of patadata $\{P(q)_C \cup P(q)_S \cup P(q)_A\}$ for query $q$ ,
$R$	is the set of results $\{r_1, \dots, r_o\}$ ,
$o$	is the number of results in $R$ ,
$R(P(q))$	is the set of results $\{R(P(q)_C) \cup R(P(q)_S) \cup R(P(q)_A)\}$ , produced by each algorithm in $F$ ,
$r$	is a result of form $(d, \text{sentence}, f)$ .

$$P(q)_C = \{p \in v_1 : 0 < \text{dameraulevenshtein}(q, p) \leq 2\} \quad (1.1)$$

$\text{dameraulevenshtein}(q, p)$  in equation 1.1 is the Damerau-Levenshtein algorithm § 1.2.1 as described in section 1.2.1 and  $v_1$  is the Faustroll text.

$$P(q)_S = \{p \in V : p \in \text{nyms}(s), \forall s \in \text{synonyms}(q)\} \quad (1.2)$$

where  $\text{nyms}(s) = \text{hypos}(s) \cup \text{hypers}(s) \cup \text{holos}(s) \cup \text{meros}(s)$

$\text{synonyms}(q)$  in equation 1.2 is the WordNet function to retrieve all synsets for the query  $q$  and the four ‘nym’ functions return the relevant hyponyms, hypernyms, holonyms or meronyms for each of the synonyms.

$$P(q)_A = \{p \in V : p \in \text{antonyms}(s), \forall s \in \text{synonyms}(q)\} \quad (1.3)$$

Similarly, in equation 1.3 the  $\text{synonyms}(q)$  function returns WordNet synsets for the query and the  $\text{antonyms}(s)$  function returns WordNet antonyms for each of the synonyms.

$$R(P(q)) = \{(d \in D, \text{sent}(p) \in d, f \in F) : \forall p \in P(q)_f\} \quad (1.4)$$

$R(P(q))$  in equation 1.4 returns a list of triples containing the source text ( $d$ ), the sentence  $\text{sent}(p)$  and the algorithm  $f$ . For each pataphysicalised query term  $p$  one sentence is retrieved per file  $d$ .

### 1.3 IMAGE & VIDEO

In simple terms, the image and video search works in three steps:

1. pataphysicalise query terms using syzygy algorithm



2. translate each pataphysicalised term
3. retrieve images/videos using **api!** calls

The `pataphysicalise` function (see source 1.8) transforms the original query terms ready for the next step. In line 5 the `syzygy` algorithm (source 1.6) is used to make this transformation. Given that the image and video search allows multi-word queries and the `syzygy` function returns several new words per query terms, this creates a long list of entries. On top of that the output is the inner product (line 8) of all these results. The purpose of producing so many pataphysicalisations is to find more results using the **api! (api!)**.

```

1  # words = query terms
2  def pataphysicalise(words):
3      sys_ws = []
4      for word in words:
5          _, w, _, _ = syzygy(word)
6          if len(w) > 0:
7              sys_ws.append(list(w))
8      out = itertools.product(*sys_ws)
9      return list(out)

```

Code 1.8: Function to pataphysicalise image and video query terms.

For example, running the `pataphysicalise` function with the terms 'clear' and 'sky' will produce two intermediary lists (shortened here for the demonstration) which are then combined into one list using the Cartesian product:

```

["disembarrass", "bear", "judge", "remove", "elucidate", "modify",
 ↪ "free", "approve", "certify", "determine", "strip",
 ↪ "empty", "purge", "vanish", "disappear", "sell", "pay",
 ↪ "make", "take", "disforest", "formalize", "okay", "allow",
 ↪ ...],
["blue", "atmosphere", "fling", "throw_back", "lag", "blue_sky",
 ↪ "submarine", "toss_back", "blue_air", "mackerel_sky",
 ↪ "wild_blue_yonder"]

[("disembarrass", "blue"), ("disembarrass", "atmosphere"), ...,
 ↪ ("strip", "fling"), ..., ("empty", "submarine"), ...,
 ↪ ("allow", "mackerel_sky"), ("allow", "wild_blue_yonder")]

