# Exploring the Drawbacks of Using Artificial Intelligence in Studies on Architecture: NLP and Highly Contextual Postmodern Architectural Discourse

PhD
**OLGA CHRZANOWSKA**
Assistant Professor
Institute of Architecture and Town Planning
Lodz University of Technology
**ORCID: 0000-0001-6939-9249**

This research investigates the drawbacks of using Natural Language Processing tools in studies on discursive sentiment in architectural discourse. The results of the study suggest that the sentiment analysis of postmodernist texts using opinion mining techniques must be interpreted with the utmost caution. First, it is because architectural postmodernists use many polarized words which might end in inconclusive results when opinion mining techniques are in use, second, the postmodernist texts might themselves lack important contextual cues for appropriate classification of sentiment by NLP. Discrepancies and internal contradictions are characteristic for the postmodernist style of writing, and artificial intelligence still does not fully decode it.

The early modern architecture's crisis of historicity, with its beginnings in the Enlightenment [1], [2], [3], and its continuation in postmodernism of the sixties [4], has evolved in the seventies into a specific melancholy and disenchantment in works (texts and build output) of various architects, observable even to this day in contemporary architecture. This investigation has a comparative character, examining the discourse of a leading group of architects of the third quarter of the twentieth century. The group studied here is the group of early postmodernists, represented by the Second Philadelphia School, with their main texts written and published in the sixties and the seventies. Their ideas were later on passed to the seventies and the eighties, mainly to the Disenchanted Neo-Avant--Garde [5], [6], [7] (namely Aldo Rossi, Peter Eisenman, John Hejduk, and Bernard Tschumi).

The history of architecture in the period of modernism and postmodernism changes its basic functions, as the historian of this period, Manfredo Tafuri, puts it, it becomes operative, projective history [8], [9], [10], [11]. The reading and interpretation of the history of architecture by leading architects are becoming more subjective and ideological [12], [13]. The history of architecture and its individual periods seem to fall in and out of the canon very dynamically in the interpretations of modernist and postmodernist architects. Mythologies of past architectural styles are used by modernist and postmodernist architects to build narratives about

Table 1.1 Paragraph one, sentence sentiment analysis of R. Venturi, Complexity and Contradiction in Architecture, second edition, New York: The Museum of Modern Art, 2016, ISBN: 978-0-87070-282-2

| No. | Sentence | Sentiment NLP | Sentiment manual | Type of NLP's mistake | Explanation |
|---|---|---|---|---|---|
| 1. | I like complexity and contradiction in architecture. | Neutral | Positive | Polarized words | „Complexity and contradiction" are usually negatively connoted, while "I like" positively. |
| 2. | I do not like the incoherence or arbitrariness of incompetent architecture nor the precious intricacies of picturesqueness or expressionism. | Neutral | Negative | Polarized words | „Precious intricacies of picturesqueness" are often positively connoted, while "I do not like" negatively. |
| 3. | Instead, I speak of a complex and contradictory architecture based on the richness and ambiguity of modern experience, including that experience which is inherent in art. | Neutral | Positive | Polarized words | „Complex, contradictory, richness, ambiguity," a mix of positively and negatively connoted words, resulted in NLP's neutral code of a sentence. |
| 4. | Everywhere, except in architecture, complexity and contradiction have been acknowledged, from Gödel's proof of ultimate inconsistency in mathematics to TS Eliot's analysis of "difficult" poetry and Joseph Albers' definition of the paradoxical quality of painting. | Neutral | Negative | Context cues | The sentence is complex, „Everywhere, except in architecture" suggests that architecture falls behind "mathematics, poetry, painting," therefore is not neutral as per code. |

their own works [14]. The works and theories of those two influential groups have a tremendous influence on contemporary, twenty-first century architecture. The term Philadelphia School [15], refers to the larger group of architects, but in this study, it is narrowed down to selected architects connected to Venturi, Scott Brown and Associates office, namely Louis I. Kahn, Robert Venturi, Denise Scott-Brown, and Stephen Izenour The paper puts forward the research question of the feasibility and validity of the method of sentiment analysis in architectural discourse, using Natural Language Processing tools. This paper searches to identify the possible drawbacks of using the NLP tool for the analysis of the texts of postmodern architects.

