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Model Processes Methods Technologies NLP: I.R.I.S
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I) INTRODUCTION

Research topics: Natural Languages¹, NLP Natural Language Processing², Digital Intelligence³

The research topic is as follows: The evolution of communication in the digital age, from the era of the spoken word to the present era of contractualism in the third millennium.

The focus of this study is: to examine the evolution of communication in the digital age, from the era of human speech to the current era of artificial intelligence. This research topic concerns the communicative process of literary communication in the digital domain. It examines the evolution of human intelligence and its interaction with artificial intelligence.

The observation area is as follows: The study of literary communication in the digital domain encompasses techniques, technologies, and models⁴.

The research pathway is divided into three segments and topics:

1. *Humanae litterae* digital text exploration⁵.
2. Automatic digital text.
3. Implementation and Digital Intelligence.

The disciplines involved in this research pathway are as follows: digital human literature, computational philology, computational linguistics, quantum computing, and Artificial Intelligence (AI).

Research Resources

Max Silberstein⁶. The University of Franche-Comté, located in Besançon, France, offers a degree program in this field. ELLIADD.

¹ <https://www.greelane.com/it/humanities/inglese/what-is-a-natural-language-1691422/#:~:text=Un%20linguaggio%20naturale%20C3%A8%20un%20linguaggio%20umano%20C%20come%20l%27inglese,il%20linguaggio%20della%20logicaformale.%20Chiamato%20anche%20C2%A0%20linguaggio%20ordinario.>

² https://blog.osservatori.net/it_it/natural-language-processing-nlp-come-funziona-lelaborazione-del-linguaggio-naturale.

³ [https://www.consapevolmenteconnessi.it/intelligenza-digitale/.](https://www.consapevolmenteconnessi.it/intelligenza-digitale/)

⁴ <https://www.bing.com/search?PC=PV03&FORM=PVSBDF&q=La+comunicazione+letteraria+in+digitale>
<https://www.dipsumdills.it/tx-course/comunicazioneletterariadigitale/>
[https://www.dipsumdills.it/Dialogo sulle traduzioni tradizionali e digitali: nuove prospettive per la traduzione letteraria.](https://www.dipsumdills.it/Dialogo+sulle+traduzioni+tradizionali+e+digitali:+nuove+prospettive+per+la+traduzione+letteraria.)

⁵ https://www.corriere.it/cultura/11_gennaio_08/letteratura-elettronica-internet-rastelli_7e3dfbd4-1af9-11e0-8e74-00144f02aabc.shtml#:~:text=Si%20tratta%20degli%20esponenti%20della%20cosiddetta%20eLiterature%20%28Letteratura,dell%27opera%20ma%20lo%20strumento%20stesso%20della%20sua%20creazione.

⁶ <https://www.researchgate.net/profile/Max-Silberstein.>

Disciplines: Syntax, Semantics, Data Mining, Informatics in the social sciences, arts, and humanities. Skills and Expertise: Corpus linguistics, Grammar, Computational linguistics, Morphology.

M. Planat⁷. FEMTO-ST: Michel Planat FEMTO-ST (Besançon) and Quantum Gravity Research (Los Angeles, USA) Besançon, France Expert in Quantum Computing Institute of Femto-ST Department of Micro Nano Science and Systems (MN2S) Besançon, France.

Andrea Fernanda Rodrigo⁸. The Rosario Department of the National University, Argentina. The Center for the Study of Educational Technologies and Computer Tools for Language Processing is a research center dedicated to the advancement of educational technologies and computer tools for language processing.

In summary, the research studies and analyses conducted between 2019 and 2023 focused on the areas of natural language and Natural Language Processing (NLP), as well as digital intelligence. The model/framework is designed to formalize various complex phenomena in research fields, including humanities, theoretical linguistics, computational linguistics, computerized numerical philology with automatic computation, and software engineering. The pathway is comprised of the following segments: 1. *Humanae litterae* electronic literature; 2. Automatic digital text; 3. Implementation and digital intelligence. The research is limited to the following segments: 1-2- Automatic Digital Text; 3- Implementation and Digital Intelligence.

Exploration of the digital text *Humanae litterae*⁹

The objective is to provide a foundation for the field of computational text analysis. We welcome contributions that include methods and tools for computational text analysis, as well as historical reflections on the evolution of research up to the most recent theoretical frameworks. This encompasses methodologies for the analysis of literary texts and corpora, encompassing computational models for literary criticism on the one hand, and linguistics and computational linguistics research, including natural language processing techniques, on the other. Furthermore, this section welcomes reflections on methods and projects in fields not strictly within the humanities.

II) RESEARCH PHASES:

A- REVIEW OF RELEVANT LITERATURE

A review of relevant literature and a synthesis of the insights gleaned from it. The textual types under consideration are shown below.

1. Project: The objective of this study is to develop language resources for the automatic generation of natural sign language. In addition, the project will investigate language structures, including language mechanisms (transformational and distributive). Furthermore, the project will examine text types and develop a predictive calculation for online language production.
2. Project: Technologies and New Communication Models for Teaching ESP Digital Intelligence. Substantive Differences and Language Mechanisms and New ESP Communication Models.

⁷ <https://www.researchgate.net/profile/Michel-Planat>.

⁸ <https://www.researchgate.net/profile/Andrea-Rodrigo>.

⁹ https://www.corriere.it/cultura/11_gennaio_08/letteratura-elettronica-internet-rastelli_7e3dfbd4-1af9-11e0-00144f02aabc.shtml#:~:text=Si%20tratta%20degli%20esponenti%20della%20cosiddetta%20eLiterature%20%28Letteratura,dell%27opera%20ma%20lo%20strumento%20stesso%20della%20sua%20creazione.

3. The Digital Intelligence Project employs technology models and processes to develop next-generation software for computational and supercomputational transformations, corpus production, local grammars, and databases. The project is led by M. Silberstein and includes contributions from Word tool for digital intelligence, p. Villari; M., F.; R. Bucciarelli *et al.* The project's objective is to edit, translate, and reformulate texts in real time.

B-RESEARCH PROJECTS

A synopsis of the findings and insights gleaned from various studies. The disciplines of mathematics, quantum physics, philosophy, *Humanae litterae*, philology, psychology, and others.

Project: Digital Literary Communication: Techniques and Models. DPH: Validation and Implementation of Quantum Physics: Analysis: Phono-tonal Analysis.

The objective of this study is to investigate the potential of quantum computation for the detection of the emotional triplet described in the Fano Plane.

1.1 The Musicological Model as a Scientific Study of Music¹⁰.

1.2 The Number Sequence of the Fibonacci Series and the Golden Section Compared with Musical Forms¹¹.

Focus: Connections between Music and Mathematics, Repeated Number (Recursiveness), Fibonacci Sequence, the reflection sequence is defined as a group of numbers¹².

The following hypothesis is put forth for consideration: Relational Musical Poetry The concept of recursiveness can be understood as an emotional calculus. Sequence reflection is defined as a group of numbers¹³.

1.3 Project This dissertation examines the implications of digital communication design in a quantum society. It considers the potential of smart technologies and digital intelligence to shape the future of communication.

In the Homeric tradition, the mirror metaphor is employed in DPH or comparative sentences. The field of study is concerned with the interrelationship between groups of phrases in the context of phrase group realizations theory. The relationship between number groups and groups of sentences in number theory for the purpose of solving sentences (or paraphrasing to homologize sentences) is of interest.

¹⁰ [https://www.treccani.it/enciclopedia/musicologia_\(Enciclopedia-Italiana\)/](https://www.treccani.it/enciclopedia/musicologia_(Enciclopedia-Italiana)/).

¹¹ <https://www.musica-spirito.it/musica-2/filosofia/sequenza-di-fibonacci-e-note-musicali/>.

¹² <https://www.musica-spirito.it/singolo-pavane-faure-musica-a-432-hz-integrale/>: Pavane Op. 50 è una composizione di Fauré che farà parte di un CD composto da Musica a 432 Hz Integrale. Si tratta di un lavoro di ricerca che sto portando avanti da alcuni anni con il quale intendo trovare la connessione tra musica, matematica e consapevolezza. Ad esempio, questo brano è composto nella tonalità di Mi minore, una scala che ha forti caratteristiche emotive e che interagisce con le frequenze del sesto Chakra (il terzo occhio). La melodia bella ed espressiva di Fauré permette alla musica di parlare.

¹³ <https://www.studenti.it/sequenza-di-fibonacci-significato.html> di Fibonacci sono numeri interi e quindi, come accennato, lievemente approssimati rispetto all'effettivo valore di S.A. di un segmento, quest'ultimo, al contrario, sempre espresso da un irrazionale. Per conoscere l'esatto valore della S.A. di 144 (a) è sufficiente moltiplicare il nostro numero per 0,618..., coefficiente, questo (Le Nombre d'Or), ottenuto dalla formula di seguito esposta e a sua volta derivata dall'equazione iniziale di cui sopra:

Focus: The Fibonacci series represents a number group (number theory) and a sentence group. It also encompasses reductions and equivalences (Planat *et al.*). Furthermore, it examines the interconnections and roles of mathematical language in formal languages.