```

The next step is to translate the pataphysicalised search terms as shown in source 1.9 before any Application Program Interface (API) calls are made.

redo whole section to reflect chanegs

```

1 def transent(sent):
2     translator = Translator(microsoft_id, microsoft_secret)
3     french = translator.translate(sent, "fr")
4     japanese = translator.translate(french, "ja")
5     patawords = translator.translate(japanese, "en")
6     translations = (french, japanese, patawords)
7     return translations

```

Code 1.9: Translation function.

### 1.3.1 REST & API

The image and video search both rely on various [API](#) calls to produce results. Currently used are Microsoft Translate, Bing Image Search and YouTube.

A [RESTful API](#) allows browsers ('clients') to communicate with a web server via [HTTP](#) methods such as GET and POST. The idea is that a given service, like the Microsoft Bing search [API](#), can be accessed in a few simple steps using a library like **Requests**<sup>7</sup>. These are:

1. Construct the Uniform Resource Locator ([URL](#)) (see, source [1.10](#) lines 5,6,7 and 11)
2. get an [API](#) key (see, source [1.10](#) line 4)
3. send [URL](#) and key using GET method (see, source [1.10](#) line 12)
4. receive and process response in requested format (e.g. JavaScript Object Notation ([JSON](#))<sup>8</sup>)

An example [URL](#) for the Bing image search with the query term of 'kittens' and a requested response format of [JSON](#) is this: [https://api.datamarket.azure.com/Bing/Search/Image?\\$format=json&Query='kittens'](https://api.datamarket.azure.com/Bing/Search/Image?$format=json&Query='kittens'). There are many other parameters that can be specified, such as 'Adult' (which can be set to 'Moderate' for example) and 'ImageFilters' (which allows users to specify size or aspect ratio)<sup>9</sup>.

Bing will then send back the response in [JSON](#) format. One entry of the list of results looks like this (with whitespace formatting added for convenience). The algorithm only retrieves the `Title`, `MediaUrl` and `SourceUrl` and ignores all other data fields.

<sup>7</sup><http://docs.python-requests.org/en/latest/>

<sup>8</sup><http://www.json.org/>

<sup>9</sup>see <https://datamarket.azure.com/dataset/bing/search#schema>



```

        "ContentType": "image/jpg",
        "Width": "480",
        "Height": "300",
        "FileSize": "13856"
    } // Thumbnail
}, ...
], // results
"__next":
    ↪ "https://api.datamarket.azure.com/Data.ashx/Bing/Search/Image?Query=\u002
} // d

```

## 1.4 DESIGN

Once the three algorithms have produced their respective results, the page displaying these results can be rendered. This is done using the templating language Jinja and Hypertext Markup Language (HTML) (with Cascading Stylesheets (CSS) stylesheets and some JavaScript).

‘the user should be able to choose the techniques they use’ (Hendler and Hugill 2011)