The early Postmodern's and the Disenchanted's attitude toward the recent past generated highly critical and vital environment that fueled the works of many architects, and is present in architectural discourse up to this day. That is why, the research into the sources of the present-time architectural thought might be beneficial for the cultural critique and analysis of our build environment and theories behind its emergence. As new analysis tools emerge they are to be tested [16].

One can observe application of sentiment analysis across various domains, in sociology, business, and design [17]. Opinion mining analysis has already been used in the study of the political leaders [18], or professional groups such as journalists [19]. The twentieth century architectural discourse did not stray from politics and architectural texts of that time often comment on society, culture, and general worldviews while also being architecture-ideological (arguing for and against certain styles or other designers). Architects are also a professional group with large social reach and an important societal voice that influences both the image of our immediate surroundings (interiors, buildings, cityscapes) but also participate in the processes of mass culture transformations.

## Background

Text mining techniques using sentiment analysis could be utilized to "classificate emotions and feelings regarding a set of data against a specific event" [20] or a "relationship between public sentiment and the urban environment" [21]. With that findings, one can speculate that sentiment analysis might be checked against other entities, such as architectural styles. Sentiment analysis toward various past architectural styles is an important subject to study due to rapid increase of digital data concerning architectural discourse. The qualitative data analysis software might help to visualize the insights of such studies.

This paper searches whether Natural Language Processing methods might be an addition to the interpretative tendencies in the mainstream architectural research. The postmodern rhetoric within architectural realm was studied, for instance by Peter Fröhlicher [22]. Fröhlicher's careful linguistic analysis of the first chapter of Complexity and Contradiction in Architecture [23] by Robert Venturi, stressed the paradoxical usage of various architectural phrases of Venturi. This study shows what findings an AI aided opinion mining analysis might bring in this matter, the paper focuses on the most recognized piece of writing on postmodernist discourse.

Methodology

The study utilizes the qualitative AI aided discourse analysis tool Within the repertoire of themes that might be rendered from such an analysis the paper focuses on opinion mining. The sentiment of sentences in the sample postmodernist text are analyzed using Natural Language Processing software. The discourse analysis helps in the study of a social reality of a professional group [24]. The research uses this theoretical approach as a rationale behind the search within the architectural texts.

The study is of relevance in the face of growing introduction of the artificial intelligence into qualitative research within the studies of professions and design, architecture and urbanism included [25], [26]. NLP is already used to extract various concepts and conceptual categories coded in architectural texts [27]. The discourse analysis used in the full-scale research searches for various marks of emotion recognition in the form of sentiment analysis. NLP analysis tool used in this study is Atlas.ti 23.1.0 (4207), the main code is sentiment, subcodes are positive, negative, and neutral.

## Sample

The representativeness of the architects under case study is dictated by their recognition within those groups. There is no issue with the privacy of the data, as the texts were chosen from published and authorized texts of the architects. The additional data preparation, such as data cleaning for the analysis, was determined as not necessary. The representativeness of the specific dataset is discussed below.

The chosen sample size was comparable to the length of the text that is used in the traditional manual semantic analysis by socio-linguists. That is why, the studied fragment was identical in size to the one analyzed by Peter Fröhlicher [22] – a whole first chapter

Table 1.2 Paragraph two, sentence sentiment analysis of R. Venturi, Complexity and Contradiction in Architecture, second edition, New York: The Museum of Modern Art, 2016, ISBN: 978-0-87070-282-2

| No. | Sentence | Sentiment NLP | Sentiment manual | Type of NLP's mistake | Explanation |
|---|---|---|---|---|---|
| 5. | But architecture is necessarily complex and contradictory in its very inclusion of the traditional Vitruvian elements of commodity, firmness, and delight. | Negative | Neutral | Context cues | The sentence is highly contextualized. Architecture's postmodern idea of complexity is in line with antique theories. |
| 6. | And today the wants of program, structure, mechanical equipment, and expression, even in single buildings in simple contexts, are diverse and conflicting in ways previously unimaginable. | Positive | Neutral | Context cues | Typical of architectural writing of a time this sentence represents a neutral judgement about modern needs. |
| 7. | The increasing dimension and scale of architecture in urban and regional planning add to the difficulties. | Positive | Neutral | Context cues | Typical of architectural writing of a time this sentence represents a neutral judgement about modern needs. |
| 8. | I welcome the problems and exploit the uncertainties. | Neutral | Positive | Polarized words | „I welcome" is positively connoted while "problems, exploit, and uncertainties," are negative, which resulted in coding mistake. |