1.4 Project: Experimentation in the Cloud Digital Text Workshop: New Solutions for Supercomputing Environments.

Focus: The concept of similarity is fundamental to the concept of synthetic homology. It can be reasonably deduced that: 1. The initial formal process commences with mathematical languages. 2. A potential methodology for transferring data from NLP to AI is presented.

III) PROJECTS 2020-2023

1-PROJECT: LANGUAGE RESOURCES FOR AUTOMATIC GENERATION OF NATURAL SIGN LANGUAGE

Overall goals: The objective is to create a scientific description and produce a natural language for the analysis of speech, specifically focusing on the lemmas and syntax. This will ensure a correct translation and trans codification production, which will have linguistic coherence and be applicable to information and communication sciences.

Brief focus on: Syntactic vocabularies constructed with the goal of providing the most complete and formalized description of a language through data processing.

Description: Corporal phraseology; Dictionary for consultation; Text former.

PUBLICATIONS

- Bucciarelli, R., et al. "Mathematical Analysis and Physics of NLG Languages." (2020) Mathematical Analysis and Physics of NLG Languages.
https://scholar.google.com/scholar?hl=it&as_sdt=0%2C5&q=A.+Bendjoudit&btnG= .
- LANDI, E. Bucciarelli R.; LANDI, A. From grammar to poetic text: lessons in linguistics. Loffredo Editore Napoli, 2000. Bucciarelli, R., Falco, V., & Savarese, G. (2018). Linguistic resources for automatic natural sign language generation. EDUCATION AND TEACHING. International journal of education and training sciences, 16 (2), 13-24.
https://scholar.google.com/scholar?hl=it&as_sdt=0%2C5&q=Ritamaria+Bucciarelli++&og=R.
- Bucciarelli, R. (2014). Lexicography for linguistic corpus description and analysis. Training and Teaching, 12 (4), 389-396.
https://scholar.google.com/scholar?hl=it&as_sdt=0%2C5&q=A.+Bendjoudit&btnG=
https://scholar.google.com/scholar?hl=it&as_sdt=0%2C5&q=Ritamaria+Bucciarelli++&og=.
- R Bucciarelli, R., M., & Villari, P. (2016). Working tools: tablets for inclusive education. EDUCATION AND TEACHING. International Journal of Education and Training Sciences, 14(2), 203-210.
https://scholar.google.com/scholar?start=10&q=Ritamaria+maria+Bucciarelli&hl=en&as_sdt=0.5.

2- PROJECT: TECHNOLOGIES AND NEW COMMUNICATION MODELS FOR TEACHING ESP DIGITAL INTELLIGENCE

Overall goals: to transfer the different textures (ESP-DPH) LNG-NLP through the application of cloud techniques.

Brief focus on: ESP professional languages.

Description: input languages and methodology for professional text processing.

PUBLICATIONS

- Ritamaria Bucciarelli, Roberto Capone, Marianna Greco, Javier Julian Enriquez, Francesca Santoro, Raffaele Marcone, Francesco Saverio Tortoriello (1), Technologies and new communication models for teaching ESP digital intelligence (September 2019). Technologies and new communication models for teaching ESP digital intelligence. In New methods of teaching and learning Ememitalia 2019 (Vol. 8) <https://hal.science/hal-03725354/>.
- R. Bucciarelli Capone, FS Tortoriello, M. Greco, G. Savarese, Javier Enriquez, Learning Analytics - Scientific description and heuristic validation of NLG languages in Volume 15, no. 3 (2019) Journal of e-Learning and Knowledge Society - Focus on: Learning Analytics: for a dialogue between teaching practices and educational research, 251-261 R. Bucciarelli. <https://hal.open-archives.fr/hal-03690838/> .
- Bucciarelli, R., Marcone, R., Santoro, F. and Dolci, C. (2017). Technology and languages of the new economy. Salerno IRIS in the text (Bucciarelli, 2017). https://issue.com/pensamultimedia/docs/f_i_unique-compressed.
- Julian Enriquez, Javier & Capone, Roberto & Tortoriello, Francesco & Bucciarelli, Ritamaria & Greco, Marianna & Franceschini, Samuela & Ivanov, Anastas. (2019). Technologies and new communication models for a didactic of digital intelligence ESP. https://www.researchgate.net/publication/333017162_Technologies_and_new_communication_models_for_a_didactic_of_digital_intelligence_ESP.
- Bucciarelli, Ritamaria & Giampieretti, Federica & Alkoby, Karen. (2019). Technologies and languages in the society of acronyms. https://www.researchgate.net/publication/330728178_Technologies_and_languages_in_the_society_of_acronyms/stats.

3- DIGITAL INTELLIGENCE: TECHNOLOGY MODELS – PROCESSES

Software:

©Race Type M. Renda, A R. Bucciarelli POLO Team University of Salerno, corpus of lemmas for the completion of words and sentences and paraphrases of sentences

©Intelligenza Digitale Acro - Parola R. Bucciarelli; P. Villari, MF, R. Marcone, F. Santoro: DB language development environments and text reformulators with natural language cloud techniques.

©Word-Tool, R. Bucciarelli; P. Villari, FM, M. Greco, R. Marcone, F. Santoro: Text editor for text formulation and NG language conversion (L1 to L2), real-time translator.

PUBLICATIONS

- Bucciarelli, R., M., & Villari, P. (2016). Working tools: tablets for inclusive education. Training and teaching, 14 (2 Suppl.), 203-210. https://scholar.google.pt/scholar?hl=it&as_sdt=0%2C5&q=Work-Tools%3A+Tablet+for+Inclusive+Education&btnG=.
- Bucciarelli, R., Falco, V., & Savarese, G. (2018). Language resources for the automatic generation of natural sign language. Education and training, 16 (2 suppl.), 13-24. https://scholar.google.pt/scholar?hl=en&as_sdt=0%2C5&q=Linguistic+resources+for+a+automatic+generation+of+natural+sign+language&btnG=.

- Bucciarelli, Ritamaria & Villari, Pasquale & Santoro, Francesca & Terrone, Francesco & Terrone, Maria & la Ragione, Colomba & Giulio, Rosa & Marcone, Raffaele & Tortoriello, Francesco & Capone, Roberto & Savarese, Giulia & Julian Enriquez, Javier & Greco, Marianna & Franceschini, Samuela & Alkoby, Karen. (2019). *Intelligenza digitale Word - Tool: modelli tecniche e tecnologie L-M-I*.
https://www.researchgate.net/publication/337945944_Intelligenza_digitale_Word_-_Tool_modelli_tecniche_e_tecnologie_L-M-I¹⁴

4- PROJECT: DIGITAL LITERARY COMMUNICATION: DPH TECHNIQUES AND MODELS: QUANTUM PHYSICS VALIDATION AND IMPLEMENTATION¹⁵

Model: Musicological-Quantitative

Objectives: Sentiment analysis; Recursive processes - comparison of models: Dante Alighieri between rhetoric and graphs; Sentiment analysis: Comparative analysis, Fano's plane analysis of the Adagietto in Visconti's *death in Venice* - Dante Alighieri's *La Divina Commedia*.

Competencies to be acquired: this course will examine recursive processes and structures, with a particular focus on recursion in language. The development of recursive transition networks for the processing of applications of quantum techniques and theories of comprehension. A comparison of tonal analysis B is presented below. The objective of focal analysis DA is to describe the emotional traits of Dante's triplet through the lens of Fibonacci theories. Translate the data into a formal language for emotion detection and utilize linguistic computational tools for scientific validation.

Overview of the study approach and the requisite skills

Guiding text: Planat-literary words and a fundamental homomorphism - The dominant geometric linguistic context.

1. The objective of this study is to gain an understanding of the problem presented in the mathematical file. A study of Kurt Gödel's contributions to musical logic offers insights into the life and work of a polymath who was a logician, philosopher, and mathematician. From Gödel's theorem to feedback, and from axiomatic reasoning to the theorem. The extension theorems DEF axiom rules, Mumon and Godel.
2. The concept of recursive structures and processes is discussed in Gödel, Escher, Bach (pp. 137, 160). This is followed by an examination of linguistic recursion, descriptions, and computational systems¹⁶.
3. J. Pustejovsky's generative lexicon provides a theoretical framework for lexical semantics, which is situated within the broader context of the Qualia structure theory and is informed by a range of empirical studies in computational tools and lexicology.
4. A study of the description and application of graph theory in the field of network science¹⁷.

Analysis of the guide text:

- ✓ Planat, two-letter words and a fundamental homomorphism, the dominant geometric linguistic context 1, for understanding the problem (fil. Mat): A study of musical logic in Kurt Gödel, a logician, philosopher, and mathematician, reveals insights into Gödel's

¹⁴ <https://accademiadellacrusca.it/it/contenuti/banche-dati-corpora-e-archivi-testuali/6228>.

¹⁵ <https://www.dantecommedia.it/>
<https://www.dantecommedia.it/index.html?ms=Triv&n=45&page=22v>.

¹⁶ dagli usi, I. A. B. D., & lessicali, d. Lessicografia e dizionari elettronici.

¹⁷ dagli usi, I. A. B. D., & lessicali, d. Lessicografia e dizionari elettronici.

theorem and its applications in axiomatic reasoning, including extensions of the theorems and axiom rules. Gödel's work is also linked to Mumon and Godel¹⁸.