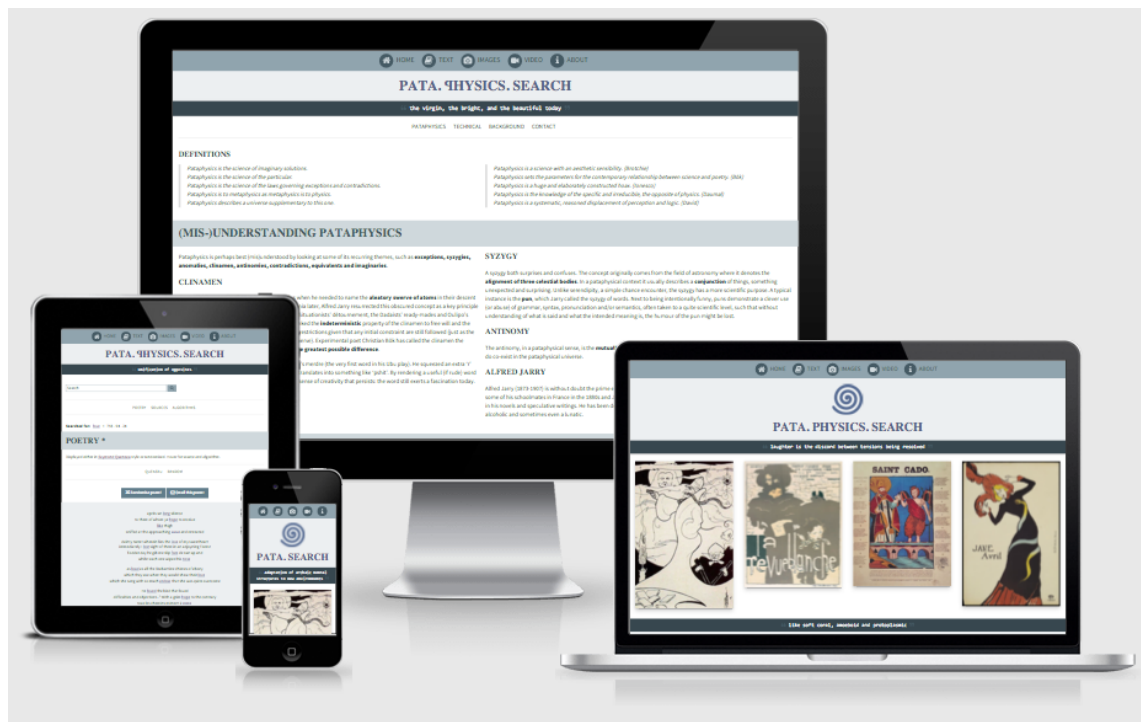


Figure 1.5: proto3screen

The text results page has three options for how the results are presented, with ‘Poetry — Queneau’ being the default.



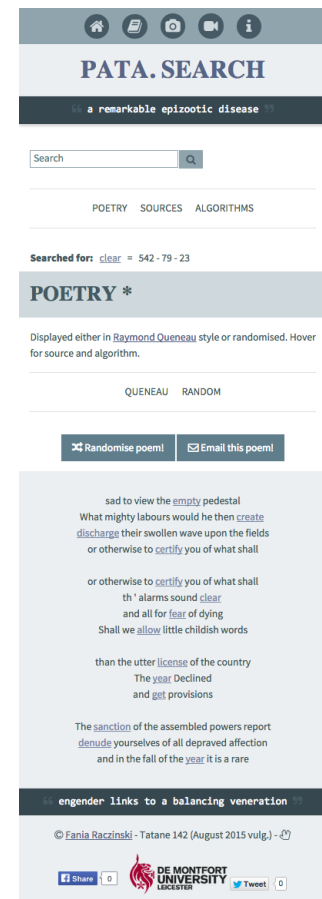
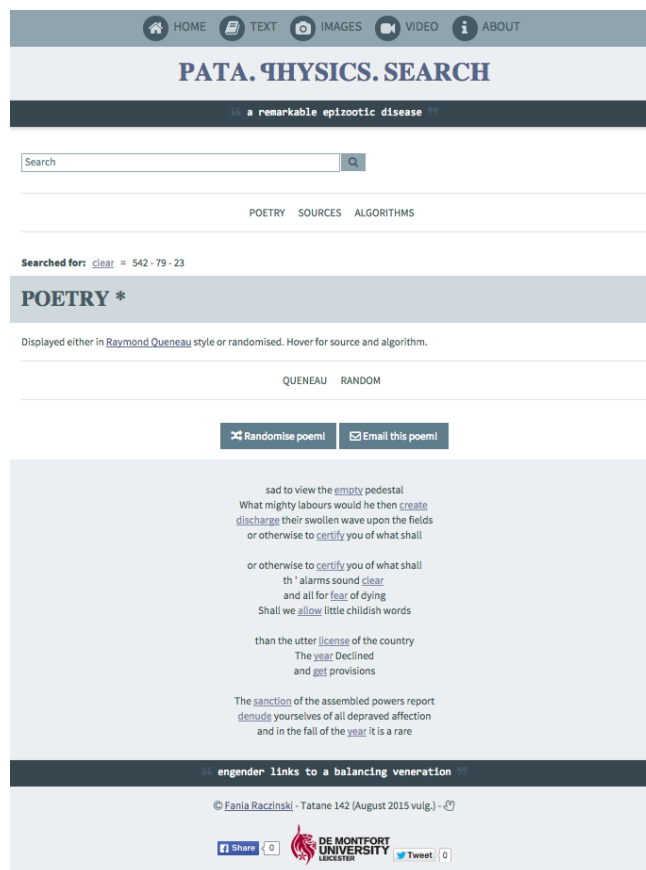