Table 1.3 Paragraph three, sentence sentiment analysis of R. Venturi, Complexity and Contradiction in Architecture, second edition, New York: The Museum of Modern Art, 2016, ISBN: 978-0-87070-282-2

| No. | Sentence | Sentiment NLP | Sentiment manual | Type of NLP's mistake | Explanation |
|---|---|---|---|---|---|
| 10. | Architects can no longer afford to be intimidated by the puritanically moral language of orthodox Modern architecture. | Negative | Negative | - | - |
| 11. | I like elements which are hybrid rather than "pure," compromising rather than "clean," distorted rather than "straightforward," ambiguous rather than "articulated," perverse as well as impersonal, boring as well as "interesting," conventional rather than "designed," accommodating rather than excluding, redundant rather than simple, vestigial as well as innovating, inconsistent and equivocal rather than direct and clear. | Negative | Positive | Inconclusive comparisons | The tirade of comparisons rendered the sentence negative. |
| 12. | I am for messy vitality over obvious unity. | Neutral | Positive | Polarized words | „I am for," "vitality," and "unity" are positively connoted, while "messy" and "obvious" negatively. |
| 13. | I include the non sequitur and proclaim the duality. | Neutral | Positive | Polarized words | „I include" and I proclaim are positive, while "non sequitur" negative. |

**The results show that the sentiment analysis of postmodernist texts using opinion mining techniques must be interpreted with the utmost caution.**

of the Complexity and Contradiction in Architecture "Nonstraightforward Architecture: A Gentle Manifesto", following 2nd edition of the text 1977, reprinted in 2016, page 16, which was 371 words in 19 sentences in 5 paragraphs [23]. After coding the sentiment analysis of the text, an algorithm was set to find paragraphs and sentences that contain the positive, neutral, and negative sentiment.

## Results

In the sample comparable to the one used in traditional manual semantic analysis, of 5 paragraphs the AI aided sentiment analysis proposed that 2 paragraphs are positive, 2 negative and 1 neutral in sentiment. The NLP tool also found that of 19 sentences, 3 contained positive sentiment, 3 were negative, and 13 neutral. Yet, the AI generated results require further explanation.

The opinion mining tool suggested that most of the statements in the analyzed text were neutral. Surprisingly, the AI tool proposed that the famous opening statements of the book, such as "I like complexity and contradiction in architecture", or "I welcome the problems and exploit the uncertainties", are not positive, but neutral [table 1. and 2.]. Those findings are not consistent with traditional manual text analysis. This might be due to the intensive use of polarized words in the text.

As one of the techniques that AI tools use in their sentiment analysis is the recognition and classification based on the use of polarized words. In this method terms such as "bad", "ugly", or as in Venturi's example "contradictory", "problems" make the tool to classify the sentiment as negative [28]. While "good", beautiful", or as in Venturi's example

Table 1.4 Paragraph four, sentence sentiment analysis of R. Venturi, Complexity and Contradiction in Architecture, second edition, New York: The Museum of Modern Art, 2016, ISBN: 978-0-87070-282-2

| No. | Sentence | Sentiment NLP | Sentiment manual | Type of NLP's mistake | Explanation |
|---|---|---|---|---|---|
| 14. | I am for richness of meaning rather than clarity of meaning; for the implicit function as well as the explicit function. | Neutral | Positive | Inconclusive comparisons | The comparisons rendered the sentence negative. |
| 15. | I prefer "both-and" to "either-or," black and white, and sometimes gray, to black or white. | Neutral | Positive | Contextual cues | He refers to the modern and postmodern groups of architects Whites and Greys. |
| 16. | A valid architecture evokes many levels of meaning and combinations of focus: its space and its elements become readable and workable in several ways at once. | Positive | Positive | - | - |