- ✓ Recursive structures and processes (Gödel, Escher, Bach, pp. 137, 160), recursive linguistic descriptions and computational systems¹⁹.
- ✓ The generative lexicon of J. Pustejovsky²⁰ to outline a theory of lexical semantics, in the structure theory of the *Qualia* and interesting for studies for computational tools for lexicology.
- ✓ Studies for the description and application of graph theory in Network Science²¹.

Acquired experience:

Sentence decomposition is a fundamental concept in semantic theory, group and graph theories, and quantum physics theories. It is also a key area of investigation in the study of SA in relation to the formal sphere. The subject matter encompasses recursiveness in musical and linguistic structures, as well as the concept of geometric structures, mathematical functions, physical and automatic theories.

Insight: the study of recursive processes and comparative models is a field of inquiry that has been the subject of considerable interest in recent years. Dante Alighieri's work represents a synthesis of rhetoric and graphics, with the objective of achieving a comprehensive understanding of the human condition. Sentimental analysis Comparative analysis: Fano's analysis of the *Adagietto in the Death of Visconti in Venice*, as presented in Dante Alighieri's *Divine Comedy*.

Description: This paper will examine recursive processes and structures, with a particular focus on recursion in linguistics. The objective of this research is to develop recursive transition networks for processing applications of quantum understanding techniques and theories. A comparison of tonal analysis B is presented below. The purpose of phonon analysis is to describe the emotional traits of Dante's triplet using a test guide derived from Fibonacci theories. The data must be transferred into a formal language for the purpose of emotion detection and the use of computational language tools for scientific validation.

MM.FF.NN. M. PLANAT: Communications and Vision Support Papers

- Planat, M.; Aschheim, R.; Amaral, M.M.; Zanna, F.; Irwin, K. (2016), "Quantum Information in Protein Codes, 3-Varieties, and Kummer Surfaces," *Symmetry* 2020, 13, 1146.
- Planat, Michel, et al. (2020). "Quantum computation and measurements from an exotic R4 spacetime." *Symmetry* 12.5 (2020): 736.
- Planat, Michael. "It from qubits: A Method for Drawing Quantum Contextuality." *Information* 5.2 (2014): 209-218.
- Planat, Michael. "Two-letter words and a fundamental homomorphism governing geometric contextuality." arXiv preprint arXiv: 1605.07118 (2016).
- Planat, M., & Saniga, M. (2007). On Pauli's papers from N-qudits. arXiv preprint quant-ph/0701211.

¹⁸ *Fraasi indesiderabili formalmente finite i Principia Mathematica e sistemi correlati* «Numeri mensili di Matematica e Fisica », Vol. 38, [1931](#). Disponibile in una traduzione in [Inglese](#) di Martin Hirzel ·, 2000, [che è Nel Archivio Internet](#) Archiviata dall'originale il 19 marzo 2012 .

¹⁹ Gödel, Escher, Bach: un'eterna ghirlanda brillante: ADELPHI.

²⁰ Mastrofini, R. (2007). Il lessico verbale dell'italiano come L2: tipologie di errore e rilevanza del contesto. *Il lessico verbale dell'italiano come L2*, 1000-1035.

²¹ Mastrofini, R. (2007). Il lessico verbale dell'italiano come L2: tipologie di errore e rilevanza del contesto. *Il lessico verbale dell'italiano come L2*, 1000-1035.

Michel Planat offers a quantum interpretation of the triple Paradise of Canto XXXIII of the *Divine Comedy* and the Inferno of Canto III of the *Divine Comedy*. In the Fano Triangle, we are grateful for the support and modes of communication provided by ResearchGate.

PUBLICATION

- Terrone, Francesco & Gagliardi, Nicoletta & Capone, Roberto & Alkoby, Karen & Julian Enriquez, Javier & Greco, Marianna & Bucciarelli, Ritamaria. (2020). DPH: Validation and implementation of quantum physics: the Fano solving plan of Dantesque Rhetoric. https://www.researchgate.net/publication/344626660_DPH_Validation_and_implementation_of_quantum_physics_the_Fano_solving_plan_of_Dantesque_Rhetoric

5. PROJECT EXPERIENCE: HOMER DIGITAL COMMUNICATION DESIGN IN A QUANTUM SOCIETY: SMART TECHNOLOGIES AND DIGITAL INTELLIGENCE (Project: Technologies, Robotics and Nanotechnologies for Digital Education)

Tools: a probabilistic analysis of the elements in semantic Web environments for quantum computation was conducted using the NooJ system. The results were published in Digital Intelligence A.W.

Objective: to examine the Homeric tradition in the DPH sentence. The mirror metaphor is employed to describe a world, a culture, or a tradition. Furthermore, the transformation of a literary text into a digital text is investigated through the lens of natural language processing (NLP)²².

Description:

The objective of this study is to reconstruct a scientifically valid computational and mathematical quantum linguistic model that focuses on the reduction process of a digital transformation. Additionally, this study presents a lexicon-grammatical and diz LEF linguistic model for the reduction of verse into classes and categories. This scientific process initiates the transformation of verse from a Greek code into a formal code.

Comparative phrases in the mirror metaphor: Homer is informed that philology cannot be reconstructed, and thus the metaphor of the vine in the comparative form of the imagery of a people's tradition can serve as the necessary mechanism for DPH. As a fixed phrase, it lends itself well to being translated into acronyms, graphs, and diz. The term "electronic" is used in this context.

PUBLICATIONS

- Bucciarelli, R., Tortoriello, F. S., Rodrigo, A. A., Enriquez, J. J., La Ragione, C. C., & Veronesi, I. (2021, February). The integration of intelligent technologies and digital intelligence. In the webinar series "Theories and Practices of Annotation through Domain-Specific Languages," which spanned from Fall 2020 to Spring 2021, Ritamaria Bucciarelli and colleagues presented a lecture entitled "Intelligent Technologies and Digital Intelligence." The presentation is available for download in PDF format at the following link: <https://cophilab.ilc.cnr.it/euforia2021/slides/08-bucciarelli-et-al-ita.pdf>. For more information about the webinar, please visit the following website: <http://www.ilc.cnr.it/content/webinar-euforia-2021-euforia-2021>.
- Bucciarelli, Ritamaria & Savarese, Giulia & Gagliardi, Nicoletta & Greco, Marianna & Julian Enriquez, Javier & Franceschini, Samuela. (2020). SMART TECHNOLOGIES AND DIGITAL INTELLIGENCES: CROSS TECHNIQUES AND VALIDATIONS. https://www.researchgate.net/publication/342987547_SMART_TECHNOLOGIES_AND_DIGITAL_INTELLIGENCES_CROSS_TECHNIQUES_AND_VALIDATIONS

²² [Natural Language Processing, cos'è, come funziona, applicazioni e Python \(ai4business.it\)](https://www.ai4business.it/natural-language-processing-cos-e-come-funziona-applicazioni-e-python).

- Ritamaria Bucciarelli, Francesco Saverio Tortoriello, Andrea Rodrigo, Javier Julian Enriquez, Colomba La Ragione, et al. Smart technologies and digital intelligence. *Webinar series in Theories and Practices of the Annotation through Domain-Specific Languages Fall 2020 - Spring 2021* Ritamaria Bucciarelli et al., *Smart technologies and digital intelligence*, Feb 2021, Venice, Italy. <https://hal.science/hal-03741253>.

6. PROJECT-EXPERIENCE: THE DIGITAL TEXT WORKSHOP CLOUD, NEW SOLUTIONS FOR SUPERCOMPUTING ENVIRONMENTS

Project²³: the study of nonlocal communication structures is enhanced using graphic coverings. These coverings facilitate the description, analysis, and validation of such structures. The research interest score for this article is 14.7, which is higher than the average score for all research articles. The research interest score of this article is higher than 89% of research articles related to the following disciplines: Computational Linguistics; Respect by Discipline. The research interest score for this article is higher than 87% of research articles related to: The field of Computation Theory.

Reference model

This study examines the use of graph coverings in the analysis of nonlocal structures in proteins, music, and poems. The authors of this study are Michel Planat, Raymond Aschheim, Marcelo M. Amaral, Fang, and Klee Irwin.

The following references are included in this study:

- Planat, M., Aschheim, R., Amaral, MM, Fang, F., & Irwin, K. (2021). The use of graphs in the study of nonlocal structures in proteins, music, and poems. For further information, please refer to *Sci*, 3 (4), 39: <https://www.mdpi.com/2413-4155/3/4/39/htm>.

Description:

Analogy Process: The team produces analogies. In the first analogy, we explore structural similarities in three different languages: protein language, whose primary letters are amino acids; musical language, whose primary letters are annotated; and poetic language, whose primary letters are in the alphabet²⁴. We then proceed to a mathematical theory. Our mathematical theory of secondary structures in proteins, music, and poetry is based on the concept of finitely generated groups and corresponding graphical superpositions. This concept is explained in the Planat project, "Mathematics and poetry, in view of machine learning," Planat *et al.* (2021). Our current group theoretical approach to protein language²⁵. ... It could be converted into an understanding of poetic language, as well as an understanding of some other domains. In this paper, French physicists have already developed an automated process for reducing classes and categories into groups according to finite groups. Our team has reported their results in NooJ's grammar.