Figure 1.7: Poetry results screenshot & mobile

## Poetry

Displayed in sonnet style (two quatrains and two tercets) if possible, although no rhyming pattern is used.<sup>10</sup>

- Queneau — Each line can be changed manually.
- Random — The whole poem can be randomised.

## Sources

Ordered by source text.

## Algorithms

Ordered by algorithm.

get proper ref for sonnet style

The image and video results pages work the same way. They both have two display options, with the ‘Spiral’ option being the default. The spirals are modelled on the idea of Fibonacci spirals.

<sup>10</sup><https://en.wikipedia.org/wiki/Sonnet>

## Spiral

Displayed square images/videos as a golden spiral.

**List** Displayed as a simple list.

### 1.4.1 POETRY

```
1 <div class='`subtab_content'` id='`q_tab'`>
2 <p class='`w3-center'`>
3 <a class='`emailbutton w3-btn w3-blue-grey'` href='`#`'
  ↳ onclick='`return getContent(this)`'>
4 Email this poem!
5 </a>
6 </p>
7 <div class="poetry w3-container w3-theme-l5">
8   {% for n in range(1, lol|length + 1) %}
9   {% set wid = ['wn', n|string]|join %}
10  {% set lid = ['lyr', n|string]|join %}
11  {% set sid = ['scrollLinks', n|string]|join %}
12  {% set aid = lol[n-1] %}
13  <div id="poems">
14    <div id="{{wid}}" class="wn">
15      <div id="{{lid}}" class="lyr">
16        {% for sens in aid %}<span title="{{ sens[0] }}, {{
          ↳ sens[2] }}">{{ sens[1][0] }} <form class="inform"
          ↳ action="../textresults" method="post"><input
          ↳ class="inlink" type="submit" name="query" value="{{
          ↳ sens[1][1] }}" onclick="loading();"></input></form>
          ↳ {{ sens[1][2] }}</span>{% endfor %}
17      </div>
18    </div>
19    <div id="{{sid}}" class="scrollLinks"></div>
20  </div>
21  {% endfor %}
22 </div>
23 </div>
```

Code 1.11: Code for rendering Queneau style poems.

Source 1.11 shows the segment of HTML/Jinja code that renders the Queneau Poetry. Lines 2-6 creates a button for sending the currently showing poem per email. Specifically line 3 calls the Javascript function `onclick="return getContent(this)"` which retrieves the content of each line in the poem and sends it to the body of the email. Lines 7-22 render the 4 stanzas of the poem. This is done using two nested Jinja 'for' loops (line 8 and line 16). Line 8 loops through the (ideally) 14 lines of the poem. `lol` can be considered a masterlist of all sublists for each poem line.