Table 1.5 Paragraph five, sentence sentiment analysis

| No. | Sentence | Sentiment NLP | Sentiment manual | Type of NLP's mistake | Explanation |
|---|---|---|---|---|---|
| 17. | But an architecture of complexity and contradiction has a special obligation toward the whole: its truth must be in its totality or its implications of totality. | Neutral | Neutral | - | - |
| 18. | It must embody the difficult unity of inclusion rather than the easy unity of exclusion. | Neutral | Neutral | - | - |
| 19. | More is not less. | Neutral | Negative | Contextual cues | He paraphrases Mies van der Rohe's motto. |

**Discrepancies and internal contradictions are characteristic for the postmodernist style of writing.**

"like", "welcome" classify sentence as positive. Due to the intensive use of contradictory polarized words, both positive and negative, in a single sentence, opinion mining techniques might render such sentences neutral.

In the case of "I like complexity and contradiction in architecture" the sentence's sentiment should be positive, not neutral. The computer sentiment analysis does not "read" that negative words here were used in a positive way. Venturi's opening book statement sounded contradictory, but was actually the theme he argued for, throughout the book and in his whole career. The ugly and the ordinary – another set of traditionally negatively connoted adjectives, were famously used by Venturi and Scott Brown in architecturally inclusive manner.

Another problem arises when the AI sentiment analysis encounters comparisons that need contextual cues. The negative sentiment proposed by the tool to the following sentence, is in author's opinion inconclusive [table 3. and 4.]: "I like elements which are hybrid rather than "pure", compromising rather than "clean", distorted rather than "straightforward", ambiguous rather than "articulated", perverse as well as impersonal, boring as well as "interesting", conventional rather than "designed", accommodating rather than excluding, redundant rather than simple, vestigial as well as innovating, inconsistent and equivocal rather than direct and clear" [20].

The negative connotation of this sentence is contrary to the manual analysis which suggests the sentence to be neutral or even positive in tone. The whole tirade of comparisons, "the rathers" of Venturi, requires contextualization. With such contrasting entities as "conventional rather than 'designed' or hybrid rather than 'pure'" he establishes the postmodern movement against the previous architectural dogmas stated by the modernists, or as he calls them the "Orthodox Moderns".

Surprisingly, also the use of disjunct might render the sentiment wrong such as in the sentence [table 5.], "Instead, I speak of a complex and contradictory architecture based on the richness and ambiguity of modern experience, including that experience which is inherent in art" [20]. In this case the results of AI were neutral, while the whole sentence is positive in tone. Venturi compares richness and ambiguity of modern experience to that one gets from art. Venturi renders such comparison as positive and productive for postmodernism in clearly approving tone.

## Conclusions and disscusion

The results show that the sentiment analysis of postmodernist texts using opinion mining techniques must be interpreted with the utmost caution. Especially in the case of nonstraightforward, highly contextualized, and modernist reactive, often ironic or sarcastic, postmodern discourse. This may have consequences in various domains, one of them being architectural education. It is important to teach architecture students 'epistemic cognition' when experiencing or assimilating information, so that they think about the reliability and limits of cognition, being careful and mindful of the protocols behind the latest technological solutions might enhance productivity, such as opinion mining [29].

Two main reasons for that were found in this study. First, architectural postmodernists use many polarized words which might end in inconclusive results when opinion mining techniques are in use. Second, the postmodernist texts might themselves lack important contextual cues for appropriate classification of sentiment by NLP. Also, due to a number of metaphorical expressions, the AI aided analysis of architects' texts might render some of positive, negative, and neutral sentiment wrong. The poetic mode of language and internal coding in architectural discourse might be a reason for the higher volume of metaphorical expressions, comparisons, and polarized words found in

architects' texts. It is then the finding of this study that one should carefully look into the sentences which contain sentiment analysis of architects' texts, and identify whether the language of the sentence is metaphoric, then verify the sentiment, changing it manually if necessary.

Discrepancies and internal contradictions are characteristic for the postmodernist style of writing. Still, AI is getting better at understanding our emotions and associations in the language [30]. Developers broaden the contextual data with each new program version and also by continuously expanding their databases. If the similar analysis was to be performed after another couple of months it might render different results, and also different reasons for AI mistakes in interpretation of postmodern texts by might arise.