Objective: to transfer the mathematical theories of M. Planat into formal linguistic structures.

Description

Descriptions of the techniques employed is provided below. In accordance with the assumptions proposed by M. Planat and colleagues, we proceed as follows:

²³

https://www.researchgate.net/publication/355116190_GRAPHIC_COVERINGS_TO_STUDY_NON_LOCAL_STRUCTURES_OF_COMMUNICATION_DESCRIPTIONS_ANALYSIS_VALIDATIONS Magazen Lieu x -methodologies -processus et validations/stats.

²⁴ [Grafico Michel Planat , Raymond Aschheim , Marcelo M. Amaral , Fang Fang e Klee Irwin p](#)

²⁵ _Pagina 2 seq _ 3,

1. Transfer data from the Seq.
2. Transfer of the Baudelaire text from the mathematical code, with quantum detections (SA), to the lexicon-grammatical code (NooJ).
 - 2.1. Transfer of data to the Nooj environment for the construction and analysis of graphs for frequency validation.
 - 2.2. Construction of the corpus and local grammars.
3. Translation, reformulation, and editing of the text into digital.

This process results in the transformation of the input textual typology (literary into target typology) from a fixed, homologous, and synthetic state.

The process of reading, providing support, and exercising expert judgment is fundamental to the advancement of knowledge.

-Graphic coverings for the study of nonlocal structures in protein, music, and poetry

The following report presents the findings of the analysis. The analysis features graphs, translations, and reformulations created with the software on the GPT model, accessible via the following link: <https://www.femto-st.fr/en/Research-departments/DISC/Research-groups/AND>.

6.1 DESCRIPTION OF THE PRACTICAL PROCESS

A description of the reproductive process is provided below. The French language²⁶ has been reformulated in digital form.

Seq. 2 XVI

Chinese see time in cats' eyes.

[...] The boy from the Celestial Empire hesitated at first; then, changing his mind, he replied, I will tell you. A few moments later he reappeared, holding a large cat in his arms, and looking him, as they say, straight in the eye, he stated without hesitation: 'It is not yet noon. "What was true [...]

This represents an irrefutable validation in the mathematical logic of data transfer from narrative textual typology to digital typology, marking the beginning of a formal process²⁷.

Graph coverages and group actions are closely related.

We start with an enumeration of integer partitions of d that satisfy.....

²⁶ I grafici, l'analisi linguistica e il calcolo delle frasi di co-occorrenza sono stati eseguiti con il software Nooj. La traduzione e la riformulazione dei testi sono state eseguite con software di Digital Intelligence.

²⁷ Copertine grafiche per l'indagine di strutture non locali in Proteine, Musica e Poesie Pag 2 Michel Planat 1,* , † , Raymond Aschheim 2,† , Marcelo M. Amaral 2,† , Fang Fang 2,† e Klee Irwin 2,†.

Table 1. The number $\text{Isoc}(X; d)$ for small values of first Betti number r (alias the number of generators of the free group F_r) and index d . Thus, the columns correspond to the number of conjugacy classes of subgroups of index d in the free group of rank r .

r	$d = 1$	$d = 2$	$d = 3$	$d = 4$	$d = 5$	$d = 6$	$d = 7$
1	1	1	1	1	1	1	1
2	1	3	7	26	97	624	4163
3	1	7	41	604	13,753	504,243	24,824,785
4	1	15	235	14,120	1,712,845	371,515,454	127,635,996,839
5	1	31	1361	334,576	207,009,649	268,530,771,271	644,969,015,852,641

Le Gamin du Céleste Empire ... Ce Qui était Vrai.	Card. Seq. of cc of Subgroups	r
3 letters: $\text{rel} = C^2 H^5 C^2 H^7 H^6 E^6 C^7 C C^4 C C^2 E^8 C \dots$	[1,3,7,34,131]	2
4 letters: $\text{rel} = C^2 H^5 A^2 H^7 H^6 E^6 C^7 C C^4 C C^2 E^8 C \dots$	[1,7,41,636,14364]	3
5 letters: $\text{rel} = C^2 H^5 A^2 H^7 H^6 E^6 B^7 C B^4 C C^2 E^8 C \dots$	[1,15,235,14376,...]	4

The Fibonacci series is calculated, and homophonic iteration is performed²⁸.

Game 1 of cé 1 on 2 ste 3 E 5 mpire 8 h 13 sita first; then, delighting, he replied, "I will tell you: 1 1 2 3 5 8 13.

Sentence M. Word or idiomatic = The Chinese see time in the eyes of cats.

... *looking at it, as they say, in the whites of the eyes...* = N 0 V as C 1.

NooJ, Max Silberstein²⁹ -Digital Intelligence, W.T, CHAT, GPT Technologies, R. Bucciarelli et al.³⁰

- M. Renda and A. R. Bucciarelli, POLO team, University of Salerno, Corpus of Lemmas for Word and Sentence Completion and Sentence Paraphrasing.
- R. Bucciarelli, P. Villari, M. F., R. Marcone, and F. Santoro, Digital Intelligence Acro: Word, Language Development Environments and Text Reformulator with Natural Language Cloud Techniques.
- The Word Tool, developed by R. Bucciarelli, P. Villari, M. Greco, R. Marcone, and F. Santoro, is a text formulation editor and NLG language conversion (L1 to L2) system that functions as a real-time translator. fi...

²⁸ La tecnica ricorsiva è stata condotta sul calcolo elementare delle sillabe e sulla ripetizione fonica di un'analisi fonica (Silvestri 2014, p. 214)

²⁹ <https://atishs.univ-fcomte.fr/nooj/index.html> Sviluppare risorse linguistiche per formalizzare vari fenomeni linguistici a livello ortografico, lessicale, morfologico, sintattico e semantico, per qualsiasi lingua naturale (Linguistica).

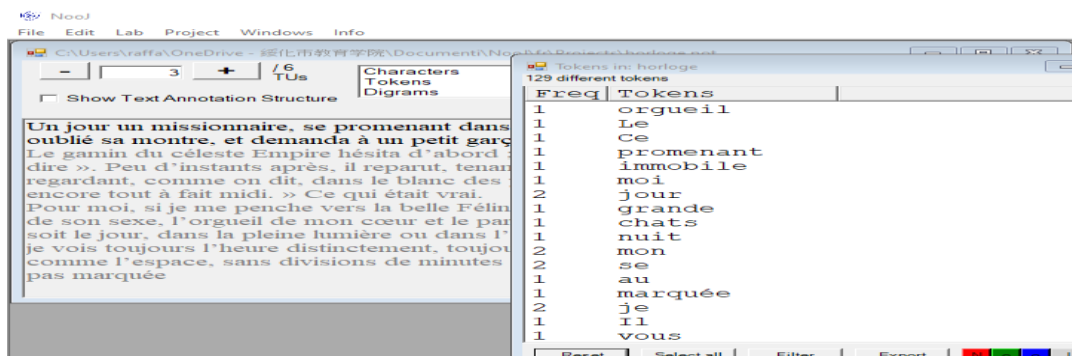
→ Crea i tuoi corpora di testi, applica queste risorse linguistiche ad essi e poi esegui varie analisi statistiche in Corpus Linguistics e Digital Humanities.

→ Utilizzare il motore e le risorse linguistiche di NooJ per costruire applicazioni di elaborazione del linguaggio naturale.

³⁰ https://www.linguistics.unisa.it/gruppidiricerca/ling_comp/gruppo1: Il Laboratorio "Maurice Gross", cui il gruppo afferisce, si occupa di diverse ricerche come la creazione di grammatiche formalizzate delle lingue europee, con particolare attenzione per l'italiano, per il quale sono state già realizzate ampie classificazioni lessico-grammaticali, dizionari elettronici e grammatiche locali basate sulla creazione di automi a stati finiti. Il software di analisi linguistica maggiormente utilizzato è NOOJ, programma per il trattamento automatico del linguaggio naturale elaborato da Max Silberstein, evoluzione di INTEX a cui Silberstein ha lavorato nel decennio 1992-2002 sotto la guida di Maurice Gross al LADL.



Graphic looking at it, as they say, in the whites of the eyes ... = N 0 V as C 1



Language analysis and token detection

A homage and a translation

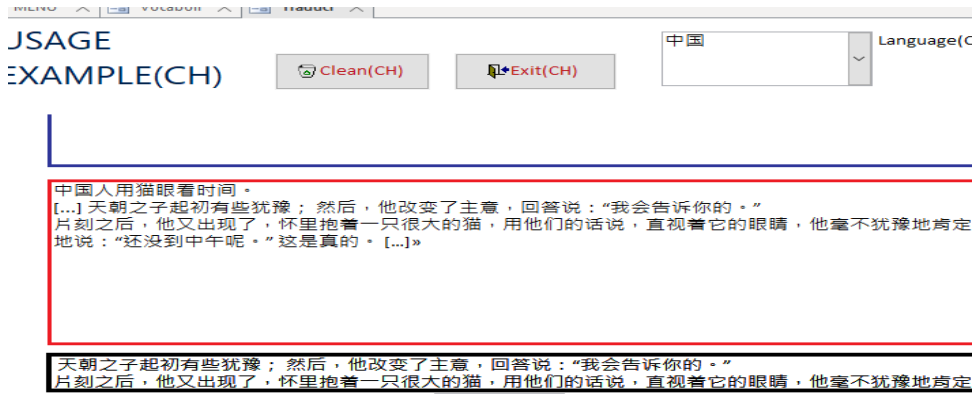
Fig. Environment Digital Intelligence Word Tool R. Bucciarelli; P. Villari *et al.*



³¹ Nooj M. Silberztein ambiente digitale: produzione di grafici e analisi sintattica è stato riprodotto dagli autori per domini.