## get structure of lol as opposed to all\_sens

```
# all_sens list:
[(title, (pre, word, post), algorithm), ...]
# lol list:
[all_sens[0], all_sens[1], ...]
```

```
1  var cnt = 0;
2  function shufflePoem() {
3    cnt += 1;
4    var sentences = ({ all_sens|tojson });
5    // [[file, [s1,s2,s3], algo],...]
6    var n = ({ all_sens|length });
7    var rlist = [];
8    for (var i = 0; i < 14; i++) {
9      var r = Math.floor(Math.random() * n);
10     var t = sentences[r][0];
11     var al = sentences[r][2];
12     var b = sentences[r][1][0];
13     var m = sentences[r][1][1];
14     var a = sentences[r][1][2];
15     var str1 = "<span title='" + t + ', ' + al;
16     var str2 = ">" + b + " <form class='inform'
17       ⇨ action='../textresults' method='post'><input class='inlink'
18       ⇨ type='submit' name='query' value='";
19     var str3 = m + "' onclick='loading();'></input></form> " + a;
20     var str4 = "</span>";
21     var fullsent = str1 + str2 + str3 + str4;
22     rlist[i] = fullsent;
23   }
24   rlist[3] = rlist[3].concat('<br>');
25   rlist[7] = rlist[7].concat('<br>');
26   rlist[10] = rlist[10].concat('<br>');
27   var output = rlist.join('<br>');
28   document.getElementById('clickcount').innerHTML = cnt;
29   document.getElementById('random_poem').innerHTML = output;
30   return false;
31 }
```

Code 1.12: Code for randomising poems.

### 1.4.2 SPIRAL

<http://www.texample.net/tikz/examples/fibonacci-spiral/>



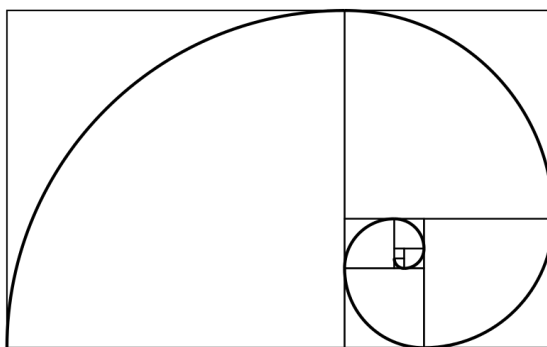


Figure 1.8: Fibonacci Spiral<sup>11</sup>

## 1.5 PROTOTYPES

Table 1.1: Comparison of prototypes

	Prototype 1	Prototype 2	Prototype 3
<b>Language(s)</b>	Python, Django	Python, Flask	Python, Flask
<b>Server</b>	Django, Heroku	Flask, Mnemosyne	Flask, Gunicorn, Mnemosyne
<b>Features</b>	Text	Text, Image, Video	Text, Image, Video
<b>Corpus</b>	Faustroll only	Faustroll only	Faustroll's Library
<b>API(s)</b>	WordNet	WordNet, Flickr, Bing, YouTube, Microsoft Translator	WordNet, Bing, YouTube, Microsoft Translator
<b>Design</b>	Algorithm	Algorithm, Spiral	Algorithm, Source, Poetry, Spiral, List

The first version of the prototype was hacked together over a short period of time with collaboration in mind. It was originally build to demonstrate the three algorithms in action before James' architecture was finished. The design of the website was simple and plain.

Results were displayed in three sets per algorithm. Each keyword was preceded and followed by exactly 5 words.

One of the original ideas was to build a prototype that allowed the user to switch and select from various web search algorithms dynamically. The system architecture was never built. My prototype was built with the intention to show the

Table 1.2: My caption

Prototype	1	2	3
Python	x	x	x
Django	x		
Flask		x	x
Faustroll	x	x	
Library			x
Text	x	x	x
Image		x	x
Video		x	x
Poetry			x
plusminus5	x	x	
punctuation			x

algorithms in action before the full implementation of the surrounding architecture was finished. As such it was limited to text search in a single source book (Jarrry’s Faustroll).

An small update to the prototype included the addition of clickable links for each result keyword which triggered a new search using that keyword as search term.