## BIBLIOGRAPHY


[1] Habermas, J. Modernity versus Postmodernity. New German Critique, no. 22 (1981): 3–14.
[2] Habermas, J. Modernity an Unfinished Project [1980]. In Contemporary Social Theory, edited by Craig J. Calhoun, 444–450. Cambridge: Blackwell, 2012.
[3] Habermas, J. The Philosophical Discourse of Modernity: Twelve Lectures. Cambridge: Blackwell, 2007.
[4] Huyssen, A. Mapping the Postmodern. New German Critique, no. 33 (Autumn 1984): 5–52.
[5] Hays, K.M. Uwagi o metodzie narracyjnej w interpretacji historycznej. Footprint 1, (jesień 2007): 23–30.
[6] Hays, K.M. red. Architecture Theory Since 1968. Cambridge, MA: MIT Press, 1998.
[7] Hays, K.M. Architecture's Desire Reading the Late Avant--Garde. Cambridge, MA: The MIT Press, 2010. 1991.
[8] Tafuri, M. Architecture and Utopia: Design and Capitalist Development. Translated by Barbara Luigia La Penta. Cambridge, MA: The MIT Press, 1976.
[9] Tafuri, M. Theories and History of Architecture. Translated by Giorgio Verrecchia. London: Granada, 1980.
[10] Tafuri, M. The Sphere and The Labyrinth: Avant-Gardes and Architecture from Piranesi to the 1970s. Translated by Pellegrino d'Acierno and Robert Connolly. Cambridge, MA: The MIT Press, 1987.
[11] Tafuri, M. Toward Critique of Architectural Ideology. Translated by Stephen Sartarelli. In Architecture Theory Since 1968, edited by K. Michael Hays, 6–35. Cambridge, MA: The MIT Press, 1998.
[12] Çavdar, R.Ç. Ideology, subject, architecture: The transformation of architectural theory and the architect-subject in the 21st century, Ankara: Middle East Technical University, 2018.
[13] Mallgrave, H.F., Goodman, D.J. An introduction to architectural theory: 1968 to the present. New York: John Wiley & Sons, 2011.
[14] Harvey, D. The Condition of Postmodernity: An Enquiry into the Origins of the Cultural Change. New York: Wiley, 1992.
[15] Stierli, M., Brownlee D.B. eds. Complexity and Contradiction at Fifty. Nowy Jork: Muzeum Sztuki Nowoczesnej, 2019.
[16] Winiatri, S. Application of Artificial Intelligence in Digital Architecture to Identify Traditional Javanese Buildings, Journal of Artificial Intelligence in Architecture, 1 (2), 2022.
[17] Pang B., Lee L., Opinion Mining and Sentiment Analysis, Foundations and Trends in Information Retrieval, 2 (2008), 9.
[18] Bella, A. et al., Accessing perceived organizational leadership styles through twitter text mining, Journal of Association for Information Science & Technology 69, Issue 1 (2018) doi.org./10.1002/asi.23918.
[19] Rybiński, K. Analiza nastrojów politycznych a wolność prasy, Studia Medioznawcze 74, nr 3, 2018.
[20] Aramburo, R.F.P. et al., Data Science in Social Politics with Particular Emphasis on Sentiment Analysis, Procedia Computer Science 214, 2022. ISSN: 1877-0509, 426.
[21] Yang, L. et al., Quantifying the Relationship Between Public Sentiment and Urban Environment in Barcelona, Cities 130 (2022) ISBN:0264-2751, 1.
[22] Frohlicher, P. On the Rhetoric of a Gentle Manifesto, Complexity and Contradiction at Fifty, red. Martino Stierli i David B. Brownlee, Nowy Jork: The Museum of Modern Art, 2019, ISBN-10: 1633450627, 114–155.
[23] Venturi, R. Complexity and Contradiction in Architecture, New York: The Museum of Modern Art, 2016, ISBN: 978-0-87070-282-2.
[24] Philips, N., Hardy, C., Discourse Analysis: Investigation Processes of Social Construction, Newbury Park, CA: Sage, 2002.
[25] Kong, L. et al., How Do Different Types and Landscape Attributes of Urban Parks Affect Visitors' Positive Emotions?, Landscape and Urban Planning 226, 2022. ISSN: 0169-2046.
[26] Headley, A.M. Psychologia budynków wymiaru sprawiedliwości: A Survey Experiment on Police Architecture, Public Sentiment, and Race, Journal of Criminal Justice 73, 2021. ISSN: 1873-6203.
[27] Wong, J.F. The Text of Free-Form Architecture: Qualitative Study of the Discourse of Four Architects, Design Studies 31, 2010. ISSN 0142-694X, 237-276.
[28] Cavitha, C.R. et al. Study of Natural Language Processing for Sentiment Analysis, Conference: 3rd International Conference on Pervasive Computing and Social Networking (ICPCSN), Salem, India, 2023.
[29] Borkowski, A.S. Experiential learning in the context of BIM, STEM Education 3(3):190–204, 2023.
[30] Smith, K.K. et al. Emotion recognition and artificial intelligence: A systematic review (2014–2023) and research recommendations, Information Fusion Volume 102, February 2024.