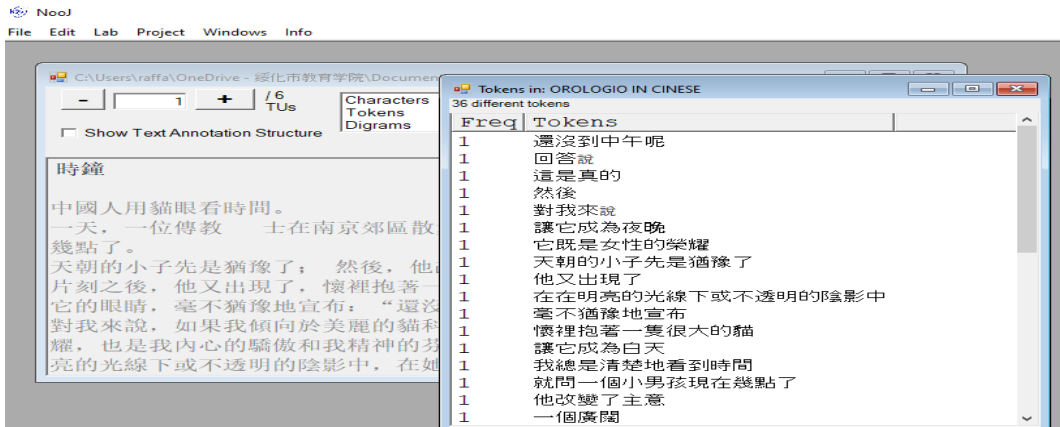
³² L'analisi sintattica dei grafi e la supercomputazione sono state eseguite sul programma Nooj da Ritamaria Bucciarelli e Andrea Fernanda Rodrigo.

³³ Le grammatiche e i corpus locali sono stati costruiti con il sistema software del sistema Adalta di Matematica. eseguita da R. Bucciarelli, F. Tortoriello, I Veronesi. Con il Digital Intelligence W. Tool sono stati tradotti e curati e tradotti dalla lingua francese, in inglese e cinese dal gruppo di ric. Infine, i due software sono stati utilizzati per ottenere un test di riformulazione.



Translation: Transferring C. Baudelaire's text into digital languages (French to Chinese translation)

The NooJ language analysis and token detection software



A tribute to William Shakespeare³⁴: phono tonal analysis and a reformulation of language in the musicality of tenses



PUBLICATIONS

- Veronesi, I., Bucciarelli, R., Tortoriello, FS, Rodrigo, A., Greco, M., , C., & Enriquez, J.J (2023, January). The reason for digital text cloud workshops, new solutions for supercomputing environments. In Formalizing Natural Languages: Applications to Natural Language Processing and Digital Humanities: 16th International Conference, NooJ 2022, Rosario, Argentina, June 14-16, 2022, Revised Selected Papers (pp. 202-213). Cham: Springer Nature Switzerland. Available at: https://rehip.unr.edu.ar/xmlui/bitstream/handle/2133/24913/XVI%20International%20NooJ%20Conference%202022-Rosario%2C%20Argentina-Libro%20de%20abstracts.pdf?sequence=3#_pagina=37.
https://link.springer.com/chapter/10.1007/978-3-031-23317-3_17.
- Iliara Veronesi, Ritamaria Bucciarelli, Francesco Saverio Tortoriello, Andrea Rodrigo, Marianna Greco, Colomba, Javier Julian Enriquez. The cloud digital text workshop, new solutions for supercomputing environments. 2023. HAL reason ID: hal-03919524. Available at: <https://hal.science/hal-03919524>.

IV) CONCLUSION AND CONSIDERATIONS

Starting assumptions Communication in digital: Exploration of NLG languages: Focus Type of input and type of output. Projects and Experiences:

1. Scientific Reference Model: A combination of musicological and quantitative analysis, coupled with an in-depth examination of sound and tonal elements. The issue of recursivity and the detection of SA is also worthy of consideration.
2. Relation: The concentration of numerical syntagmas on finite groups and classes.
3. A demonstration of the transformation of literary text into digital text.

RELEVANT PUBLICATIONS

- Validation and Implementation of Quantum Physics: The Solution Plan of Dante's Rhetoric of Fano: https://www.researchgate.net/publication/344626660_DPH_Validation_and_implementation_of_quantum_physics_the_Fano_solving_plan_of_Dantesque_Rhetoric.
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V) APPENDIX

SOURCE: REVISTA APRENDO CON NOOJ: NooJ is a linguistic development environment that provides tools for linguists to construct linguistic resources that formalize many linguistic phenomena: typography, orthography, lexicons for simple words, multiword units and discontinuous expressions, inflectional, derivational and agglutinative morphology, local, phrase-structure and dependency grammars, as well as trans-formational and semantic grammars. NooJ contains a rich toolbox that allows linguists to construct, maintain, test, debug, accumulate and share linguistic re-sources. This makes NooJ's approach different from most other computational linguistic tools that typically offer a unique formalism to their users and are not compatible with each other. <https://aprendoconnooj.unr.edu.ar/index.php/revista/index>.

THE STUDY OF DIGITAL LITERARY COMMUNICATION

Abstract

This work presents research into the transition from literary textuality to digital textuality, or from a narrative text in code. The approach of this work is based on the work of Charles Baudelaire, *Les Petits Poèmes en prose*, as well as the formalization of various linguistic descriptions using NooJ.

This work will examine the mathematical model proposed by French experts, as well as the points of contact and structural equivalences between mathematical theory and computational linguistics. Furthermore, it will identify a novel research avenue that generates a novel mathematical, linguistic, and computer science multi-code paradigm. Hence, it is concerned with the formal process of literary production and its encounter with digital intelligence. Mathematicians and logicians initially identified that in formal systems, the meaning and form of the knowable and nature could be discerned. It can be surmised, therefore, that contemporary communication is formal in nature, comprising systems, axioms, methods of validation, and theorems, and embedded within a formal grammar. NooJ is designed for the development of grammars for processing large amounts of text. Corpora may be of any size, and text may be imported in a wide variety of formats. A lexical analysis is immediately applied based on a robust dictionary module that includes a built-in morphological analyzer. The outcome of the lexical analysis functions as the inaugural tier in a hierarchy of stand-off annotation levels.

Keywords: literary textuality, digital textuality, mathematical theory, computational linguistics, NooJ grammar development.

1. Introduction

Quantum communication with a digital transformation is like Gloria Bertasi's³⁵ *A drone flying over the city, past and future that are married in a sequence, to summarize in a video, with images, our digital, classrooms, coworking*. It is a new didactic model that represents a leading project from the rector Tiziana Lippiello: «*Commitment to the new generations. We are a forge of*

³⁵https://corrieredelveneto.corriere.it/venezia-mestre/cronaca/21_dicembre_23/venezia-futuro-ca-foscari-digitale-aule-coworking-studentato-lido-27357a14-6.

ideas to face global challenges » It is a communication that digitalizes signs, symbols and icons, morphs, imprinted in formal techniques, but which scientifically transmits an integral semantics. The idea was born from a collaborative research model involving scientists from all over the world. These scientists gather themselves in a social network dedicated to all scientific disciplines, they work in different areas of expertise and use new and real-time tools for comparison.³⁶ It is an open dialogue in which experts, according to their field of experience, provide research and guidance. In other words, collaboration in real time leads the participants to understand the study indicators, the methodology, and a model of *Project quantum computing: quantum models, technologies, and validations*. This research is available at ResearchGate³⁷, which offers an open dialogue in collaborative work.

This work focuses, on the DPH text in the field of quantum and literary communication, which represents the synthesis of the *digital literary communication project included in Graphic coverings to study non local structures of communication descriptions analysis validations magazin: lieux - méthodologies - processus et validations*.³⁸ Through this work, we seek to establish semantic equivalences between quantum mathematics and computational linguistics within the French narrative typology, which is guided by the following themes: Entanglement Numbers, experts in Corpus Linguistics, Grammar, Computational Linguistics, Morphology, Natural Language Processing, Lexicography, and Syntax. We have conducted and authored research in several related topics, including number theory and the theory of group graphs. This work presents research into the transition from literary textuality to digital textuality, or from a narrative text in code. The model is according to Planat *et al.* (2021), whose focus is on discovering the structural similarities among three different languages. Similarly, the foundations of this approach are based on the work of Charles Baudelaire (2011) *Les Petits Poèmes en prose*, as well as the formalization of various linguistic descriptions using NooJ (2015).