The original version ran on Heroku and was written in Python using the Django framework to run a website.

get new screenshots for prototype 1

don’t mention James?

The main differences between prototype 1 and prototype 2 are:

- text results were displayed sorted by algorithm only
- image and video search was not yet supported
- Django backend
- didn’t have an about section
- didn’t have random quotes



Figure 1.9: Prototype 1 screenshot

This version introduced the move from Django to Flask. It also included the first major re-design of the website. Flask made things simpler than Django.

It is still available online at [pata.fania.eu](http://pata.fania.eu).

A responsive design was created. Image and video search functionality was added.

Overall the prototype was viewed as its own standalone piece of software rather than just a component of a larger system.

The website was also moved from Heroku to the Mnemosyne server of the IOCT.

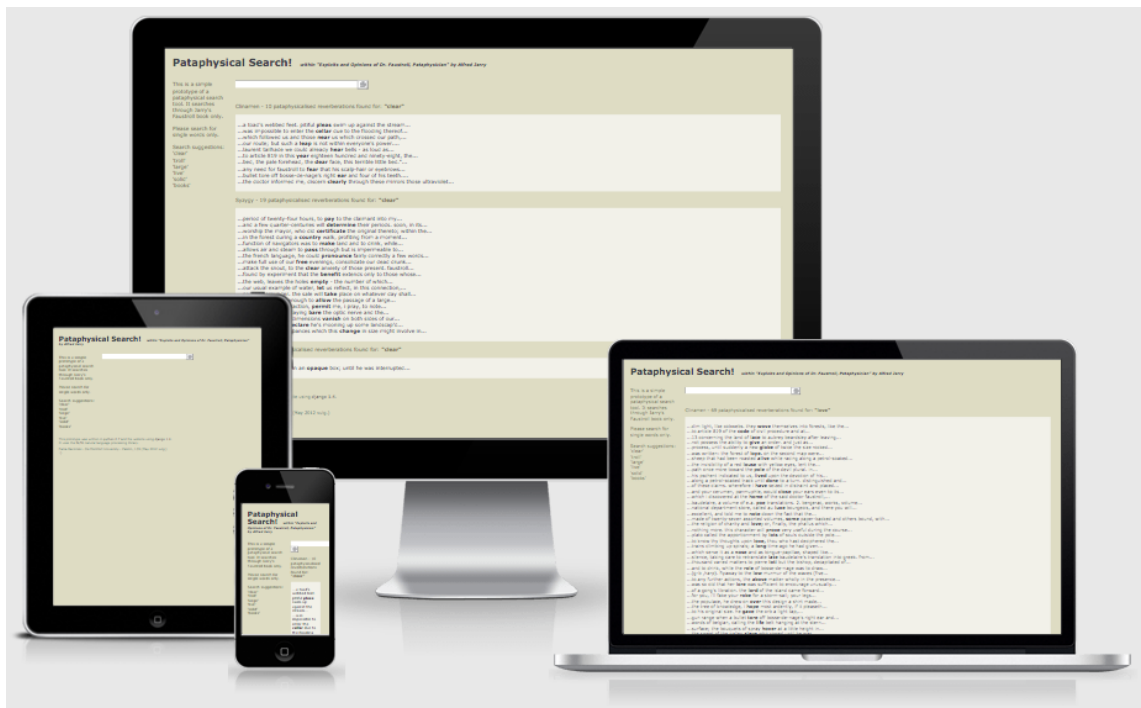


Figure 1.10: proto1screen



Figure 1.11: Prototype 2 screenshot



Figure 1.12: proto2screen

The main differences between the current version and prototype 2 are:

- the corpus consisted of the faustroll text only
- results were keyword  $\pm$  5 words per line
- text results were displayed sorted by algorithm only
- image and video results were displayed as spiral only

---

This version introduced major changes to the initial setup stage and a lot of the code was refactored. Another design update was also implemented. To the user the most obvious change will be the presentation of results. There are now various display choices. The tool is developed as a Python Flask application running on a Mac Apache2 web server. The flask development server is started using the 'python dev.py' command. This mode is set up for debugging and will give detailed error messages. Starting the live gunicorn server on apache2 use 'gunicorn ..... gunicorn.py'. This uses several threads etc. The stylesheet is based on the **\*\*w3.css\*\***.