**DOI: 10.5604/01.3001.0054.6118**

**PRAWIDŁOWY SPOSÓB CYTOWANIA**
**Chrzanowska Olga, 2024, Exploring the Drawbacks of Using Artificial Intelligence in Studies on Architecture: NLP and Highly Contextual Postmodern Architectural Discourse, „Builder" 07 (324). DOI: 10.5604/01.3001.0054.6118**


## ABSTRACT:


This research investigates the artificial intelligence aided architectural discursive sentiment analysis within the texts of the representants of architectural culture of the sixties and the seventies. The subject of inquiry for this study is to examine the nature and validity of sentiment analysis, using Natural Language Processing tools, on postmodernist architectural discourse. This paper searches to identify the possible drawbacks of using the NLP tool. The results show that the sentiment analysis of postmodernist texts using opinion mining techniques must be interpreted with the utmost caution. Especially in the case of unstraightforward, highly contextualized, and modernist reactive, often ironic or sarcastic, postmodern discourse. Two main reasons for that were found in this study. First, architectural postmodernists use many polarized words which might end in inconclusive results when opinion mining techniques are in use. Second, the postmodernist texts might themselves lack important contextual cues for appropriate classification of sentiment by NLP. Discrepancies and internal contradictions are characteristic for the postmodernist style of writing and artificial intelligence still does not fully decode it.



## KEYWORDS:

discourse, artificial intelligence, architecture, postmodernism


## STRESZCZENIE:


**ANALIZA WAD UŻYWANIA SZTUCZNEJ INTELIGENCJI W BADANIU ARCHITEKTURY:** NLP a silnie kontekstualny postmodernistyczny dyskurs w architekturze. Celem badań była analiza sentymentu wspomagana sztuczną inteligencją w tekstach przedstawicieli kultury architektonicznej lat sześćdziesiątych i siedemdziesiątych. Przedmiotem badań była analiza zasadności użycia narzędzi przetwarzania języka naturalnego w postmodernistycznym dyskursie architektonicznym. W artykule podjęto próbę zidentyfikowania możliwych wad stosowania narzędzia Natural Language Processing. Wyniki pokazują, że analizę sentymentu z wykorzystaniem technik eksploracji opinii należy interpretować z najwyższą ostrożnością w tekstach postmodernistycznych. Zwłaszcza w przypadku nieprostolinijnego, silnie skontekstualizowanego i modernistycznie reaktywnego, często ironicznego lub sarkastycznego dyskursu postmodernistycznego. W niniejszym badaniu znaleziono dwa główne powody takiego stanu rzeczy. Po pierwsze architektoniczni postmoderniści używają wielu spolaryzowanych słów, co może prowadzić do niejednoznacznych wyników, gdy stosowane są techniki eksploracji opinii w oparciu o sztuczną inteligencję. Po drugie w tekstach postmodernistycznych może brakować ważnych wskazówek kontekstowych dla właściwej klasyfikacji nastrojów przez NLP. Rozbieżności i wewnętrzne sprzeczności są charakterystyczne dla postmodernistycznego stylu pisania, a sztuczna inteligencja wciąż nie do końca go rozszyfrowuje.



## SŁOWA KLUCZOWE:

dyskurs, sztuczna inteligencja, architektura, postmodernizm