In this work, we will examine the mathematical model proposed by French experts, as well as the contact points and structural equivalences between mathematical theory and computational linguistics. Additionally, we will identify a new exploration in the research area that generates a new mathematical, linguistic, and computer science multi-code paradigm. Consequently, we believe this work will offer a series of insights which can be used to identify equivalences between structures or between different typologies. However, there is one underlying question here: will we be able to find other convergence points among quantum theory, mathematics, and linguistics?

Likewise, the hypothesis of this research is structured with a new methodology and with the participation of experts, who gather themselves in a social network and work within different areas of expertise, using new tools of comparison. This work is also focused on the formal process of literary production and its encounter with digital intelligence. And the questions here are the following: 1) Will the mathematical model succeed in describing formal processes? and 2) Will we succeed with scientific theories to elucidate the process of synthesis of languages and still find the convergence points between quantum mathematics and computational linguistics? The mechanization of mental processes of reasoning was initiated by Nagel and Newman (2001). It is important to note that Euclid had already codified geometry, yet it took us centuries to reach axiomatic reasoning. Mathematicians and logicians first recognized that in formal systems, the meaning and form of the knowable and nature could be discerned. Indeed, in the dialogue, Carroll poses a profound philosophical problem, as outlined in Douglas *et al.* (1984): "Do words and thoughts follow formal rules or not?". The answer can be found in Wendt (2015), which posits that we are continually "trapped" through language and communication. Thus, it can be surmised that contemporary communication is formal in nature, comprising systems, axioms, methods of validation, and theorems, and embedded within a formal grammar.

³⁶ This work is based on a previous one: https://doi.org/10.1007/978-3-031-23317-3_17.

³⁷

https://www.researchgate.net/publication/355491134_Quantum_computation_and_measurements_from_a_space-time_in_fixed_languages.

³⁸https://www.researchgate.net/publication/355116190_Graphic_coverings_to_study_non_local_structures_of_communication_descriptions_analysis_validations_magazen_lieux_-metologies_-_processus_et_validations

2. A mathematical model: group relationship and analysis

In the first phase, we look for the assumptions that lead us to the primary purpose, which is to verify the applicability of scientific theories, as a correlation tool to literary communication. We analyze and investigate the process that transformed the literary text into a scientific model performed by M. Planat. The conjugation classes of the subgroups in a finitely generated group start from the concept of relationship. Let $rel(x_1, x_2, \dots, x_r)$ be the relation defining the finitely presented group $fp = \langle x_1, x_2, \dots, x_r | rel(x_1, x_2, \dots, x_r) \rangle$ on r letters (or generators). We focus our attention on the classes of subgroups of fp with respect to the nature of the relation rel .

Table 1. The number $Isoc(X, d)$ for small values of first Betti number r (alias the number of generators of the free group Fr) and index d . Thus, the columns correspond to the number of conjugacy classes of subgroups of index d in the free group of rank r .

r	$d=1$	$d=2$	$d=3$	$d=4$	$d=5$	$d=6$	$d=7$
1	1	1	1	1	1	1	1
2	1	3	7	26	97	624	4163
3	1	7	41	604	13,753	504,243	24,824,785
4	1	15	235	14,120	1,712,845	371,515,454	127,635,996,839
5	1	31	1361	334,576	207,009,649	268,530,771,271	644,969,015,852,641

The convergence between linguistics and mathematics is evident in the parallel methodologies employed by both disciplines. As demonstrated by Planat *et al.* (2021), the French research model exemplifies this convergence, whereby the number group is transferred to the phrase group... *Our mathematical theory of the secondary structures in proteins, music and poems relies on the concept of a finitely generated group and the corresponding graph coverings... and LGLI lexicon-grammar methodologies.* From intuition, it arises that the process of the mathematical model for the reduction of the group just described is filtered through... *the cardinality structure ηd (fp) of the conjugation classes of the subgroups ... to transform a group into a partition of certain cardinality structures and then... and so the formal reduction process is the same as the linguistic model.*

In the first stage, we identify in the theories of Planat *et al.* (2021) a formal paradigm that is developed in mathematical theories. Our assumptions then lead us to the primary purpose, which is to test the applicability of scientific theories, as a correlation tool to literary communication. Similarly, with our studies we concentrate on the mathematical model and the justifications of formal processes, as outlined by Hofstadter *et al.* (1984). This approach involves *the use of mathematical reasoning to explore the very nature of mathematical reasoning itself.* The methodology employed in this work is therefore based on the investigation of mathematical theories, such as group theories and their properties in order to identify answers which can be included in the realm of mathematical reasoning itself. The aim of the answers we are seeking is to motivate, validate, and justify: 1-the comparison of parameters in different textual contexts; 2-the structuring or validating of a guiding formal system that serves mathematical reasoning (system of validation of axioms, a method, etc.) as described by Hofstadter *et al.* (1984). This system will support the activation of a synthetic, homologous, and fixed formal code embedded in a new formal paradigm; 3- the analysis of *Les Petits Poèmes en prose: Le Spleen de Paris*, poem "L'Horloge" for the narrative text by Baudelaire (2011) in accordance with the methodology proposed by Planat *et al.* (2021):

Les Chinois voient l'heure dans l'œil des chats.

[...] *Le gamin du céleste Empire hésita d'abord; puis, se ravisant, il répondit: «Je vais vous le dire. » Peu d'instant après, il reparut, tenant dans ses bras un fort gros chat, et le regardant, comme*

on dit, dans le blanc des yeux, il affirma sans hésiter: «Il n'est pas encore tout à fait midi. » Ce qui était vrai. [...].³⁹

To proceed with the analysis, we focus on the text in question and identify points of convergence, as outlined by Planat *et al.* (2021). Their mathematical theory of secondary structures in proteins, music, and poems is based on the concept of finitely generated groups and the corresponding coverings of graphs, as explained. We posit a theory in which we declare that there is a same correspondence too, and we elucidate their similarities, transformations, and code symbols embedded in their own grammar. They utilize scientific theories in these focal points.

In this paper, we point out for the first time a remarkable analogy between the structure of the bonds between amino acids of a protein (the secondary structure of proteins) and the nonlocal structures observed in tonal music and poems. We explain the origin of these analogies with finitely generated groups and graph covering theory.

Description: Transformation into finite group: Analysis and partitions into groups (group theory); Homomorphism, Generators, etc.

Chosen codes:

- Protein language = alphabet.
- Musical language = letters (tonal analysis -) recursion.
- Poetic -narrative language = letters (final analysis) recursion.

Categories of 3 symbols: H = (Names and Adj); E = (V); C = (died and ended)

Categories of 4 symbols: H = (Names and Adds); E = (V); C = (died and ended); A = Prep

Categories of 5 symbols: H = (Names and Adds); E = (V); C = (died and ended); A = Prep; Lawyer

Table 2. Reformulation of the textual tract of C. Baudelaire sequence.

Le Gamin du Céleste Empire ... Ce Qui était Vrai	Card. Seq. of cc of Subgroups	f
3 letters: $rel=C^2 H^5 C^2 H^7 H^8 E^8 C^7 CC^4 CC^2 E^8 C \dots$	[1,3,7,34,131]	2
4 letters: $rel=C^2 H^5 A^2 H^7 H^8 E^8 C^7 CC^4 CC^2 E^8 C \dots$	[1,7,41,636,14364]	3
5 letters: $rel=C^2 H^5 A^2 H^7 H^8 E^8 B^7 CB^4 CC^2 E^8 C \dots$	[1,15,235,14376,...]	4

The research carried out thus far has been made possible by following the scientific Planat's model. The support of these studies has been very useful. This has enabled us to describe a new formal code in a descriptive grammar within the context of a quantum mathematical model. The dissertation then proceeds to the formal grammar stage, with a distinct code but identical mathematical axioms. In their work, Planat *et al.* (2021) presents a novel analogy between the secondary structure of proteins and the nonlocal structures observed in tonal music and poems. This analogy represents a significant advancement in the field of structural biology. They elucidate the genesis of these analogies through the lens of finitely generated groups and graph covering theory.

³⁹ The boy of the Celestial Empire at first hesitated; then, changing his mind, he replied: "I'll tell you." A few moments later he reappeared, holding a very large cat in his arms, and looking him, as they say, straight in the eye, said without hesitation: "It is not yet noon." What was true.

3. Comparing models: language environments and lexicon grammar as an elementary calculation LGLI

To gain a deeper understanding of the relationship between Planat's methodologies and the Lexicon-Grammar methodologies for transforming mathematical codes into linguistics, it is necessary to examine the similarities and differences between these two approaches.

To proceed to one taxonomic classification from the possible sentences in the narrative sequence of the French narrative literary text, it would be beneficial to clarify the importance of the verb in the sentence through the research and experimentation method of LGLI and to insert them into a local grammar. Consequently, the goal here is to integrate the mathematical paradigm into linguistic structures to generate a formal synthetic code within a formal grammar lexicon-grammar L.G.L.I. (as proposed by Elia *et al.*, 1985).

Over the course of a decade, the Department of Communication Sciences at the University of Salerno collaborated with various research centers and the *Laboratoire d'Automatique et Linguistique (CNRS - Paris)* to develop novel methodologies for linguistic inquiry. The research has been conducted primarily through the construction of syntactic lexicons, which have been developed to provide a comprehensive and formal description of a specific language. This research is part of the larger project, "Lexicon Grammar of the Italian Language (LGLI)". The theoretical framework guiding this research is the "Operator-Argument Grammar framework," as proposed by Harris (1982). A rigorously analytical approach has been derived in which, despite the centrality of syntax and the scientific nature of the rules of transformation, the grammar of a language should no longer be interpreted as an abstract model but be investigated on the basis of concrete statements.