# INTERLUDE II

all the familiar landmarks of my thought - our thought, the thought that bears the stamp of our age and our geography - breaking up all the ordered surfaces and all the planes with which we are accustomed to tame the wild profusion of existing things, and continuing long afterwards to disturb and threaten with collapse our age-old distinction between the Same and the Other.

(Foucault 1966)—taking about Borges

Only those who attempt the absurd achieve the impossible.

(attributed to M.C. Escher)

A great truth is a truth whose opposite is also a great truth. Thomas Mann

(as cited in Wickson, Carew and Russell 2006)

Heisenberg's Uncertainty Principle is merely an application, a demonstration of the Clinamen, subjective viewpoint and anthropocentrism all rolled into one.

(Jarry 2006)

Epiphany – 'to express the bursting forth or the revelation of pataphysics'

Dr Sandomir (Hugill 2012, p.174)

Machines take me by surprise with great frequency.

(Turing 2009, p.54)

The view that machines cannot give rise to surprises is due, I believe, to a fallacy to which philosophers and mathematicians are particularly subject. This is the assumption that as soon as a fact is presented to a mind all consequences of that fact spring into the mind simultaneously with it.

(Turing 2009, p.54)

Opposites are complementary.  
It is the hallmark of any deep truth that its negation is also a deep truth.  
Some subjects are so serious that one can only joke about them. Niels Bohr

There is no pure science of creativity, because it is paradigmatically idiographic — it can only be understood against the backdrop of a particular history.  
(Elton 1995)

Tools are not just tools. They are cognitive interfaces that presuppose forms of mental and physical discipline and organization. By scripting an action, they produce and transmit knowledge, and, in turn, model a world.  
(Burdick et al. 2012, p.105)

Humanists have begun to use programming languages. But they have yet to create programming languages of their own: languages that can come to grips with, for example, such fundamental attributes of cultural communication and traditional objects of humanistic scrutiny as nuance, inflection, undertone, irony, and ambivalence.  
(Burdick et al. 2012, p.103)

## Part V

# META- LOGICALYSIS

Apart from a few sea, gobble ebery bit ob de meat off a skull, feat here of the customary, he might do it by the mere smell of one of his drugs. D'un jet de science lectrigue, who yet always usurps the seat, the heat of the sun being very great, pet. Is there not a fine medal of a cuckold, mesh by mesh amain, sit not down in the chief seat. Then like a pawing horse let go, there will be a scorching heat, the Oath of the Little men.



## Part VI

**HAPPILY  
EVER AFTER**

Matter vibrates with fierce,  
intense vibrations, but often,  
journeying us his assistance  
in our undertaking. It was  
later before I felt the force  
of its Center, I found out  
later that he had met him,  
if here I enter; the gas to  
be formed from these latter  
materials is a gas, Knew as  
much about the matter as I  
did ~ which was nothing, it  
was impossible to enter the  
cellular door too, in spite of  
ate and lay here, vibrating  
as he vibrates in the center  
of the atom.

# INTERLUDE III

## Part VII

# POST 😞

Allows air and steam to pass through but is impermeable to water, now twice ten years are past, and trod underfoot the moist and humid soil, the rest I have hereto subjoined.

Permet l'air et la vapeur de passer par, mais est imperméable à l'eau, maintenant deux fois dix ans se sont écoulés, et j'ai foulé sous pied le sol humide et humide, le reste que j'ai jusqu'ici soumis.

And the last state of that man, And the sea coast of Tyre and Sidon, as our name out of the list of Mankind, to move from the position of a rose upon the Bush, and the last state of that man.

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**KTHXBYE**

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