In this way, by associating the first-class code sentence (43) with the class code sentence (41), a multitude of sentences with analogous characteristics is obtained:

$N_2 = \text{Nhum}$	$N_1 = V^{\circ}\Omega$
$N_2 = \text{Nnr}$	$N_1 = \text{di } V^{\circ}\Omega$
$N_2 = \text{il fatto Ch F}$	$N_1 = N_{1, \text{hum}}\Omega$
$N_2 = V^{\circ}\Omega$	$N_1 = \text{se Fo se F ciò}$
$N_1 \text{ di } V_1 \Omega$	$\text{Ppv} = \text{lo}$
$N_2 V$	$N_1 = \text{Nhum}$
$N_2 V N_1 \text{ contro } N_2$	$N_1 = \text{N-hum}$
$N_2 V \text{ (presso con) Nhum}$	$N_1 = \text{il fatto ChF}$
	$N_1 \text{ di Nhum}$
$N_2 = \text{Che F}$	$N_1 \text{ da } N_2$
$N_2 = V^{\circ}\Omega$	$N_1 \text{ dal fatto ChF}$
$N_2 = \text{Aux } V^{\circ}\Omega$	$\text{ChF} = N_{1, \text{hum}}$
$N_2 \text{ di } V^{\circ}\Omega$	Passivo
$N_2 = \text{di Aux } V^{\circ}\Omega$	
$\text{Neg/interrog} = \text{Fcong}$	$N_1 = N_1 \text{ Agg}^1$
$\text{Imp} = \text{Fcong}$	$N_1 = \text{Agg}^1 \text{ ChF}$
$N_2 = \text{Che Fcong}$	$N_2 V \text{ (essere cong)}$
$N_2 = \text{Fcong}$	$N_1 \text{ hum per Aux } V^{\circ}\Omega$

Fig. 1. Description of an operator by classes of operators (lexicon-grammar): converging models. Classifying table: Elia *et al.* (1984).

This transformation can occur in an injective manner. This is defined as the correspondence of two distinct elements of the first set with two distinct elements of the second set, which is known as a monomorphism. It can also occur in a surjective manner, whereby each element of the second set is associated with at least one element of the first set (epimorphism).

This phenomenon can occur in a univocal manner if each element of the initial set is associated with a single element of the subsequent set (i.e., isomorphism) F. Description of an operator by classes of operators (lexicon-grammar): converging models.

The initial reduction in formal code is achieved through the categorization of operators, as proposed by Elia *et al.* (2000), according to a lexicon-grammatical classification of verbs and the possibility of aggregation with nominal forms. Research on sentence structures involves a lexicon-

grammatical classification of verbs and a determination of the actual possibility of aggregation with nominal forms. As stated in Elia *et al.* (2011), the theories of Harris and Chomsky posit that sentences with a high degree of lexical interchangeability within the position N radioactivity of the class of IVs are considered "free." This is based on the premise that sentences with a high degree of combinatorial possibilities are more flexible and therefore more "free". A second defining feature of simple sentences is the co-occurrence of a class of operator verbs and support verbs. It is appropriate to parse sentences according to the theories of Harris and Chomsky through the study of the combinatorial possibilities of sentences, which are considered "free" sentences and that have wide possibility of switching lexical entries within the N position (productivity of the class of N). A second feature of simple sentences is characterized by the co-occurrence of a class of operator and support verbs. The third category, which may be referred to as "phrases," is defined as follows: as a result, as previously stated, if we would like to proceed to one taxonomic classification from the possible sentences in the narrative sequence of the French narrative literary text, it would be convenient to clarify the importance of the verb in the sentence through the research and experimentation method and to insert them into a local grammar in accordance with Elia *et al.* (1985).

-Analysis of the linguistic mechanisms of the sequence Fs:

- a) Verbal operators: *Je vais vous le dire; il reparut; le regardant; il affirma; hésiter; (Ce qui) était vrai. Mechanisms of Pronominalization.*
- b) Substitute preverbal pronouns: *le dire; il reparut; le regardant; il affirma; hésiter; (Ce qui) était vrai. Pronominal positionality.*
- c) Polyrematic: *celeste Empire; M. Word= (le regardant) dans le blanc des yeux: Denotative phrase DPH= comme on dit.*

-Parsing and reduction in Fs = Analysis on a sequence

- a) Fixed sentences: *le regardant, ..., dans le blanc des yeux, Ppv V*

-Comparative analysis: Mathematical Model – L.G.L.I

- a) 3 = Le *gamin* *hésita* = Det N0 V= HEC
- b) 4 = N0 Det V C = A H E C
- c) Le *gamin. Empire* *hésita* =
- d) 5= N0 V C c = A E H C B
regardant, comme on dit, dans le blanc des yeux, =N0 V Ppo C loc.

-Analysis of the mechanisms of the sentence

- a) Pronominal manipulation = analysis of the average such as

Je vais vous le dire; il reparut; le regardant; il affirma; hésiter;(Ce qui) était vrai.

= Ppv V_{supp} V; Ppv V Ppv V.....

- b) Calculation of the Fibonacci series, homophone iteration ⁴⁰

Le₁ gamin du cé₁le₂ste₃ E₅mpire₈ hé₁₃sita d'abord; puis, se ravisant, il répondit: "Je vais vous le dire

⁴⁰ The recursive technique was carried out on the elementary calculation of syllables and on the phonic repetition of a phonic analysis (Silvestri 2014, pag.214).

1 1 2 3 5 8 13...

-Phrase M. Word or idomatics = *Les Chinois voient l'heure dans l'œil des chats.*
..... *le regardant, comme on dit, dans le blanc des yeux ... = N O V as C 1*

4. The lexicon-grammatical and automatic text analysis⁴¹

NooJ is designed for the development of grammars that process large amounts of text. Consequently, it contains a comprehensive corpus processing module, which includes functions for indexing, annotation, and querying of corpora. The size of the corpora is typically ... Text can be imported in a wide variety of formats and a lexical analysis is immediately applied based on a robust dictionary module that has a built-in morphological analyzer. The outcome of the lexical analysis serves as the initial tier in a set of stand-off annotation levels, which contain, in addition to the elements, POS and morphological codes, as well as the results of any morphological grammars that have carried out typical pre-processing normalizations of the text...⁴²

The environment is designed for supercomputing, with computations generated through transformational analysis of feature mechanisms and graphs produced in the NooJ environment. One of the most appealing aspects of the system is its ease of use, particularly in the construction of sophisticated grammars of varying levels of computational complexity. These grammars can be readily created in graph form and applied to corpora as queries, as illustrated in Figure 2. This feature alone renders NooJ an optimal tool for both educational and rapid application development purposes. If the mode of definition proves more applicable, the graphs are equipped with alternative textual notations.



Fig. 2. Sophisticated grammars of various levels of computing power built in graph form and applied to corpora as a query.

As Silberztein *et al.* (2012) observes, NooJ is a self-contained corpus analysis and comprehensive linguistic development tool that employs an efficient uniform formalism, enabling the system to be deployed for a range of NLP tasks. A more flexible and powerful successor to INTEX (Silberztein, 1993), which was created at the LADL to develop sophisticated yet robust computational linguistic analyses, NooJ has far surpassed its predecessor in terms of implementation, linguistic and computational power, and efficiency. In accordance with these authors, NooJ is capable of functioning as a corpus processor (capable of processing large texts in real time) and a linguistic development tool (used to implement a multitude of linguistic resources). Additionally, it provides a unified formalism that can be employed to enter grammars of the four types of the Chomsky-Schützenberger hierarchy. As Silberztein *et al.* (2012) state,

⁴¹ For the realization analysis textual automatic was _ used the NOOJ software package, mainly based on the use of dictionaries electronic, grammars locals and state automata and transducers _ finished (hereinafter FST). In the course from the software applications, they are States used the dictionaries electronic developed by the Science Department from the Communication of the University of Salerno, or five dictionaries of the DELA system (dictionaries of simple and compound words) to which it has been flanked a dictionary electronic specialist in the sector from the communication.

⁴² Max Silberztein, Tamás Váradi, Marko Tadić, Open source multi -platform NooJ for NLP.

NooJ is designed to facilitate the development of grammars for processing large amounts of text. Consequently, it incorporates a comprehensive corpus processing module, which enables users to index, annotate, and query corpora.

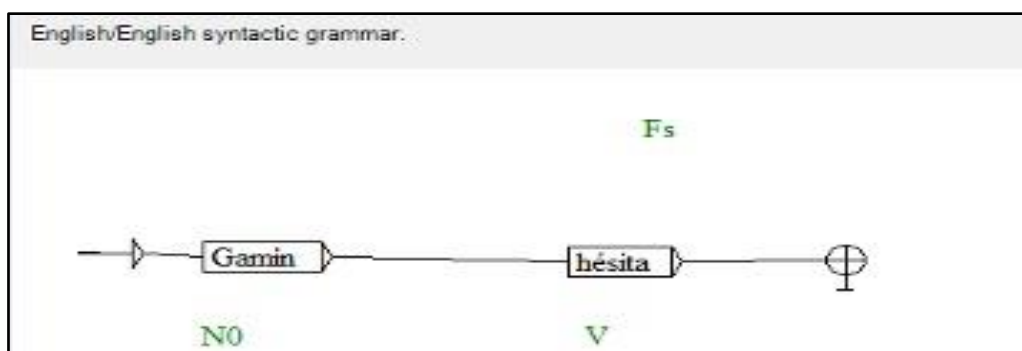


Fig. 3. Analysis and graphs converging in a single local grammar.



Fig. 4. 0..... le regardant, comme on dit, dans le blanc des yeux ... = N 0 V as C 1

In accordance with these features, the corpus processing engine of NooJ employs a multitude of linguistic, lexical, and syntactic resources, enabling users to perform sophisticated queries encompassing any of the available morphological, lexical, or syntactic properties. In this manner, Planat's and Silberztein's methods could serve as a foundation for carrying out operations in the linguistic, physical, and mathematical domains that would permit users to construct more expansive mathematical, lexical, and semantic structures within these academic disciplines.

5. Digital Intelligence Tool in NooJ environment

The DIGITAL INTELLIGENCE W.T language environment (©2020) BiVuTeGMS's is dependent upon the presence of an "excellent" human mind to control and guide the entire process:

1. The reconversion of taxonomies of phrases, parts of phrases, syntagms, or parts of syntagms into acronyms that have undergone validations is a process that has been undertaken to analyze and detect linguistic mechanisms. These mechanisms include the manipulation of substitutions, permutations, syntagmatic and phonological calculation according to Silvestri's theories (1996), as well as the computation of averages for selected sentences.
2. In the context of the linguistic environment, NooJ software Silberztein facilitates the reconversion of parts phrases or syntagms into graphs, employing techniques and tools drawn from graph theory. This process entails the parallel production of the phenomenon in question, with two distinct justifications for its occurrence in both the linguistic and mathematical domains.

This is the final reduction in acronyms, which is the result of fixed sentences. The digital archive is supported by a sheet of editing, reformulation, and reconversion of sentences or textual parts.

To describe the formal process, we may say that data, or sentences, undergo the following process: data collection, calculation of linguistic mechanisms, averaging, reduction into categories (L.G.L.I.), production of formal codes in the NooJ environment, transformational and distributional analysis of chosen traits in high-computing and scientific validation environments, and phrase reductions into acronyms. The central component of the software is a digital sheet on which the operator edits, translates, and recodes using acronyms (i.e., fixed phrases) and free phrases that the digital operator produces as needed. The term "redactor text" is employed to describe a digital sheet that can be likened to a paper sheet. It can construct different text types, and its functionality is enhanced by human skills, which can be further augmented by human excellences. Its functions include the drafting of a text composed of free sentences and paraphrases; translation and reformulation from one language to another (L1, L2, L3), including iconic languages.

Similarly, as Silberztein (2005) points out, one distinguishing feature of NooJ is that its corpus processing engine employs a comprehensive array of linguistic, lexical, and syntactic resources⁴³. This enables NooJ users to execute sophisticated queries that encompass any of the available morphological, lexical, or syntactic properties. In contrast to INTEX, NooJ employs a novel technology, namely .NET, a novel linguistic engine, and was designed with a novel range of applications in mind⁴⁴.



Fig. 5. Digital intelligence Tool in NooJ environment, an example.

6. Conclusion

This research was made possible using Planat's scientific model. The support of these studies has been invaluable, enabling us to describe a new formal code in a descriptive grammar within the context of a quantum mathematical model. The dissertation then proceeds to the formal grammar stage, with a distinct code but identical mathematical axioms. This mathematical theory of secondary structures in proteins, music, and poems is based on the concept of finitely generated groups and the corresponding coverings of graphs, as previously explained.

Although the Planat mathematical model has been described using only a single text and based on the authors' production of it, comparisons have been made between mathematical and computational linguistic theories of Lexicon-grammar. These comparisons have been drawn within the context of the similarities between languages and the reduction of fixed synthetic code.

⁴³ See annex N° 1

⁴⁴ See annex N°2

From the concentration on the mathematical concept of group, relation, and series, it became evident that they are the unequivocal reductions to paraphrase the number group into phrase group, then into validation code from mathematical to linguistic symbols. While outlining the fundamental stages for the formal description of languages, it becomes evident that certain crucial stages are absent, including those pertaining to quantum computing and universal digital writing code.

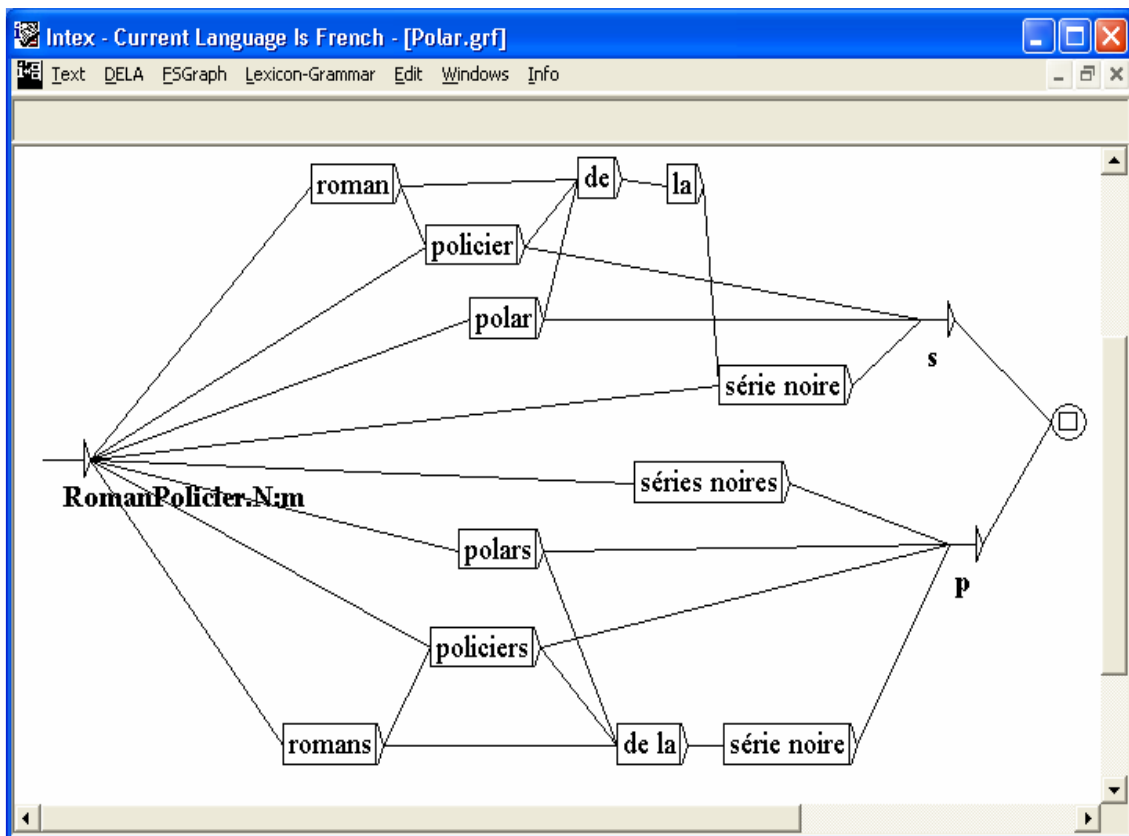
In conclusion, this work aims to present in-depth research about the transformation from literary textuality to digital textuality, or from a narrative text in code. Similarly, the foundation of this approach is based on the work of Charles Baudelaire, *Les Petits Poèmes en prose*, as well as the formalization of various linguistic descriptions using NooJ.

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Annexes

Annex N° 1: Representation of a set of compounds synonyms. (Source: Silberztein, M. (2004). *NooJ: A Cooperative, Object-Oriented Architecture for NLP. INTEX pour la Linguistique et le traitement automatique des langues*. Online: [NooJ: A Cooperative, Object-Oriented Architecture for NLP](#)).



Annex N° 2: The Java version of NooJ. (Source: Max Silberztein. NooJ V4. Formalizing Natural Languages with NooJ2013, Jan 2013, Saarbrucken, Germany. <https://hal.science/hal-02435923>. Online: [NooJ V4](#)).

The screenshot displays the NooJ software interface. At the top, the menu bar includes 'File', 'Edit', 'Lab', 'Project', 'Windows', 'Info', and 'CONCORDANCE'. The main window is titled 'Portrait of a lady.jnot' and shows a text editor with the beginning of 'The Portrait of a Lady' by Henry James, 1881. A sidebar on the right provides statistics: 125 digits, 47813 delimiters, and 78221 characters. Below the text editor, a 'Concordance for Text Portrait of a lady.jnot' window is open, showing search results for the pattern 'before, and'. The concordance table has four columns: 'Text', 'Before', 'Seq.', and 'After'. The search results show various time-related phrases like 'a few days ago', 'a few short weeks ago', and 'at a quarter to eight'. At the bottom, a progress bar indicates '71 sec' and '0%' completion.